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# Prevalence of problematic Internet use and problematic gaming in Spanish adolescents

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ABSTRACT

Epidemiological studies on problematic Internet use and problematic gaming conducted so far have mainly been carried out with unrepresentative and self-selected convenience samples, resulting in unreliable prevalence rates. This study estimates the prevalence of problematic Internet use and problematic gaming in a large sample of Spanish adolescents ($N = 41,507$) and identifies risk and protective factors for these risky behaviours. Data were collected online using the Adolescent Problem Internet Use Scale and the Adolescent Gaming Addiction Scale. Using a cut-off approach with measurement instruments inspired by the DSM-5 framework, we found a prevalence of 33% for problematic Internet use and 3.1% for problematic gaming. With a more conservative approach inspired by the ICD-11 framework, prevalence rates decreased to 2.98% for problematic Internet use and 1.8% for problematic gaming. Female gender, higher parents' education, elevated Internet connection time, reporting being online after midnight and using the mobile phone in class predicted problematic Internet use; whereas male gender, "living situation" where families do not have a traditional structure or stable environment, elevated Internet connection time and reporting using the mobile phone in class predicted problematic gaming. A cut-off approach involving scales that recycle substance use criteria (as in the DSM-5) over-pathologize Internet use and gaming behaviours. In contrast, the ICD-11 approach seems to provide more realistic and reliable prevalence rates.

## 1. Introduction

The globalization of the Internet and advances in the field of technology over the last two decades, in addition to the undeniable benefits they have brought, have been the driving force behind one of the biggest behavioural changes in society, especially affecting children and adolescents (Díaz-Aguado et al., 2018; Vigna-Taglianti et al., 2017). These populations have been increasingly involved in – and spend a lot of time on – online activities, which amongst other things, affects the construction of their identity (Raiziene et al., 2022; van der Merwe, 2017), contributes to fulfilling basic needs (Chen, 2019; Partala, 2011) and yet also raises concerns about potentially risky or hazardous online behaviours (Fontana et al., 2022; Kaess et al., 2021). In 2015, the World Health Organization published a report about the need to consider the public health implications of excessive use of the Internet, computers, smartphones and similar electronic devices (World Health Organization, 2019). Simultaneously, online video games became one of the most popular leisure activities worldwide. Recently, the COVID-19 pandemic further increased reliance on online platforms and apps for professional, social and leisure purposes, raising concerns about a potential increase in problematic patterns of Internet use (Király et al., 2020).

Problematic Internet use is an umbrella construct that refers to a

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wide range of online behaviours (shopping, pornography viewing, social networking, cyberbullying, "cyberchondria") that can become uncontrolled and engender negative consequences (social, occupational, familial, educational), and associated with functional impairment in a subgroup of vulnerable users (Fineberg et al., 2018, 2022; World Health Organization, 2019). Notably, however, the construct of problematic Internet use is still debated. Several authors have argued that the Internet has to be viewed as a medium through which specific potentially problematic online activities occur and that the addiction framework is not necessarily the most suited to explaining problematic Internet use (Kardefelt-Winther, 2014; Ryding and Kaye, 2018; Starcevic and Billieux, 2017). Despite these conceptual controversies, scientific evidence shows that problematic patterns of involvement in online activities can be linked with psychological and physical adverse consequences and can thus be considered a relevant public health issue (World Health Organization, 2019).

This excessive or inappropriate use of the Internet is not recognized as a psychiatric condition per se, as only gaming disorder has been included in the latest version of the *International Classification of Diseases* (ICD-11) in its section on "disorder due to addictive behaviours" (Reed et al., 2022). Gaming disorder is primarily characterized by the manifestation of a persistent and dysregulated pattern of involvement associated with negative consequences (social, occupational, familial, educational) and functional impairment (Reed et al., 2022; Stein et al., 2018).

Video game involvement, including e-sports participation, has been growing exponentially, especially amongst young people (King and Potenza, 2019). Similarly, adolescents are increasingly confronted with gambling opportunities, especially regarding sport betting, putting them at risk of developing hazardous gambling behaviours (Barrera-Algarín and Vázquez-Fernández, 2021). A growing convergence between (video) gaming and gambling has been observed in recent years, further exposing children and adolescents to gambling opportunities (e.g. loot boxes) while they are playing video games (Kim and King, 2020). It is essential to produce reliable data on the prevalence of problematic Internet use and problematic gaming in representative adolescent samples. Indeed, previous epidemiological studies were mainly conducted in self-selected non-representative convenience samples (Rumpf et al., 2019; van Rooij et al., 2018), which resulted in unreliable prevalence rates of between 4% and 22.8% for problematic Internet use (Bickham, 2021; Díaz-Aguado et al., 2018) and between 0.7% and 15.6% for problematic gaming (Buiza-Aguado et al., 2018; Colasante et al., 2022; Gómez et al., 2020). In Spain, the country in which the current study takes place, previous studies also showed inconsistent results, with prevalence rates ranging from 16.3% to 38.8% (Gómez et al., 2017; Rial et al., 2018; Rodríguez et al., 2020) for problematic Internet use and from 3.3% to 7.1% specifically for problematic gaming (Brime et al., 2021; Mora-Salgueiro et al., 2022).

This huge variability in prevalence rates may be due to the overall poor quality of epidemiological studies in this field (Rumpf et al., 2019) related to the constant evolution of the technology itself, the screening instruments used, the target population and the lack of consensus about the establishment of cut-off points or the criteria used to define a "disorder" (King et al., 2013, 2020; Slack et al., 2022; Stevens et al., 2021). These aspects have contributed to the current situation in which prevalence rates are often inflated, contributing to moral panic and casting doubt on their public health relevance (Ryding and Kaye, 2018).

Previous prevalence studies in this field also largely relied on a "confirmatory approach", which consists in recycling the criteria for substance use disorder to define online addictive behaviours (; Billieux et al., 2015, 2022; Kardefelt-Winther, 2015), resulting in over-pathologization of normal behaviours and contributing to the inflated prevalence rates. Over-pathologization occurs because some criteria borrowed from substance use disorder (e.g. tolerance, mood regulation) – and included as diagnostic criteria in the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 2013), fifth edition (DSM-5) – are not necessarily indicative of pathology in gaming or Internet use (Castro-Calvo et al., 2021; Charlton, 2002; Charlton and Danforth, 2007). In contrast, the ICD-11 framework posits that a behavioural addiction is present when a dysfunctional pattern of involvement (in the activity) is characterized by loss of control, excessive priority given to the activity and continued use despite negative consequences, implying significant impairment in important domains of life (Brand et al., 2020; Reed et al., 2022). In fact, studies that applied stringent criteria and considered functional impairment as a mandatory feature (as defined in the ICD-11) reported more reliable prevalence rates (e.g. 1%−2%); see Stevens et al. (2021).

Against this background, and cognizant of the limitations of previous epidemiological research in this field, in the present study, we investigated the prevalence of problematic Internet use and online gaming in a large representative sample of Spanish adolescents. Here we capitalized on a double approach to determine prevalence rates. First, we followed the classic approach used in the last decade by using cut-off-based measurement instruments inspired by the DSM-5 framework and the recycling of substance use disorder criteria. Second, to avoid overdiagnosis and over-pathologization, we also applied the more conservative and recent ICD-11 framework, in which three criteria are necessary (i.e. loss of control, excessive priority, continued use despite consequences) and some potentially non-valid substance use disorder criteria not retained (e.g. tolerance, preoccupation, mood regulation) (Castro-Calvo et al., 2021; Reed et al., 2022). In addition, we also aim is to identify risk and protective factors for problematic Internet use and problematic gaming. Indeed, based on previous studies, we can expect that a number of factors to be associated with these problematic behaviours. including sociodemographic, familial, and environmental factors (e.g., Ji et al., 2022; Kuss et al., 2014; 2020; Nielsen et al., 2020).

## 2. Methods

### 2.1. Participants and procedure

A survey was conducted amongst Spanish adolescents who were between 11 and 18 years old. The target population consisted of all schoolchildren residing in the national territory who were in compulsory secondary education in Spain. We relied on two-stage sampling that combined clusters and quotas (Cooksey and McDonald, 2019; Rada and Martín, 2014). Clusters were used to select the largest groups within the country, identified as the educational centres of each autonomous community, and quotas (city, province, sex, age and ownership of the centre) to establish the smallest groups, that is, to select the second-level units, the students (Fig. 1). The sampling procedure was the same as that used in the Survey on Drug Use in Secondary Education in Spain (ESTUDES, 2021) (Spanish Observatory on Drugs and Addictions, & Government Delegation for the Spanish National Drugs Plan, 2022) and in the Report of the European School Survey Project on Alcohol and Other Drugs (ESPAD, 2019) (EMCDDA, 2020).[1]

Information letters for parents explained the purpose, form and date of data collection. The letters also requested consent from families for the inclusion of their children in the study. The questionnaire was administered by using the school's own natural groups or "classes" between February and April 2021. All schoolchildren were duly informed of the purpose of the study, its confidential and voluntary nature, and the anonymity of their responses. The study was approved by the Bioethics Committee of the University of Santiago de Compostela under registry USC-35/2021/08/07. The final sample consisted of 41′507 adolescents, 48.7% females and 50.3% males, aged between 11 and 18

[1] In order to take into account the discrepancy between the total number of students in each autonomous community and the samples actually collected in the current study, we also computed weighted prevalence rate which are available from the Open Science Framework (OSF): https://osf.io/ujh3y/.

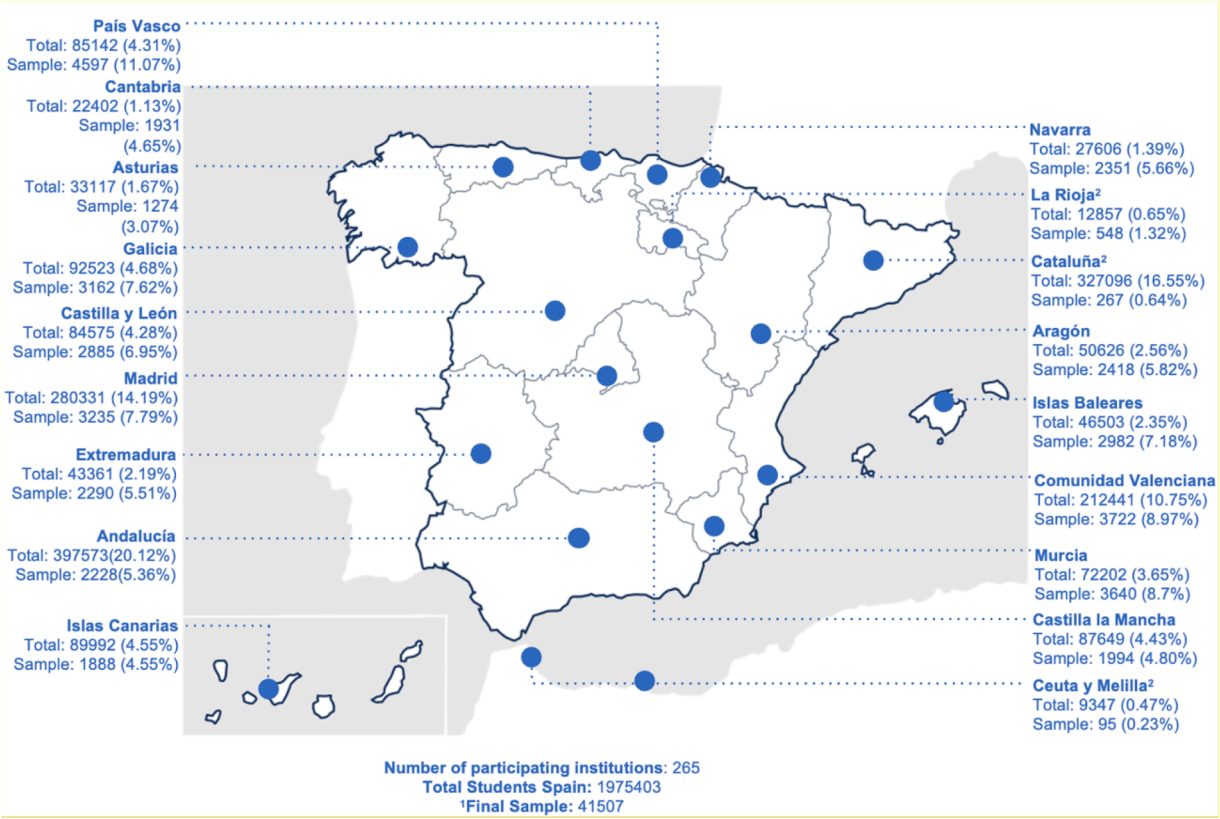


**Fig. 1.** Distribution of participants by autonomous community
1. The sample was adjusted to correct the imbalances generated by the fieldwork on the original sample.
2. In the case of Cataluña, La Rioja, and Ceuta and Melilla, the corresponding weighting was not performed, because it was not possible to reach the necessary sample size.
Total = number of students per autonomous community and percentage of participation per each community; Sample = final number of students per community and percentage of the total sample.

years ($M$ = 13.81; SD = 1.32) (Table 1). The study was not pre-registered, but all data and materials used are available from the following Open Science framework (OSF) link: https://osf.io/8dha5/.

In this study, we used a two-step procedure corresponding to the research objectives to determine the prevalence rates. A first prevalence rate was determined from the traditional cut-off values validated for each instrument used. This approach is aligned with the DSM-5 framework and considers each criterion for substance use disorder to be equivalent for reaching a cut-off value for problematic Internet use or problematic gaming. A second more conservative prevalence rate was determined from the recent diagnostic guidelines provided in the ICD-11. To determine this second prevalence rate, we selected items from the Game Addiction Scale for Adolescents (GASA) and Problematic Internet Use Scale in adolescents (PIUS-a) that match the ICD-11 clinical guidelines proposed for gaming disorder (ICD-11 code: 6C51) and other specified disorders for addictive behaviours (ICD-11 code: 6C5Y) (see Table 2 for details). For this second approach, the scores were recoded dichotomously so that they corresponded with dichotomic (yes/no) diagnostic criteria (for a similar approach, see (Király et al., 2019).

## 2.2. Instruments

An online survey was developed that included psychometrically validated measurement instruments. This survey was implemented on a platform of the University of Santiago de Compostela, hosted in the Galicia Supercomputing Centre, with the technical and legal supervision of the General Council of Professional Colleges of Computer Engineering of Spain. To minimize the possible problem of accuracy of the online survey methods, two complementary strategies have been used. On the one hand, a double piloting process of the questionnaire was carried out. The questionnaire was tested by individual interview (face-to-face) with a sample of 50 students of the same age target under study and, subsequently, in its online version with a sample of 432 students from two schools, one in a large city and the other in a rural town. On the other hand, a careful data cleaning process was carried out, following the indications of Rial et al. (2001), not only analysing the presence of missing data, but also incoherent response patterns and numerous repeated answers involving the same response option. The SPSS v.25 EXAMINE procedure was used for this purpose. From an initial sample of 50′957 adolescents, 9450 adolescents were excluded based on this procedure, resulting in a final sample of 41′507 adolescents.

### 2.2.1. Demographic variables

The demographic variables collected consisted of gender, age, sexual orientation, school year, country of birth, number of siblings, parent education, living situation and partner.

### 2.2.2. Problematic Internet use scale in adolescents (PIUS-a) (Rial et al., 2015)

This scale is designed to assess problematic Internet use, with items having been selected to cover the DSM-5 constructs of gambling disorder and Internet gaming disorder, as well as the opinion of a panel of experts based on a Delphi consensus (for more details, see Rial et al., 2015). Classic features of substance use disorder such as tolerance, withdrawal or mood regulation are assessed with 11 items arranged on a Likert-type scale with five alternatives. The total score ranges from 0 to 44 and a cut-off point of 16 has been established (Rial et al., 2015). For the calculation of prevalence according to the ICD-11 approach, the PIUS-a

**Table 1**
Characteristics of study participants.

| Variable | Total ($n$ = 41,507) |
|---|---|
| **Gender, *n* (%)** | |
| Female | 20,219 (48.7%) |
| Male | 20,907 (50.4%) |
| Other | 381 (0.9%) |
| **Age (%), years** | |
| 11 | 87 (0.2%) |
| 12 | 7885 (18.9%) |
| 13 | 9950 (24.0%) |
| 14 | 10,518(25.3%) |
| 15 | 9318(22.4%) |
| 16 | 3036 (7.3%) |
| 17 | 134 (0.3%) |
| 18 | 609(1.5%) |
| Age, mean ± SD | 13.81 ± 1.32 |
| **Scholar Year, *n* (%)** | |
| 1st compulsory secondary education | 10,376 (25%) |
| 2nd compulsory secondary education | 10,820 (26.1%) |
| 3rd compulsory secondary education | 10,828 (26.1%) |
| 4th compulsory secondary education | 9483 (22.8%) |
| Repeat course | 6732 (16.2%) |
| **Parent** Education, ***n* (%)** | |
| Mother | |
| No education | 452 (1.1%) |
| Primary | 4896 (11.8%) |
| Secondary | 12,933 (31.2%) |
| University | 16.425 (39.6%) |
| No response | 6801 (16.4%) |
| Father | |
| No education | 464 (1.1%) |
| Primary | 6355 (15.3%) |
| Secondary | 13,818 (33.3%) |
| University | 12,846 (30.9%) |
| No response | 8024 (19.3%) |
| **Born in Spain, *n* (%)** | |
| Mother | |
| Yes | 34,308 (82.7%) |
| No | 6903 (16.6%) |
| No response | 296 (0.7%) |
| Father | |
| Yes | 34,527 (83%) |
| No | 6476 (15.6%) |
| No response | 504 (1.2%) |
| Adolescent | |
| Yes | 38,654 (93.1%) |
| No | 2680 (6.1%) |
| No response | 173 (0.4%) |
| **Living situation, *n* (%)** | |
| With both parents | 30,433 (73.3%) |
| With parents and grandparents | 989 (2.4%) |
| Shared custody | 3622 (8.7%) |
| With grandparents | 214 (0.5%) |
| With mother | 2434 (5.9%) |
| With mother and partner | 1886 (4.5%) |
| With father | 2434 (5.9%) |
| With father and partner | 269 (0.6%) |
| Other | 1259 (3.1%) |
| **Siblings, *n* (%)** | |
| Only child | 6717 (16.2%) |
| 1 | 23,905 (57.6%) |
| 2 | 7595 (18.3%) |
| 3 or more | 3288 (9.4%) |
| **Partner, *n* (%)** | |
| Single | 35,645 (85.9%) |
| Couple | 5855 (14.1%) |
| No response | 7 (0.0%) |
| **Sexual Orientation, *n* (%)** | |
| Totally heterosexual | 29,586 (71.3%) |
| Fundamentally heterosexual | 4797 (11.6%) |
| Totally homosexual | 388 (0.9%) |
| Fundamentally homosexual | 421 (1%) |
| Bisexual | 3215 (7.7%) |
| Asexual | 319 (0.8%) |
| No response | 2781 (6.7%) |

**Table 2**
Distribution of items according to ICD-11 criteria.

| | ICD-CRITERIA Negative consequences | Increasing priority | | Impaired control |
|---|---|---|---|---|
| PIUS-a | 8. I've sometimes got into trouble because of the Internet | 3. I've sometimes even managed to neglect certain tasks or perform below par (in exams, sport, etc.) because I put connecting to Internet first | 7. I've stopped going to places or doing things that interested me before so as to connect to the Internet | 2. I've sometimes tried to control or reduce my Internet use, but I couldn't |
| GASA | 6. Did you have fights with others (e.g., family, friends) over your time spent on games? | 7. Have you neglected other important activities (e.g., school, work, sports) to play games? | | 4. Have others (limitations) unsuccessfully tried to reduce your game use? |

responses for "never", "almost never" and "sometimes" were recoded as zero, indicating that the criterion was not met, and the response options of "very often" and "always" were assigned a value of 1, implying the criterion was met. The scale has high reliability, with a Cronbach's alpha of 0.88 in this sample.

#### 2.2.3. *Game addiction scale for adolescents (GASA-Short version) (Lemmens et al., 2009; Lloret et al., 2018)*

This scale assesses gaming addiction in a framework that essentially recycles substance use disorder criteria (e.g., tolerance, withdrawal, etc.). It is composed of seven items preceded by the statement "During the last six months, how often . . ." and is scored with a 5-point Likert scale, ranging from 1 (never) to 5 (very often). All responses over 3 (sometimes) are given a score of 1, with a cut-off point of $\geq 4$, which allows the creation of three categories: normal use (0–3), problematic use (4–6) and possible gaming disorder (7). To determine prevalence rates according to the ICD-11, we followed the same approach as for the PIUS-a, assigning a value of zero (the criterion is not met) for the response options "never", "almost never" and "sometimes" and a value of 1 (the criterion is met) for the alternatives "often" and "very often". The scale shows high internal consistency ($\alpha = 0.87$).

### 2.3. *Data analytic strategy*

Data analysis was performed in two steps. First, a descriptive analysis of the data and a frequency analysis were performed to summarize the socio-demographic data of the sample and the prevalence data. Prevalence rates were then computed according to the procedure described earlier. Second, a series of binary logistic regression analyses were computed to identify potential risk and protective factors associated with the targeted problematic behaviours. The independent variables were categorized (age, sex, parents' education, living situation, Internet use frequency and use of mobile phone) to estimate the statistical probability that these variables predict the prevalence of problematic Internet use and problematic gaming, based on the odds ratio with 95% confidence intervals. Bonferroni correction (Hochberg, 1988; Knudby and Ellsworth, 1936) was used to adjust the Type 1 error (a) by the total of the test (a/n) (Mohieddin and Naser, 2019; VanderWeele and Mathur, 2019). Statistical analyses were performed by using SPSS 25 (IBM Corp, 2017) and R programming language (R Core Team, 2021) through the graphical user interface, *RStudio* (R Studio Team, 2021).

## 3. Results

### 3.1. Socio-demographic characteristics of the sample

Table 1 shows a detailed description of the sample, which presents a homogeneous and balanced gender distribution (females 48.7%, males 50.4%), with 71.3% of the participants identifying themselves as heterosexual. The 13- to 16-year age group is the most represented in the sample. The most common family unit is that of mother and father (73.3%), in which mothers have a higher level of education, with 39.6% having a university education compared with 30.9% of fathers. More than 80% of the children assessed had at least one sibling, with only 16.2% being an only child. Almost all participants (96.3%) reported using an electronic device to stay connected to the Internet, 90.9% regularly used social networks and 67.7% frequently played video games.

### 3.2. Prevalence data

After we calculated the new prevalence rates according to the ICD-11 criteria, the results were lower than those obtained with the cut-off generally used for the scales (see Table 3 for details). Using a traditional cut-off value, we obtained a global prevalence of 33% for problematic Internet use and 3.1% for problematic gaming. When we applied the conservative approach adopted in the ICD-11, the prevalence rates decreased to 2.98% for problematic Internet use and 1.8% for problematic gaming. Detailed prevalence rates by gender and age ranges are reported in Table 3 and Fig. 2 (data shown only for the problematic use cases).

### 3.3. Identification of risk and protective factors

A logistic regression model was created by using the p-value of the Bonferroni correction ($p = 0.005$) in order to identify the relationship between each behaviour and the used Vis (gender, age, parents' education, living situation, Internet connection frequency, bringing a mobile phone to class and using a mobile phone during lessons). The dependant variable used in the regression was the prevalence rate for problematic Internet use (ICD-11 approach) and problematic gaming (ICD-11 approach). As shown in Table 4, statistically significant predictors for the problematic Internet use model were female gender (odds ratio [OR] = 1.524, 95% confidence interval [CI] = 1.362, 1.706), higher parents' education (OR = 1.129, 95% CI = 1.052, 1.211), elevated Internet connection time (week: OR = 1.252, 95% CI = 1.170, 1.340, weekend: OR = 1.325, 95% CI = 1.223, 1.436), reporting being online after midnight (OR = 1.593, 95% CI = 1.490, 1.706)) and reporting using the mobile phone in class (OR = 1.390, 95% CI = 1.390, 1.318).

As shown in Table 5, statistically significant predictors for problematic gaming were male gender (OR = 0.344, 95% CI = 0.272, 0.431), "living situation" for those families that do not have a "traditional structure" or a stable environment (OR = 0.801, 95% CI = 0.671, 0.963), elevated Internet connection time (week: OR = 1.266, 95% CI = 1.133, 1.415, weekend: OR = 1.334, 95% CI = 1.170, 1.528), being online after midnight (OR = 1.352, 95% CI = 1.216, 1.508) and reporting using the mobile phone in class (OR = 1.441, 95% CI = 1.317, 1.575).

**Table 3**
Prevalence data for each of the approaches (classic vs ICD).

| | | Problematic use PIUS-a | | GASA | |
|---|---|---|---|---|---|
| **Gender** | | **Classic** | **ICD-11** | **Classic** | **ICD-11** |
| Male | % within row | 29.80% | 3.10% | 4.90% | 2.40% |
| | % of total | 15.02% | 1.11% | 2.50% | 1.43% |
| Female | % within row | 36.10% | 5.00% | 1.10% | 0.90% |
| | % of total | 17.58% | 1.82% | 0.50% | 0.35% |
| Other | % within row | 47.00% | 11.00% | 7.10% | 5.00% |
| | % of total | 0.43% | 0.05% | 0.10% | 0.05% |
| **Age** | | | | | |
| 11 | % within row | 25.30% | 2.30% | 3.40% | 1.40% |
| | % of total | 0.10% | 0.00% | 0.00% | 0.00% |
| 12 | % within row | 23.20% | 2.40% | 2.40% | 1.30% |
| | % of total | 4.38% | 0.34% | 0.50% | 0.25% |
| 13 | % within row | 30.90% | 3.80% | 3.20% | 1.90% |
| | % of total | 7.41% | 0.66% | 0.80% | 0.46% |
| 14 | % within row | 35.90% | 4.50% | 3.00% | 2.00% |
| | % of total | 9.09% | 0.87% | 0.8% | 0.49% |
| 15 | % within row | 38.30% | 4.80% | 3.10% | 1.80% |
| | % of total | 8.60% | 0.79% | 0.70% | 0.39% |
| 16 | % within row | 38.20% | 5.40% | 3.70% | 2.30% |
| | % of total | 2.79% | 0.24% | 0.30% | 0.15% |
| 17 | % within row | 41.80% | 9.70% | 8.20% | 10.90% |
| | % of total | 0.13% | 0.02% | 0.00% | 0.03% |
| 18 | % within row | 38.30% | 5.60% | 3.80% | 2.40% |
| | % of total | 0.56% | 0.05% | 0.10% | 0.03% |
| Total | | **33.03%** | **2.98%** | **3.1%** | **1.84%** |

## 4. Discussion

In this study, we sought to establish the possible prevalence of problematic Internet use and problematic gaming in a sample of Spanish adolescents, using two different methods: a cut-off-based approach inspired by the DSM-5 framework (in which all symptoms are considered equivalent to reach a defined cut-off value) versus an approach based on the recent ICD-11 framework (in which specific symptoms are required to endorse a condition). We also tested whether specific sociodemographic variables and technology usage patterns are associated with the presence of problematic Internet use and problematic gaming. These analyses revealed that different risk factors can be identified for problematic Internet use versus problematic gaming. This study represents one of the few epidemiological studies conducted in a large and representative sample of adolescents in this field.

Epidemiological studies of problematic Internet and gaming use have presented with several limitations beyond the difficulties inherent in identifying problematic usage patterns of technologies that are constantly evolving (Fineberg et al., 2022) (e.g. poor sampling methods, lack of gold standard, pathologizing measurement instrument), making them unreliable and promoting unrealistic prevalence rates (Ballou and Zendle, 2022; Billieux et al., 2015; King et al., 2020; van Rooij et al., 2018). In the present study, we tried to overcome these limitations by (1) using a nationally representative sample of Spanish adolescents and (2) comparing a cut-off approach inspired by the DSM-5 framework for substance use disorder with a more conservative approach inspired by the recent ICD-11 framework, in which three specific criteria need to be present to endorse the condition (i.e., loss of control, excessive priority given to the activity and continued use despite negative consequences). Similarly, compared with what was reported in a few other recent studies (Borges et al., 2021; Maldonado-Murciano et al., 2022; Pontes et al., 2022), the ICD-11 framework produced lower and more realistic prevalence rates. This finding is also consistent with a recent meta-analysis showing that when stringent criteria are used, the prevalence of problematic gaming is estimated to be around 1% to 2% of the general population (Stevens et al., 2021). Crucially, the excessively elevated prevalence rates found in previous studies on problematic Internet use (Díaz-Aguado et al., 2018; Gómez et al., 2017; Lopez-Fernandez et al., 2019; Pontes and Macur, 2021) cannot be solely attributed to poor sampling, as the present study showed that 33% of the sample reached the cut-off for problematic Internet use. In contrast, when classic substance use disorder criteria were not considered and the more conservative framework from the ICD-11 was used, the prevalence rate obtained became more realistic (2.98% of probable problematic users).

Although the measurement instrument used in the current study to screen for problematic gaming seems less prone to over-pathologization than that used for problematic Internet use, applying the ICD-11

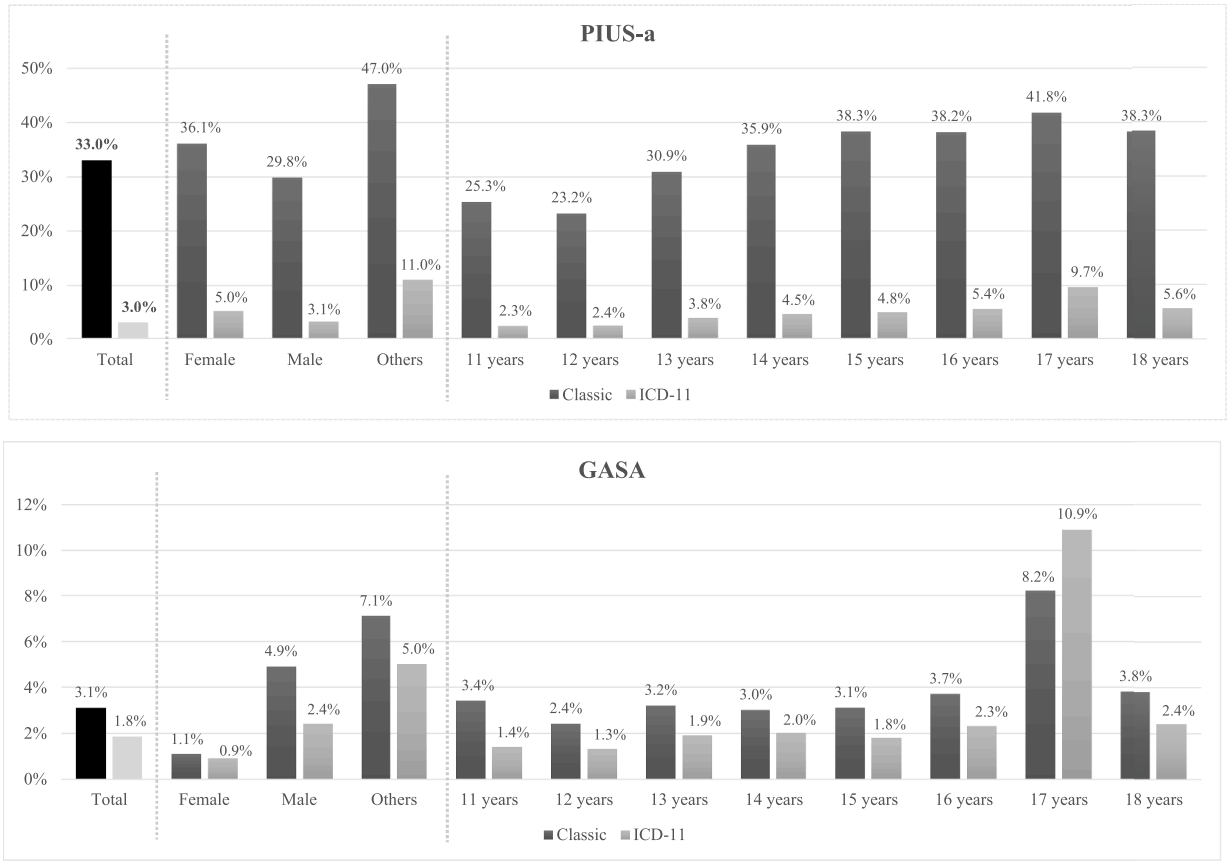


**Fig. 2.** Prevalence data by gender and age for problematic use cases (PIUS-a and GASA).

**Table 4**
Results of binary logistic regression analysis for the prediction of problematic Internet use.

| Variables | B | Standard error | *Z* | Exp (B) | 95%CI | Wald statistic | df | *P* | Bonferroni adjusted value |
|---|---|---|---|---|---|---|---|---|---|
| **Gender** | 0.421 | 0.057 | 7.335 | **1.524** | **\|1.362–1.706\|** | **53.796** | **1** | **0.000** | **0.005**** |
| **Age** | −0.052 | 0.024 | −2.162 | 0.948 | \|0.903–0.994\| | 4.676 | 1 | 0.031 | 0.005 |
| **Parents' education** | 0.121 | 0.035 | 3.405 | **1.129** | **\|1.052–1.211\|** | **11.594** | **1** | **0.001** | **0.005*** |
| **Living situation** | −0.061 | 0.057 | −1.073 | 0.940 | \|0.841–1.053\| | 1.152 | 1 | 0.283 | 0.005 |
| **Internet connection frequency** | −0.288 | 0.096 | −3.008 | **0.749** | **\|0.625–0.913\|** | **9.051** | **1** | **0.003** | **0.005*** |
| **Connection time (week)** | 0.225 | 0.034 | 6.519 | **1.252** | **\|1.170–1.340\|** | **42.494** | **1** | **0.000** | **0.005**** |
| **Connection time (weekend)** | 0.281 | 0.040 | 6.886 | **1.325** | **\|1.223–1.436\|** | **47.415** | **1** | **0.000** | **0.005**** |
| **Connecting after midnight** | 0.466 | 0.034 | 13.547 | **1.593** | **\|1.490–1.706\|** | **183.527** | **1** | **0.000** | **0.005**** |
| **Bringing a mobile phone to class** | 0.014 | 0.029 | 0.493 | 1.014 | \|0.958–1.074\| | 0.243 | 1 | 0.622 | 0.005 |
| **Using a mobile phone during lessons** | 0.329 | 0.026 | 12.319 | **1.390** | **\|1.390–1.318\|** | **151.756** | **1** | **0.000** | **0.005**** |
| **Intercept** | −4.682 | 0.452 | −10.338 | 0.009 | \|0.003–0.022\| | 106.864 | **1** | 0.000 | |

* ≥ 0.001.
** < 0.001.

**Table 5**
Results of binary logistic regression analysis for the prediction of problematic gaming.

| Variable | B | Standard error | *Z* | Exp (B) | 95% CI | Wald statistic | df | *P* | Bonferroni adjusted value |
|---|---|---|---|---|---|---|---|---|---|
| **Gender** | −1.065 | 0.117 | −9.075 | **0.344** | **\|0.272–0.431\|** | **82.353** | **1** | **0.000** | **0.005**** |
| **Age** | −0.097 | 0.040 | −2.405 | 0.907 | \|0.837–0.981\| | 5.782 | 1 | 0.016 | 0.005 |
| **Parents' education** | 0.029 | 0.060 | 0.495 | 1.030 | \|0.914–1.159\| | 0.245 | **1** | 0.620 | 0.005 |
| **Living situation** | −0.221 | 0.092 | −2.399 | 0.801 | \|0.671–0.963\| | 5.757 | 1 | 0.016 | 0.005 |
| **Internet connection frequency** | −0.401 | 0.127 | −3.154 | **0.669** | **\|0.529–0.875\|** | **9.949** | **1** | **0.002** | **0.005*** |
| **Connection time (week)** | 0.236 | 0.056 | 4.170 | **1.266** | **\|1.133–1.415\|** | **17.388** | **1** | **0.000** | **0.005**** |
| **Connection time (weekend)** | 0.288 | 0.068 | 4.244 | **1.334** | **\|1.170–1.528\|** | **18.013** | **1** | **0.000** | **0.005**** |
| **Connecting after midnight** | 0.302 | 0.054 | 5.513 | **1.352** | **\|1.216–1.508\|** | **30.393** | **1** | **0.000** | **0.005**** |
| **Bringing a mobile phone to class** | −0.080 | 0.045 | −1.771 | 0.922 | \|0.845–1.009\| | 3.136 | 1 | 0.077 | 0.005 |
| **Using a mobile phone during lessons** | 0.365 | 0.045 | 8.033 | **1.441** | **\|1.317–1.575\|** | **64.530** | **1** | **0.000** | **0.005**** |
| **Intercept** | −3.269 | 0.686 | −4.764 | 0.038 | \|0.009–0.143\| | 22.691 | 1 | 0.000 | |

framework significantly reduced the prevalence rates obtained (from 3.1% to 1.8%). All in all, this result is consistent with recent studies showing that the ICD-11 approach is less likely to pathologize intensive but healthy gaming patterns (Reed et al., 2022; Yen et al., 2022). The number of studies that use tools based on the ICD-11 framework is increasing; nevertheless, more work is needed to test the diagnostic accuracy and clinical relevance of such tools (Fineberg et al., 2022).

In line with previous research, female gender (Machimbarrena et al., 2022; Procházka et al., 2021), a higher number of hours of Internet connection (Bickham, 2021; Macur and Pontes, 2021) and high parental educational level (Kabasakal, 2015; Wu et al., 2016) were risk factors for problematic Internet use. Past literature shows that females are more prone than males to developing specific forms of problematic Internet use (e.g., problematic use of social media) (Baloğlu et al., 2020), but that time alone cannot be considered a predictor of problematic use (Slack et al., 2022). Time spent online has been heavily criticized as a proxy or predictor of problematic involvement, and other contextual factors have to be considered in relation to time spent online (e.g., period of the year) to avoid confounding problematic involvement with intensive but healthy involvement in online activities (Pontes et al., 2022; Yen et al., 2022). Finally, regarding parental education, previous research has been inconsistent (Li et al., 2014; Yu et al., 2018) and does not systematically report a relationship between parental education level and problematic Internet use (Malak et al., 2017). The study by Koo et al. (2021) is an exception in showing that children of parents with a higher level of education tend to display less problematic Internet use. These authors suggest that highly educated families seem to be more aware of the potential risks associated with Internet use and thus are more equipped to guide their children towards healthier use.

Our results align with previous reseach showing that male gender (Ferreira et al., 2020; King and Potenza, 2019; Mora-Salgueiro et al., 2022; Stevens et al., 2021), a non-traditional family structure (Colasante et al., 2022; Juthamanee and Gunawan, 2021), going online after midnight (Marouane Moustakbal and Maataoui, 2022), and mobile phone use during school hours (Choe and Yu, 2022; Sahu et al., 2019), constitute risk factors for problematic gaming. Previous research systematically showed that male gender constitutes a predictor of problematic gaming (Lopez-Fernandez et al., 2019). This has also been related to the fact that games have for a long time been created by males for a male audience (Colasante et al., 2022; Lopez-Fernandez et al., 2019), which, according to some authors, has contributed to directing females towards other online activities such as social network sites (Fam, 2018; Uçur and Dönmez, 2021; Victorin et al., 2020). Family/-parental structure has tended to be overlooked in previous research on problematic gaming; however, it seems that those families reporting less cohesion and more conflicts are less involved in supervising gaming behaviours of their children, which favours problematic usage patterns (Nielsen et al., 2020). Finally, our findings support that interference in sleep and school constitutes a relevant trigger warning to identify potentially problematic users.

### 4.1. Limitations

The present study has a number of limitations. First, the scales we used were not specifically designed to assess ICD-11 criteria. However, other studies have followed the same approach as the one used here to compare, e.g., DSM-5 and ICD-11 conceptualizations of gaming disorder (Jo et al., 2019). Second, problematic Internet use is an umbrella construct encompassing several different activities (Baggio et al., 2018; Starcevic and Aboujaoude, 2017), and therefore future studies should also consider specific activities (e.g. social media) to establish reliable and specific prevalence rates. In particular, it is likely that there is an overlap in the prevalence of problematic Internet use and problematic gaming, and that a proportion of adolescents identified with problematic Internet use are in fact presenting problematic gaming (Machimbarrena et al., 2022). This is one of the reasons why some authors claimed that problematic Internet use is not necessarily a valid construct and that the focus should instead be made on the actual activities performed online (Starcevic and Aboujaoude, 2017; Starcevic and Billieux, 2017). Third, the two scales we used are not entirely comparable in terms of the items included and specific features assessed, which may explain the discrepancies in prevalence rates. In particular, the scale used to assess problematic Internet use is likely to comprise a substantial amount of "over-pathologizing items", i.e. items assessing normal usage patterns (King et al., 2020). Fourth, the study is based on self-reports, implying that adolescents may have underestimated or overestimated the behaviours they carry out and their possible implications. However, as different authors have pointed out, self-report measures have proven to be reliable and even better than other methods when it comes to assessing levels of substance use and addictive disorders (Babor et al., 1989; Winters et al., 1990).

### 4.2. Conclusion

This study shows that the cut-off approach in which scales recycle substance use criteria (as in the DSM-5 framework) over-pathologize Internet use and gaming behaviours. In contrast, the ICD-11 approach seems to provide more realistic and reliable prevalence rates. In addition, risk factors problematic Internet use versus problematic gaming are not the same. Problematic Internet use and problematic gaming are two issues that have been the subject of much controversy, especially problematic Internet use, which is not yet recognised as a disorder. Indeed, the heterogeneity in its conceptualisation and assessment has made many researchers wary, and they do not hesitate to consider it a real minefield (Ryding and Kaye, 2018). This manuscript aimed at a better assessment of the problem, relying on criteria that help to provide epidemiological data that are closer to the clinical reality. Therefore, our findings hold important implications for future epidemiological studies and preventive actions.

## Author contributions

VVB was involved in designing the study protocol in the context of a collaborative project between UNICEF Spain, the University of Santiago de Compostela and the Spanish General Council of Informatics Engineering (CCII). ANL and JB conceived the present study and developed its theoretical framework with the support of VVB. ANL and JB wrote the paper. ARB and IGG led and carried out the project design and data collection. ANL performed the statistical analysis under the supervision of JB. ANL was responsible for uploading the data and protocol in the Open Science Framework (OSF). All authors discussed the results and contributed to editing the final manuscript.

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## Declaration of Competing Interest

The authors report no conflicts of interest with respect to the content of this manuscript.

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## References


American Psychiatric Association, 2013. Diagnostic and statistical manual of mental disorder, 5th ed. American Psychiatric Association. https://doi.org/10.1176/appi.books.9780890425596.

Babor, T.F., Kranzler, H.R., Lauerman, R.J., 1989. Early detection of harmful alcohol consumption: Comparison of clinical, laboratory, and self-report screening procedures. Addict. Behav. 14 (2), 139–157. https://doi.org/10.1016/0306-4603(89)90043-9.

Baggio, S., Starcevic, V., Studer, J., Simon, O., Gainsbury, S.M., Gmel, G., Billieux, J., 2018. Technology-mediated addictive behaviors constitute a spectrum of related yet distinct conditions: A network perspective. Psychol. Addict. Behav. 32 (5), 564–572. https://doi.org/10.1037/adb0000379.

Ballou, N., Zendle, D., 2022. Clinically significant distress" in internet gaming disorder: An individual participant meta-analysis. Comput. Hum. Behav. 129, 107140 https://doi.org/10.1016/j.chb.2021.107140.

Baloğlu, M., Şahin, R., Arpaci, I., 2020. A review of recent research in problematic internet use: Gender and cultural differences. Curr. Opin. Psychol. 36, 124–129. https://doi.org/10.1016/j.copsyc.2020.05.008.

Barrera-Algarín, E., Vázquez-Fernández, M.J., 2021. The rise of online sports betting, its fallout, and the onset of a new profile in gambling disorder: Young people. J. Addict. Dis. 39 (3), 363–372. https://doi.org/10.1080/10550887.2021.1886567.

Bickham, D.S., 2021. Current research and viewpoints on Internet addiction in adolescents. Curr. Pediatr. Rep. 9 (1), 1–10. https://doi.org/10.1007/s40124-020-00236-3.

Billieux, J., Flayelle, M., King, D.L., 2022. Addiction: Expand diagnostic borders with care. Nature 611 (7937), 665. https://doi.org/10.1038/d41586-022-03760-y.

Billieux, J., Schimmenti, A., Khazaal, Y., Maurage, P., Heeren, A., 2015. Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. J. Behav. Addict. 4 (3), 119–123. https://doi.org/10.1556/2006.4.2015.009.

Borges, G., Orozco, R., Benjet, C., Martínez, K.I.M., Contreras, E.V., Pérez, A.L.J., Cedrés, A.J.P., Uribe, P.C.H., Couder, M.A.C.D., Gutierrez-Garcia, R.A., Chávez, G.E.Q., Albor, Y., Mendez, E., Medina-Mora, M.E., Mortier, P., Ayuso-Mateos, J.L., 2021. (Internet) Gaming Disorder in DSM-5 and ICD-11: A Case of the glass half empty or half full. Can. J. Psychiatry 66 (5), 477–484. https://doi.org/10.1177/0706743720948431.

Brand, M., Rumpf, H.J., King, D.L., Potenza, M.N., Wegmann, E., 2020. Clarifying terminologies in research on gaming disorder and other addictive behaviors: Distinctions between core symptoms and underlying psychological processes. Curr. Opin. Psychol. 36, 49–54. https://doi.org/10.1016/j.copsyc.2020.04.006.

Brime, B., García, N., León, L., Llorens, M., López, M., Molina, M., Tristán, C., Sánchez, E., 2021. *Observatorio Español de Las Drogas y las Adicciones. Informe 2021. Alcohol, Tabaco y Drogas Ilegales en España*; Delegación del Gobierno para el Plan Nacional sobre Drogas: Madrid, Spain, 2021.

Buiza-Aguado, C., Alonso-Canovas, A., Conde-Mateos, C., Buiza-Navarrete, J.J., Gentile, D., 2018. Problematic video gaming in a young Spanish population: association with psychosocial health. Cyberpsychol. Behav. Soc. Netw. 21 (6), 388–394. https://doi.org/10.1089/cyber.2017.0599.

Castro-Calvo, J., King, D.L., Stein, D.J., Brand, M., Carmi, L., Chamberlain, S.R., Demetrovics, Z., Fineberg, N.A., Rumpf, H.J., Yücel, M., Achab, S., Ambekar, A., Bahar, N., Blaszczynski, A., Bowden-Jones, H., Carbonell, X., Chan, E.M.L., Ko, C.H., de Timary, P., Billieux, J., 2021. Expert appraisal of criteria for assessing gaming disorder: An international Delphi study. Addiction 116 (9), 2463–2475. https://doi.org/10.1111/add.15411.

Charlton, J.P., 2002. A factor-analytic investigation of computer 'addiction' and engagement. Br. J. Psychol. 93 (3), 329–344. https://doi.org/10.1348/000712602760146242.

Charlton, J.P., Danforth, I.D.W., 2007. Distinguishing addiction and high engagement in the context of online game playing. Comput. Hum. Behav. 23 (3), 1531–1548. https://doi.org/10.1016/j.chb.2005.07.002.

Chen, A., 2019. From attachment to addiction: The mediating role of need satisfaction on social networking sites. Comput. Hum. Behav. 98, 80–92. https://doi.org/10.1016/j.chb.2019.03.034.

Choe, C., Yu, S., 2022. The reciprocal relationship between mobile phone dependence and school adaptation in Korean adolescents: autoregressive cross-lagged modeling. Acta Psychol. 228, 103628. https://doi.org/10.1016/j.actpsy.2022.103628.

Colasante, E., Pivetta, E., Canale, N., Vieno, A., Marino, C., Lenzi, M., Benedetti, E., King, D.L., Molinaro, S., 2022. Problematic gaming risk among European adolescents: A cross-national evaluation of individual and socio-economic factors. Addiction 117 (8), 2273–2282. https://doi.org/10.1111/add.15843.

Cooksey, R., McDonald, G., 2019. How do I manage the sampling process? Surviving and Thriving in Postgraduate Research. Springer, Singapore, pp. 827–894. https://doi.org/10.1007/978-981-13-7747-1_19.

Díaz-Aguado, M.J., Martín-Babarro, J., Falcón, L., 2018. Problematic Internet use, maladaptive future time perspective and school context. Psicothema 30 (2), 195–200. https://doi.org/10.7334/psicothema2017.282.

European Monitoring Centre for Drugs and Drug Addiction [EMCDDA], 2020. ESPAD Report 2019: Results from the European school Survey Project On Alcohol and Other Drugs. Publications Office. https://data.europa.eu/doi/10.2810/970957.

Fam, J.Y., 2018. Prevalence of internet gaming disorder in adolescents: A meta-analysis across three decades. Scand. J. Psychol. 59 (5), 524–531. https://doi.org/10.1111/sjop.12459.

Ferreira, F., de, M., Bambini, B.B., Tonsig, G.K., Fonseca, L., Picon, F.A., Pan, P.M., Salum, G.A., Jackowski, A., Miguel, E.C., Rohde, L.A., Bressan, R.A., Gadelha, A., 2020. Predictors of gaming disorder in children and adolescents: A school-based study. Braz. J. Psychiatry 43, 289–292. https://doi.org/10.1590/1516-4446-2020-0964.

Fineberg, N.A., Menchón, J.M., Hall, N., Dell'Osso, B., Brand, M., Potenza, M.N., Chamberlain, S.R., Cirnigliaro, G., Lochner, C., Billieux, J., Demetrovics, Z., Rumpf, H.J., Müller, A., Castro-Calvo, J., Hollander, E., Burkauskas, J., Grünblatt, E., Walitza, S., Corazza, O., Zohar, J., 2022. Advances in problematic usage of the internet research – A narrative review by experts from the European network for problematic usage of the internet. Compr. Psychiatry 118, 152346. https://doi.org/10.1016/j.comppsych.2022.152346.

Fineberg, N., Demetrovics, Z., Stein, D., Ioannidis, K., Potenza, M., Grünblatt, E., Brand, M., Billieux, J., Carmi, L., King, D., Grant, J., Yücel, M., Dell'Osso, B., Rumpf, H., Hall, N., Hollander, E., Goudriaan, A., Menchon, J., Zohar, J., Chamberlain, S., 2018. Manifesto for a European research network into Problematic Usage of the Internet. Eur. Neuropsychopharmacol. 28 (11), 1232–1246. https://doi.org/10.1016/j.euroneuro.2018.08.004.

Fontana, A., Benzi, I.M.A., Cipresso, P., 2022. Problematic internet use as a moderator between personality dimensions and internalizing and externalizing symptoms in adolescence. Curr. Psychol. https://doi.org/10.1007/s12144-021-02409-9. In Press.

Gómez, P., Feijóo, S., Braña, T., Varela, J., Rial, A., 2020. Minors and online gambling: prevalence and related variables. J. Gambl. Stud. 36 (3), 735–745. https://doi.org/10.1007/s10899-019-09923-3.

Gómez, P., Rial, A., Braña, T., Golpe, S., Varela, J., 2017. Screening of Problematic Internet Use Among Spanish Adolescents: Prevalence and Related Variables. Cyberpsychol. Behav. Soc. Netw. 20 (4), 259–267. https://doi.org/10.1089/cyber.2016.0262.

Hochberg, Y., 1988. A sharper Bonferroni procedure for multiple tests of significance. Biometrika 75 (4), 800–802. https://doi.org/10.1093/biomet/75.4.800.

IBM Corp, 2017. IBM SPSS Statistics for Windows, Version 25.0. IBM Corp.

Ji, Y., Yin, M.X.C., Zhang, A.Y., Wong, D.F.K., 2022. Risk and protective factors of Internet gaming disorder among Chinese people: A meta-analysis. Aust. N.Z. J. Psychiatry 56 (4), 332–346. https://doi.org/10.2174/1381612811319990617.

Jo, Y.S., Bhang, S.Y., Choi, J.S., Lee, H.K., Lee, S.Y., Kweon, Y.S., 2019. Clinical characteristics of diagnosis for Internet Gaming Disorder: Comparison of DSM-5 IGD and ICD-11 GD Diagnosis. J. Clin. Med. 8 (7) https://doi.org/10.3390/jcm8070945. Article 7.

Juthamanee, S., Gunawan, J., 2021. Factors related to Internet and game addiction among adolescents: A scoping review. Belitung Nurs. J. 7 (2), 62–71. https://doi.org/10.33546/bnj.1192.

Kabasakal, Z., 2015. Life satisfaction and family functions as-predictors of problematic Internet use in university students. Comput. Hum. Behav. 53, 294–304. https://doi.org/10.1016/j.chb.2015.07.019.

Kaess, M., Klar, J., Kindler, J., Parzer, P., Brunner, R., Carli, V., Sarchiapone, M., Hoven, C.W., Apter, A., Balazs, J., Barzilay, S., Bobes, J., Cozman, D., Gomboc, V., Haring, C., Kahn, J.P., Keeley, H., Meszaros, G., Musa, G.J., Wasserman, D., 2021. Excessive and pathological Internet use – Risk-behavior or psychopathology? Addict. Behav. 123, 107045 https://doi.org/10.1016/j.addbeh.2021.107045.

Kardefelt-Winther, D., 2014. A conceptual and methodological critique of internet addiction research: Towards a model of compensatory internet use. Comput. Hum. Behav. 31, 351–354. https://doi.org/10.1016/j.chb.2013.10.059.

Kardefelt-Winther, D., 2015. A critical account of DSM-5 criteria for internet gaming disorder. Addict. Res. Theory 23 (2), 93–98. https://doi.org/10.3109/16066359.2014.935350.

Kim, H.S., King, D.L., 2020. Gambling-gaming convergence: New developments and future directions. Int. Gamb. Stud. 20 (3), 373–379. https://doi.org/10.1080/14459795.2020.1822905.

King, D.L., Billieux, J., Carragher, N., Delfabbro, P.H., 2020. Face validity evaluation of screening tools for gaming disorder: Scope, language, and overpathologizing issues. J. Behav. Addict. 9 (1), 1–13. https://doi.org/10.1556/2006.2020.00001.

King, D.L., Haagsma, M.C., Delfabbro, P.H., Gradisar, M., Griffiths, M.D., 2013. Toward a consensus definition of pathological video-gaming: A systematic review of psychometric assessment tools. Clin. Psychol. Rev. 33 (3), 331–342. https://doi.org/10.1016/j.cpr.2013.01.002.

King, D.L., Potenza, M.N., 2019. Not playing around: Gaming disorder in the International Classification of Diseases (ICD-11). J. Adolesc. Health 64 (1), 5–7. https://doi.org/10.1016/j.jadohealth.2018.10.010.

Király, O., Bőthe, B., Ramos-Diaz, J., Rahimi-Movaghar, A., Lukavska, K., Hrabec, O., Miovsky, M., Billieux, J., Deleuze, J., Nuyens, F., Karila, L., Griffiths, M.D., Nagygyörgy, K., Urbán, R., Potenza, M.N., King, D.L., Rumpf, H.J., Carragher, N., Demetrovics, Z., 2019. Ten-Item Internet Gaming Disorder Test (IGDT-10): Measurement invariance and cross-cultural validation across seven language-based samples. Psychol. Addict. Behav. 33, 91–103. https://doi.org/10.1037/adb0000433.

Király, O., Potenza, M.N., Stein, D.J., King, D.L., Hodgins, D.C., Saunders, J.B., Griffiths, M.D., Gjoneska, B., Billieux, J., Brand, M., Abbott, M.W., Chamberlain, S.R., Corazza, O., Burkauskas, J., Sales, C.M.D., Montag, C., Lochner, C., Grünblatt, E., Wegmann, E., Demetrovics, Z., 2020. Preventing problematic internet use during the COVID-19 pandemic: Consensus guidance. Compr. Psychiatry 100, 152180. https://doi.org/10.1016/j.comppsych.2020.152180.

Knudby, A., Ellsworth, L., 1936. Teoria statistica delle classi e calcolo delle probabilita, Pubblicazioni del R Istituto Superiore di Scienze Economiche e Commerciali di Firenze, 8: 3- 62. Brenning, A., 2009. Benchmarking classifiers to optimally integrate

terrain analysis and multispectral remote sensing in automatic. Environment 37 (1), 35–46.
Koo, K., Nyunt, G., Wang, B., 2021. Who spends too much time online?: Associated factors of Internet addiction among international college students in the United States. J. Int. Stud. 11 (1), 122–143. https://doi.org/10.32674/jis.v11i1.2063.
Kuss, D.J., Griffiths, M.D., Karila, L., Billieux, J., 2014. Internet addiction: A systematic review of epidemiological research for the last decade. Curr. Pharm. Des. 20, 4026–4052. https://doi.org/10.2174/13816128113199990617.
Lemmens, J.S., Valkenburg, P.M., Peter, J., 2009. Development and validation of a game addiction scale for adolescents. Media Psychol. 12 (1), 77–95. https://doi.org/10.1080/15213260802669458.
Li, W., Garland, E.L., Howard, M.O., 2014. Family factors in Internet addiction among Chinese youth: A review of English- and Chinese-language studies. Comput. Hum. Behav. 31, 393–411. https://doi.org/10.1016/j.chb.2013.11.004.
Lloret, D., Morell Gomis, R., Marzo Campos, J.C., Tirado González, S., 2018. Spanish validation of Game Addiction Scale for Adolescents. Aten Primaria 50 (6), 350–358. https://doi.org/10.1016/j.aprim.2017.03.015.
Lopez-Fernandez, O., Williams, A.J., Kuss, D.J., 2019. Measuring female gaming: gamer profile, predictors, prevalence, and characteristics from psychological and gender perspectives. Front. Psychol. 10, 898. https://doi.org/10.3389/fpsyg.2019.00898.
Machimbarrena, J.M., Beranuy, M., Vergara-Moragues, E., Fernández-González, L., Calvete, E., González-Cabrera, J., 2022. Problematic Internet use and Internet gaming disorder: overlap and relationship with health-related quality of life in adolescents. Adicciones 0 (0), 1494. https://doi.org/10.20882/adicciones.1494.
Macur, M., Pontes, H.M., 2021. Internet Gaming Disorder in adolescence: Investigating profiles and associated risk factors. BMC Public Health 21 (1), 1547. https://doi.org/10.1186/s12889-021-11394-4.
Malak, M.Z., Khalifeh, A.H., Shuhaiber, A.H., 2017. Prevalence of Internet Addiction and associated risk factors in Jordanian school students. Comput. Hum. Behav. 70, 556–563. https://doi.org/10.1016/j.chb.2017.01.011.
Maldonado-Murciano, L., Guilera, G., Montag, C., Pontes, H.M., 2022. Disordered gaming in esports: Comparing professional and non-professional gamers. Addict. Behav. 132, 107342 https://doi.org/10.1016/j.addbeh.2022.107342.
Marouane Moustakbal, M., Maataoui, S.B., 2022. A cross-sectional study on sleep length, quality, and mobile phone use among Moroccan adolescents. PAMJ 41 (252). https://doi.org/10.11604/pamj.2022.41.252.25456.
Mohieddin, J., Naser, A.P., 2019. Why, when and how to adjust your P values? Cell J. 20 (4), 604–607. https://doi.org/10.22074/cellj.2019.5992.
Mora-Salgueiro, J., Feijóo, S., Braña, T., Varela, J., Rial, A., 2022. Gaming habits and symptoms of video game addiction in Spanish adolescents. Behavioral Psychology/Psicología Conductual 30 (3), 627–639. https://doi.org/10.51668/bp.8322302n.
Nielsen, P., Favez, N., Rigter, H., 2020. Parental and family factors associated with problematic gaming and problematic Internet use in adolescents: a systematic literature review. Curr. Addict. Rep. 7 (3), 365–386. https://doi.org/10.1007/s40429-020-00320-0.
Partala, T., 2011. Psychological needs and virtual worlds: Case Second Life. Int. J. Hum. Comput. Stud. 69 (12), 787–800. https://doi.org/10.1016/j.ijhcs.2011.07.004.
Pontes, H.M., Macur, M., 2021. Problematic internet use profiles and psychosocial risk among adolescents. PLoS One 16 (9), e0257329. https://doi.org/10.1371/journal.pone.0257329.
Pontes, H.M., Schivinski, B., Kannen, C., Montag, C., 2022. The interplay between time spent gaming and disordered gaming: A large-scale world-wide study. Soc. Sci. Med. 296, 114721 https://doi.org/10.1016/j.socscimed.2022.114721.
Procházka, R., Suchá, J., Dostál, D., Dominik, T., Dolejš, M., Šmahaj, J., Kolařík, M., Glaser, O., Viktorová, L., Friedlová, M., 2021. Internet addiction among Czech adolescents. Psych J 10 (5), 679–687. https://doi.org/10.1002/pchj.454.
R Core Team, 2021. A Language and Environment For Statistical Computing (version 4.1.1) [Computer Software]. R Foundation for Statistical Computing. https://www.R-project.org/.
R Studio Team, 2021. RStudio: Integrated development For R (Version 1.4.1717) [Computer Software]. RStudio, Inc. http://www.rstudio.com/.
Rada, V.D.de, Martín, V.M., 2014. Random Route and Quota Sampling: Do They Offer Any Advantage over Probably Sampling Methods? Open J. Stat. https://doi.org/10.4236/ojs.2014.45038, 2014.
Raiziene, S., Erentaite, R., Pakalniskiene, V., Grigutyte, N., Crocetti, E., 2022. Identity formation patterns and online activities in adolescence. Identity 22 (2), 150–165. https://doi.org/10.1080/15283488.2021.1960839.
Reed, G.M., First, M.B., Billieux, J., Cloitre, M., Briken, P., Achab, S., Brewin, C.R., King, D.L., Kraus, S.W., Bryant, R.A., 2022. Emerging experience with selected new categories in the ICD -11: Complex PTSD, prolonged grief disorder, gaming disorder, and compulsive sexual behaviour disorder. World Psychiatry 21 (2), 189–213. https://doi.org/10.1002/wps.20960.
Rial, A., Golpe, S., Isorna, M., Braña, T., Gómez, P., 2018. Minors and problematic Internet use: Evidence for better prevention. Comput. Hum. Behav. 87, 140–145. https://doi.org/10.1016/j.chb.2018.05.030.
Rial, A., Gómez, P., Isorna, M., Araujo, M., Varela, J., 2015. PIUS-a: Problematic Internet Use Scale in adolescents. Development and psychometric validation. Adicciones 27 (1), 47. https://doi.org/10.20882/adicciones.193.
Rial, A., Varela, J., Rojas, A.J., 2001. Preliminary Data Cleaning and Analysis With SPSS. Ra-Ma.
Rodríguez, M.B., Formoso, C.G., Castaño, A.G., Vázquez, E.Á., Cendón, C.G., Boubeta, A. R., Fontan, A.C., 2020. Early detection of the problematic Internet use in adolescents, in pediatrics of primary care. Rev. Esp. Salud. Publica 94, 85.
Rumpf, H.J., Brandt, D., Demetrovics, Z., Billieux, J., Carragher, N., Brand, M., Bowden-Jones, H., Rahimi-Movaghar, A., Assanangkornchai, S., Glavak-Tkalic, R., Borges, G., Lee, H.K., Rehbein, F., Fineberg, N.A., Mann, K., Potenza, M.N., Stein, D.J., Higuchi, S., King, D., Poznyak, V., 2019. Epidemiological challenges in the study of behavioral addictions: a call for high standard methodologies. Curr. Addict. Rep. 6 (3), 331–337. https://doi.org/10.1007/s40429-019-00262-2.
Ryding, F.C., Kaye, L.K., 2018. Internet Addiction: a conceptual minefield. Int. J. Ment. Health Addict. 16 (1), 225–232. https://doi.org/10.1007/s11469-017-9811-6.
Sahu, M., Gandhi, S., Sharma, M.K., 2019. Mobile phone addiction among children and adolescents: a systematic review. J. Addict. Nurs. 30 (4), 261–268. https://doi.org/10.1097/JAN.0000000000000309.
Slack, J.D., Delfabbro, P., King, D.L., 2022. Toward a delineation of the differences between high engagement and problem gaming. Addict. Behav. Rep. 16, 100462 https://doi.org/10.1016/j.abrep.2022.100462.
Starcevic, V., Aboujaoude, E., 2017. Internet addiction: Reappraisal of an increasingly inadequate concept. CNS Spectr. 22 (1), 7–13. https://doi.org/10.1017/S1092852915000863.
Starcevic, V., Billieux, J., 2017. Does the construct of internet addiction reflect a single entity or a spectrum of disorders? Clin. Neuropsychiatry 14 (1), 5–10.
Spanish Observatory on Drugs and Addictions, & Government Delegation for the Spanish National Drugs Plan, 2022. Survey on Drug Use in Secondary Education in Spain (ESTUDES 2021). Government Delegation of Spanish National Plan on Drugs, Ministry of Health. Social Services and Equality.
Stein, D.J., Billieux, J., Bowden-Jones, H., Grant, J.E., Fineberg, N., Higuchi, S., Hao, W., Mann, K., Matsunaga, H., Potenza, M.N., Rumpf, H.M., Veale, D., Ray, R., Saunders, J.B., Reed, G.M., Poznyak, V., 2018. Balancing validity, utility and public health considerations in disorders due to addictive behaviours. World Psychiatry 17 (3), 363–364. https://doi.org/10.1002/wps.20570.
Stevens, M.W., Dorstyn, D., Delfabbro, P.H., King, D.L., 2021. Global prevalence of gaming disorder: A systematic review and meta-analysis. Aust. N.Z. J. Psychiatry 55 (6), 553–568. https://doi.org/10.1177/0004867420962851.
Uçur, Ö., Dönmez, Y.E., 2021. Problematic internet gaming in adolescents, and its relationship with emotional regulation and perceived social support. Psychiatry Res. 296, 113678 https://doi.org/10.1016/j.psychres.2020.113678.
van der Merwe, P., 2017. Adolescent identities in the cyberworld. J. Psychol. Afr. 27 (2), 203–207. https://doi.org/10.1080/14330237.2017.1303129.
van Rooij, A.J., Ferguson, C.J., Colder Carras, M., Kardefelt-Winther, D., Shi, J., Aarseth, E., Bean, A.M., Bergmark, K.H., Brus, A., Coulson, M., Deleuze, J., Dullur, P., Dunkels, E., Edman, J., Elson, M., Etchells, P.J., Fiskaali, A., Granic, I., Jansz, J., Przybylski, A.K., 2018. A weak scientific basis for gaming disorder: Let us err on the side of caution. J. Behav. Addict. 7 (1), 1–9. https://doi.org/10.1556/2006.7.2018.19.
VanderWeele, T.J., Mathur, M.B., 2019. Some desirable properties of the Bonferroni correction: Is the Bonferroni correction really so bad? Am. J. Epidemiol. 188 (3), 617–618. https://doi.org/10.1093/aje/kwy250.
Victorin, Å., Åsberg Johnels, J., Bob, E., Kantzer, A., Gillberg, C., Fernell, E., 2020. Significant gender differences according to the Problematic and Risky Internet Use Screening Scale among 15-year-olds in Sweden. Acta Paediatr. 109 (9), 1891–1892. https://doi.org/10.1111/apa.15240.
Vigna-Taglianti, F., Brambilla, R., Priotto, B., Angelino, R., Cuomo, G., Diecidue, R., 2017. Problematic internet use among high school students: Prevalence, associated factors and gender differences. Psychiatry Res. 257, 163–171. https://doi.org/10.1016/j.psychres.2017.07.039.
Winters, K.C., Stinchfield, R.D., Henly, G.A., Schwartz, R.H., 1990. Validity of adolescent self-report of alcohol and other drug involvement. Int. J. Addict. 25 (11A), 1379–1395. https://doi.org/10.3109/10826089009068469.
World Health Organization, 2019. International statistical classification of diseases andrelated health problems, 11th ed. https://icd.who.int.
Wu, X., Zhang, Z., Zhao, F., Wang, W., Li, Y., Bi, L., Qian, Z., Lu, S., Feng, F., Hu, C., Gong, F., Sun, Y., 2016. Prevalence of Internet addiction and its association with social support and other related factors among adolescents in China. J. Adolesc. 52 (1), 103–111. https://doi.org/10.1016/j.adolescence.2016.07.012.
Yen, J.Y., Higuchi, S., Lin, P.Y., Lin, P.C., Chou, W.P., Ko, C.H., 2022. Functional impairment, insight, and comparison between criteria for gaming disorder in the International Classification of Diseases, 11 Edition and internet gaming disorder in Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. J. Behav. Addict. https://doi.org/10.1556/2006.2022.00079.
Yu, L., Recker, M., Chen, S., Zhao, N., Yang, Q., 2018. The Moderating Effect of Geographic Area on the Relationship Between Age, Gender, and Information and Communication Technology Literacy and Problematic Internet Use. Cyberpsychol. Behav. Soc. Netw. 21 (6), 367–373. https://doi.org/10.1089/cyber.2017.0503.