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Article

# Internet Habits, Problematic Internet Use, and Online Risk Practices Among Adolescents With ADHD in Spain

Manuel Isorna[1], David Liñares[2], Patricia Gómez[3], Víctor José Villanueva-Blasco[4] and Antonio Rial-Boubeta[3]

[1] University of Vigo (Spain)
[2] Galicia Sur Health Research Institute (Spain)
[3] University of Santiago de Compostela (Spain)
[4] Valencian International University (Spain)

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**ABSTRACT**

**Background:** In recent years, there has been growing scientific concern about digital habits, online risk practices and problematic internet use (PIU) among adolescents with attention deficit hyperactivity disorder (ADHD). This exploratory study aims to compare: (1) internet use habits; (2) PIU; and (3) online risk practices (i.e., active and passive sexting, sextortion, pornography consumption, online gambling, and contact with strangers) among adolescents with and without ADHD. **Method:** A school-based sample of 4,359 adolescents aged 12-18 years old ($M$ = 14.79, $SD$ = 1.79; 51.1% girls; 5.9% ADHD) was assessed (intentional sampling). **Results:** The results indicated that adolescents with ADHD had different Internet and video game use habits, as well as a significantly higher rate of PIU compared to their peers without ADHD (25.8% vs. 18%). They also had a higher rate of sextortion, online gambling, and pornography use. In addition, significant gender differences of particular interest were observed. **Conclusions:** These findings underline the need to address the particularities of adolescents with ADHD and their environment in order to promote safer use of the technology.

## Hábitos de Uso de Internet, Uso Problemático de Internet y Conductas de Riesgo Online en Adolescentes con TDAH en España

***Palabras clave:***
Comportamiento adolescente
Trastorno por Déficit de Atención con Hiperactividad
Conducta online
Adicción a internet

**RESUMEN**

**Antecedentes**: En los últimos años, ha aumentado la preocupación por los hábitos digitales, prácticas de riesgo *online* y uso problemático de Internet (UPI) entre adolescentes con trastorno por déficit de atención e hiperactividad (TDAH). Este estudio exploratorio tiene como objetivo comparar: (1) hábitos de uso de internet; (2) UPI; y (3) prácticas de riesgo *online* (*sexting* activo y pasivo, sextorsión, consumo de pornografía, juego de azar *online* y contacto con desconocidos) entre adolescentes con y sin TDAH. **Método:** Para ello, se evaluó una muestra escolar de 4359 adolescentes de 12 a 18 años ($M$ = 14,79; $DT$ = 1,79; 51,1% chicas; 5,9% TDAH) (muestreo intencionado). **Resultados:** Los resultados indicaron que los y las adolescentes con TDAH tenían hábitos de uso de Internet y videojuegos diferentes, así como una tasa de UPI significativamente más alta en comparación con sus pares sin TDAH (25,8% vs 18%). También presentaron una mayor tasa de sextorsión, participación en juegos de azar *online* y consumo de pornografía. Además, se observaron diferencias de género significativas y de particular interés. **Conclusiones:** Estos hallazgos subrayan la necesidad de abordar las particularidades de las y los adolescentes con TDAH y su entorno, con el fin de promover un uso de la tecnología más seguro.

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Corresponding author: Patricia Gómez, patricia.gomez@usc.es

The Internet is an undeniable part of the adolescents' lives. According to the report *Impact of Technology on Adolescence: Relationships, Risks, and Opportunities* (Andrade et al., 2021), 90.8% of adolescents in Spain connect to the Internet daily, 49.6% do it more than 5 hours a day during the weekend, and 21.6% use it every day after midnight. The incorporation of digital technologies into daily life has transformed the processes of communication and social interaction, in such a way that Information and Communication Technologies [ICT] have begun to be called Relational, Information and Communication Technologies [RICT], so that they emphasize the relational dimension of their application and use (Gabelas et al., 2015). This new context has modified the dynamics of adolescents' interaction, learning, searching for information, and entertainment; producing both opportunities and risks (Jiménez-Iglesias et al., 2018). In fact, according to the most recent EU Kids Online report, 34% of teens have experienced negative situations on the Internet (Smahel et al., 2020).

One of the potential risks from misuse of RICT is Problematic Internet Use [PIU]. PIU is a pattern of behaviour in which Internet use becomes excessive, impulsive, and maladaptive, negatively affecting a person's daily functioning (Spada, 2014). More recently, PIU has been defined as such use of the internet and social media characterized by a high degree of interference in daily life, with an impact on personal, family, academic, or work life, and possibly accompanied by clinical symptoms (Andrade et al., 2021). Although other terms have been used to refer to it (e.g., compulsive use of the Internet, Internet addiction, pathological use of the Internet...), PIU has been gaining acceptance by not making assumptions about nosology or the causal mechanisms that underlie it (Fineberg et al., 2022). Unlike traditional addictions, this behaviour is associated with addictive characteristics of the Internet, such as accessibility, anonymity, and convenience (Fineberg et al., 2018; Moretta et al., 2022). PIU is associated with adverse consequences in interpersonal relationships (Al-Kandari & Al-Sejari, 2021), academic performance (Aznar-Díaz et al., 2020), sleep hygiene (Kokka et al., 2021), eating habits (Tayhan-Kartal & Yabanci-Ayhan, 2021), body perception (Rial, 2022) psychological well-being (Herruzo et al., 2023; Vázquez-Martínez et al., 2024), and overlaps with other addictions and mental disorders (Lanthier-Labonté et al., 2020; Liñares, 2023; Panova & Lleras, 2016).

Adolescents constitute the population group with the highest frequency of connection and hours of Internet use; and, therefore, with a higher risk of developing a PIU (Choi et al., 2017; Rozgonjuk et al., 2018). In Spain, 33.1% of adolescents show a PIU (Andrade et al., 2021), ranking above the European average (Meng et al., 2022). In addition, although the use of RICT and the prevalence of PIU is slightly higher among adolescents' girls (Pérez-Sáenz et al., 2023; Rial, 2022), the role of gender in this phenomenon has not yet been determined (Lukács, 2021).

Risky online behaviours are more prevalent among adolescents who engage in abusive Internet use (Andrade et al., 2021). Among these risk practices, gaming (Martín-Fernández et al., 2017), online gambling (Tran et al., 2024), grooming (Schoeps et al., 2020), sexting (Burén & Lunde, 2018), sextortion (Kopecký, 2017) and cyberbullying (Garaigordobil, 2015) are commonly cited. In relation to these behaviours, the literature points out that gender plays a crucial role in its prevalence. For example, adolescent girls tend to have higher prevalence of social media use and problematic behaviours related to social interaction, while boys show a higher tendency toward video game addiction and pornography consumption (Andreassen et al., 2016). Therefore, addressing risky practices online requires approaching the issue from a gender perspective.

The presence of previous or latent psychological disorders has been linked to an increased risk of developing PIU (Xue et al., 2023). In this context, ADHD stands out as a significant factor, given its high prevalence and early onset (Danielson et al., 2024), which also affects approximately twice as many boys as girls (Ayano et al., 2023). Recent meta-analyses estimate the global prevalence of ADHD in children and adolescents at 8.0 % (95% confidence interval (CI): 6.0–10 %) (Ayano et al., 2023), and at 5.6% (95% CI: 4.8-7%) in adolescents aged 12 to 18 years old (Salari et al., 2023). In Spain, the diagnosis of this disease is clinical and typically occurs during paediatric ages, so its approach and management begin from Primary Care services (Vázquez et al., 2022). According to the meta-analysis by Catalá-López et al. (2012), ADHD affects 6.8% of Spanish children and adolescents (95% CI: 4.9 – 8.8%). A more recent study by Canals et al. (2020) estimates its prevalence at 5.5% in school-age children.

Accumulating evidence over the past decade highlights that adolescents with ADHD are particularly vulnerable to developing PIU (Aznar et al., 2020, Kim et al., 2019; Yen et al., 2014). This susceptibility is attributed to traits such as low frustration tolerance, impulsivity, and learning difficulties (Enagandula et al., 2018; Weinstein et al., 2015). Recent studies suggest that the immediate gratification and high stimulation offered by digital environments such as RICT aggravate their vulnerability (Ra et al., 2018). The COVID-19 pandemic may have further intensified this issue, leading to increased engagement in Internet use and video gaming among adolescents with ADHD (Sciberras et al., 2022). In addition, Augner et al. (2023) indicate that significant correlations between PIU and ADHD symptoms show more pronounced effect sizes in males.

Although previous research has extensively examined risky online behaviours in general adolescent populations, studies specifically focusing on adolescents with psychological disorders remain relatively scarce (Xue et al., 2023). Adolescents with ADHD frequently encounter challenges in interpersonal relationships and struggle with emotional dysregulation, which may lead them to rely more heavily on online interactions as a coping mechanism (Yen et al., 2014). Among the various risky online behaviours, probably the association between ADHD and participation in online gambling has garnered the most substantial evidence (Derin et al., 2023; Hellström et al., 2017). This phenomenon is especially serious, as children and adolescents with ADHD take more risks in gambling due to alterations in reward and decision-making mechanisms (Groen et al., 2013; Rubiales et al., 2017). Other studies have also highlighted higher rates of sexual abuse *online* and passive sexting among adolescents and young people with ADHD (Ozdag et al., 2025), as well as of pathological consumption of pornography (Niazof et al., 2019). The neuropsychological characteristics of the disorder, such as impulsivity and sensitivity to rewards, also make it especially vulnerable to highly stimulating environments designed to reinforce compulsive behaviours such as online video games (Isorna et al., 2024). Therefore, Salerno et al. (2022) have found that multiple symptoms of ADHD can be risk factors for video game addiction in adolescence, although they do not rule out a bidirectional relationship between the two conditions.

A final point to consider is the disparity between the substantial volume of international research and the limited number of recent studies focusing on Internet use habits, PIU, and online risk behaviours among Spanish adolescents with ADHD. In this regard, the study of San Mauro et al. (2021) notes that the rate of Internet use of more than three hours a day is significantly higher in children and adolescents with ADHD. Also, in a case-control study, Menéndez-García et al. (2022) conclude that ADHD is a risk factor for the development of Internet addiction. Therefore, this paper seeks to contribute to a more comprehensive description and understanding of this issue within the Spanish context. This study is part of a line of research on TRIC and behavioral addictions among adolescents, with a special emphasis on exploring possible vulnerability profiles. The research questions to be addressed would be: Have boys and girls with ADHD higher levels of engaging in risky practices in the digital environment? Can these risks extend to a maladaptive pattern involving higher PIU? The underlying hypothesis, as previously noted in the literature, is that those with ADHD would exhibit higher levels of risky practices and PIU.

Consequently, the main objective of this study is to compare adolescents with and without ADHD in relation to their RICT use habits, the prevalence of PIU and their involvement in risky online practices, such as sexting, sextortion, pornography consumption, gambling and online contact with strangers. Also, due to gender differences noted in the literature, differences between males and females are analysed for every variable.

## Method

### Participants

To address the objectives indicated, a cross-sectional study was developed. A selective methodology was used by conducting a survey in 23 public schools in Santiago de Compostela and surrounding areas. Intentional sampling was used to select the schools and participants, ensuring geographical representativeness and educational diversity (secondary school, Baccalaureate and Vocational Training [VT]). The inclusion criteria required that the student body be within 12 to 18 years. Although the sampling was non-probabilistic, its size and diversity allow us to approximate a representativeness of the regional context.

The initial number of participants was 4,524. However, 165 were eliminated because they contained incoherent response patterns, an excess of missing values or were outside the age range under study (12-18 years). The final sample consisted of 4,359 students ($M$ = 14.79; $SD$ = 1.79; 51.2% girls). Of the total, 34.5% were in the 1st and 2nd year of secondary school, 33.5% were in 3rd and 4th of secondary school, 30.1% Baccalaureate and 1.9% were students of VT.

Among participants, 5.9% of adolescents ($n$ = 256) reported having been diagnosed with ADHD by the Spanish National Health System (SNHS). This percentage showed statistically significant differences by gender: 8.1% of boys reported having ADHD ($n$ = 172), compared to 3.8% of girls ($n$ = 84) ($\chi^2$ = 36.82; $p$ < .001). There were no statistically significant age differences between the group of adolescents with and without ADHD (14.98 vs. 14.78; $t$ = -1.87; $p$ > .05). Descriptive data about the total sample and both sub-samples are collected in Table 1.

**Table 1**
*Descriptive Data About the Total Sample and Sub-samples*

| | TOTAL SAMPLE n (%) | ADHD n (%) | No ADHD n (%) |
|---|---|---|---|
| TOTAL | 4,359 (100) | 256 (5.9) | 4,103 (94.1) |
| Boys | 2,127 (48.8) | 172 (8.1) | 1,955 (91.9) |
| Girls | 2,232 (51.2) | 84 (3.8) | 2,148 (96.2) |
| 1st and 2nd year of Secondary school | 1,502 (34.5) | 90 (5.9) | 1,412 (94.1) |
| 3rd and 4th of Secondary school | 1,465 (33.6) | 101 (6.9) | 1,364 (93.1) |
| Baccalaureate | 1,309 (30) | 56 (4.3) | 1,253 (95.7) |
| Vocational Training | 83 (1.9) | 9 (10.8) | 74 (89.2) |

### Instruments

The data were collected through an *ad hoc* questionnaire that included questions grouped into 3 blocks. The first block was dedicated to knowing the habits of Internet use (i.e., connection frequency (*How often do you connect to the internet?*), daily connection time (*How many hours a day do you usually use the Internet?)* and connection schedules (*Do you usually connect to the Internet or use your smartphone after midnight?*), use of online video games (*How often do you play online video games?*), and problematic behaviours associated with it (i.e., sexting (*Have you ever sent photos or videos of yourself with erotic or sexual content to another person via the Internet or smartphone?*), sextortion *(Have you ever been blackmailed with the threat of publishing and spreading photos or videos of you with erotic or sexual content on the internet?)*, online gambling (*In the last year, have you bet money on online gambling or betting websites?*), contact with strangers (*In the last year, have you contacted strangers via the Internet, chat rooms, or social media?*) and pornography consumption (*In the last year, have you visited websites with erotic or pornographic content?*). These questions are based on those used by previous reference studies (Andrade et al., 2021).

The second block included the Problematic Internet Use Scale in adolescents [PIUS-a] (Rial et al., 2015), an instrument developed specifically for the Spanish adolescent population. It consists of 11 items with a Likert-type response format of 0 to 4 points and offers a total score of 0 to 44 points. The cut-off point established to classify problematic users is 16 points or more. In previous studies (Rial et al., 2015), the tool showed a sensitivity of 81% and a specificity of 82.6%. In this study, PIUS-a presented an adequate internal consistency (α = .87), higher than that reported in its original validation (α = .81).

In the third block, information was collected on sociodemographic variables, such as gender, age, current academic year and the item "Have you been diagnosed with ADHD (Attention Deficit Hyperactivity Disorder) by the health system (paediatrician, neurologist, psychiatrist or primary care doctor)?" used as a diagnostic criterion for ADHD.

The questionnaire was reviewed by a panel of experts and piloted with 40 students to ensure clarity and validity. No modifications were required for the final version.

### Procedure

Data were collected in the classrooms of the centres, in small groups (between 15 and 25 individuals), to facilitate adequate supervision and ensure that each questionnaire was completed individually. Data collection was carried out during the first trimester of the 2021-2022 academic year, by a team of technicians with proven experience in carrying out this type of task. Previously, they carried out a training session to standardize the procedure to be followed as much as possible and resolve possible doubts at a technical level.

Each subject was informed of the confidentiality, anonymity, voluntariness, and purpose of the study. In addition, there was the consent and collaboration of both the management of the centres and the respective associations of mothers and fathers of students (AMPAs). The estimated time for completing the questionnaire was approximately 20 minutes. This study was approved by the Bioethics Committee of the University of Santiago de Compostela (Ref. 024/2018).

### Data Analysis

A univariate and bivariate tabulation was performed. Percentages were calculated for every internet usage habits, PIU and risky practices. For the comparison of means, Student's t-tests were used, and chi-square-tests of independence were calculated for the comparison of categorical variables under study. The level of statistical significance is reported. The significance level was set at $p$ equal-to .05, and $p < .05$, and $p < .001$ was detailed. Likewise, the Cramer V statistic was found to estimate the effect size in the comparisons of categorical variables and Cohen's $d$ for quantitative variables.

Finally, we tried to determine if ADHD could be predictive factor of PIU. Univariate and multivariate logistic regression models with sex and age adjusted were used to estimate crude and multivariable adjusted odds ratios (ORs) with 95% confidence interval (95% CI), respectively. The Wald forward method was used, and the percentage of correctly classified cases and Nagelkerke's R-squared were reported. The analyses were performed with the IBM SPSS Statistics 25 statistical package.

## Results

### Internet Usage Habits

As it can be seen in Table 2, no significant differences were found in Internet use habits (daily internet use, more than three hours a day of internet use, connection after midnight, having active three or more social networks, and using the mobile phone during class) between adolescents diagnosed with ADHD and their peers without the disorder, except in the case of playing online video games (91.8% vs. 82.2%; $\chi^2 = 14.85$; $p < .001$; $V = .06$), a practice that is more frequent in the group of adolescents with ADHD. When analysing boys and girls separately, significant differences were found in terms of nighttime connection (after midnight) among female adolescents with ADHD compared to those without the diagnosis (67.9% vs. 52.2%; $\chi^2 = 7.32$; $p < .05$; $V = .06$). Likewise, in relation to the use of social networks, girls with ADHD reported having an active account on three or more social networks (71.4% vs. 60.3%; $\chi^2 = 3.75$; $p < .05$; $V = .04$) and playing online video games more frequently than their female peers without the diagnosis (81% vs. 69.2%; $\chi^2 = 4.76$; $p < .05$; $V = .05$). The differential analysis by gender shows that the differences between boys with and without a diagnosis of ADHD are not statistically significant in any of the Internet usage habits.

**Table 2**
*Internet Use Habits in Adolescents who Report a Diagnosis of ADHD (or not)*

| | | ADHD n (%) | No ADHD n (%) | $\chi^2$ | $V$ |
|---|---|---|---|---|---|
| **Daily Internet use** | Total | 217 (84.8) | 3,549 (86.6) | 0.56 | - |
| | Boys | 140 (81.4) | 1,669 (85.5) | 1.79 | - |
| | Girls | 77 (91.7) | 1,880 (87.6) | 0.87 | - |
| **More than 3 hours a day of Internet use** | Total | 114 (44.5) | 1,941 (47.3) | 0.65 | - |
| | Boys | 67 (39.0) | 867 (44.4) | 1.68 | - |
| | Girls | 47 (56.0) | 1,074 (50.0) | 0.91 | - |
| **Connection after 12 p.m.** *(at least once a week)* | Total | 137 (53.7) | 2,077 (50.8) | 0.73 | - |
| | Boys | 80 (46.8) | 957 (49.2) | 0.26 | - |
| | Girls | 57 (67.9) | 1,120 (52.2) | 7.32* | .06 |
| **Having active 3 or more social networks** | Total | 160 (62.5) | 2,361 (57.5) | 2.38 | - |
| | Boys | 100 (58.1) | 1,066 (54.5) | 0.69 | - |
| | Girls | 60 (71.4) | 1,295 (60.3) | 3.75* | .04 |
| **Using the mobile phone during class** *(at least once a week)* | Total | 98 (38.9) | 1,523 (37.3) | 0.26 | - |
| | Boys | 59 (35.1) | 703 (36.1) | 0.03 | - |
| | Girls | 39 (46.4) | 820 (38.3) | 1.92 | - |
| **Playing online video games** *(at least once a week)* | Total | 234 (91.8) | 3,369 (82.2) | 14.85** | .06 |
| | Boys | 166 (97.1) | 1,884 (96.4) | 0.05 | - |
| | Girls | 68 (81.0) | 1,485 (69.2) | 4.76* | .05 |
| | | *M* | *M* | *t* | *d* |
| **Age of access to a smartphone of their own** | Total | 11.20 | 11.53 | 2.55* | 0.33 |
| | Boys | 11.32 | 11.51 | 1.17 | - |
| | Girls | 11.01 | 11.53 | 2.54* | 0.52 |

Note: *$p < .05$; **$p < .001$

On the other hand, adolescents with ADHD access their first smartphone at a significantly younger age compared to their peers without the disorder (11.20 years vs. 11.53 years; $t = 2.55$; $p < .05$; $d = 0.33$). This pattern also shows significant differences according to gender. In boys, no statistically significant differences were observed (11.32 years vs. 11.51 years; $t = 1.17$; $p = .24$), while in girls they were found (11.01 years vs. 11.53 years; $t = 2.54$; $p < .05$; $d = 0.52$).

### PIU

Table 3 shows statistically significant differences in PIU between adolescents with ADHD and those without a diagnosis (25.8% vs. 18%; $\chi^2 = 9.08$; $p < .05$; $V = .05$). Although both boys and girls with ADHD show a higher PIU, the differences are more noticeable in the case of girls (34.5% vs 21%; $\chi^2 = 6.71$; $p < .05$; $V = .06$).

A logistic regression analysis predicting PIU from ADHD and demographic variables was conducted (Table 4). Being older, being

female, and having ADHD were found to be risk factors for PIU, from both univariate and multivariate perspectives. The percentage of correctly classified cases was 81.5%, and the Nagelkerke's R-squared value was .045.

**Table 3**
*Problematic Internet Use in Adolescents who Report a Diagnosis of ADHD (or not)*

| | | ADHD n (%) | No ADHD n (%) | $\chi^2$ | *V* |
|---|---|---|---|---|---|
| **PIU** | Total | 66 (25.8) | 740 (18.0) | 9.08* | .05 |
| | Boys | 37 (21.5) | 289 (14.8) | 4.12* | .05 |
| | Girls | 29 (34.5) | 451 (21.0) | 6.71* | .06 |

Note: *$p < .05$; **$p < .001$

**Table 4**
*Logistic Regression Model for Predicting PIU from ADHD Reported Diagnosis, and Demographic Variables*

| | Problematic Internet Use | |
|---|---|---|
| **Variable** | **Univariate OR (95% CI)** | **Multivariate OR (95% CI)** |
| Sex | | |
| *Boys* | 1 | 1 |
| *Girls* | 1.514 (1.296-1.768) | 1.520 (1.297-1.780) |
| Age | 1.231 (1.178-1.287) | 1.225 (1.172-1.281) |
| ADHD | | |
| *No-ADHD* | 1 | 1 |
| *ADHD* | 1.579 (1.180-2.112) | 1.671 (1.240-2.250) |

## Risky Practices on the Internet

As shown in Table 5, the group of adolescents diagnosed with ADHD showed higher prevalences compared to their peers without the diagnosis in all the online risk practices analysed, being significantly higher in the case of having suffered sextortion (4% vs. 1.9%; $\chi^2 = 4.14$; $p < .05$; $V = .03$), as well as in online gambling (15% vs. 8%; $\chi^2 = 12.76$; $p < .001$; $V = .06$) and pornography consumption (46.1% vs. 35.8%; $\chi^2 = 8.89$, $p < .05$; $V = .05$).

The differential analysis by gender shows that the differences between boys with and without a diagnosis of ADHD are not statistically significant, while girls with ADHD have significantly higher prevalences than girls without ADHD in relation to passive sexting at some point in their lives (31% vs. 19.8%; $\chi^2 = 5.56$; $p < .05$; $V = .05$) and pornography consumption (29.6% vs. 17.7%; $\chi^2 = 5.66$; $p < .05$; $V = .06$) in the last year.

**Table 5**
*Risky Practices on the Internet in Adolescents who Report a Diagnosis of ADHD (or not)*

| | | ADHD n (%) | No ADHD n (%) | $\chi^2$ | *V* |
|---|---|---|---|---|---|
| **Active Sexting** *(sometime in a lifetime)* | Total | 37 (14.5) | 464 (11.4) | 2.04 | - |
| | Boys | 20 (11.7) | 186 (9.6) | 0.60 | - |
| | Girls | 17 (20.2) | 278 (13.0) | 3.08 | - |
| **Passive Sexting** *(sometime in a lifetime)* | Total | 61 (24) | 903 (22.1) | 0.52 | - |
| | Boys | 35 (20.6) | 479 (24.6) | 1.14 | - |
| | Girls | 26 (31.0) | 424 (19.8) | 5.56* | .05 |
| **Sextortion** *(sometime in a lifetime)* | Total | 10 (4.0) | 78 (1.9) | 4.14* | .03 |
| | Boys | 6 (3.6) | 30 (1.5) | 2.70 | - |
| | Girls | 4 (4.8) | 48 (2.2) | 1.33 | - |
| **Online gambling or betting** *(last year)* | Total | 34 (15.0) | 286 (8.0) | 12.76** | .06 |
| | Boys | 29 (20.0) | 219 (14.9) | 2.28 | - |
| | Girls | 5 (6.1) | 67 (3.2) | 1.32 | - |
| **Contact with strangers** *(last year)* | Total | 128 (51.0) | 1,857 (46.2) | 2.02 | - |
| | Boys | 83 (49.7) | 889 (46.6) | 0.46 | - |
| | Girls | 45 (53.6) | 968 (45.7) | 1.69 | - |
| **Pornography consumption** *(last year)* | Total | 101 (46.1) | 1,112 (35.8) | 8.89* | .05 |
| | Boys | 80 (54.1) | 830 (55.0) | 0.16 | - |
| | Girls | 21 (29.6) | 282 (17.7) | 5.66* | .06 |

*Note.* *$p < .05$; **$p < .001$

## Discussion

This study aimed to compare Internet use between adolescents with and without ADHD, to contribute to a better understanding and to increase the data on this issue within the Spanish context. Although the use habits are relatively similar in both groups, the sample prevalence of PIU and that of some risky online practices are significantly higher among the group of adolescents with ADHD. In addition, significant differences are noted by gender of particular interest.

First, 5.9% of the sample reported being diagnosed with ADHD. In comparison, Isorna et al. (2021) found a prevalence of 6.65% in Galician adolescents aged 12 to 18, similar to the present study's sample. In the Spanish and global context, various studies indicate a prevalence around 5-8% in children and adolescents (Ayano et al., 2023; Canals et al., 2020; Catalá-López et al., 2012; Salari et al., 2023). Therefore, the ADHD prevalence observed in the present sample falls within the confidence intervals established by prior research. Additionally, the prevalence of ADHD shows significant differences by gender (8.1% in boys vs. 3.8% in girls). This finding aligns with previous studies, which report a prevalence in males that is two to four times higher than in females (Llanos et al., 2019; Vázquez et al., 2022).

When analysing the frequency and intensity of connection, it was found that the overall habits of Internet use is comparable between adolescents with and without ADHD. This aligns with international literature, which suggests that adolescents with ADHD engage with RICT in a manner comparable to their peers (Dawson et al., 2019). However, this contrasts with findings from the few studies conducted in Spain, which suggest a different pattern (San Mauro et al., 2021). In the present study, approximately nine out of ten adolescents reported daily internet use, with half using it for more than three hours per day. Similarly, the frequency of internet use after midnight and mobile phone use during class did not show statistically significant differences between the two groups. These findings are consistent with those observed in prevalence studies conducted in the general Spanish adolescent population (Andrade et al., 2021; Rial, 2022).

Noteworthy findings emerged when analysing digital technology usage habits from a gender perspective. On one hand, comparative analyses reveal significant differences in technology access for girls with ADHD, who obtain their first smartphone at a younger age than their female peers (with ADHD: 11.01 years vs. without

ADHD: 11.53 years) and connect significantly more after midnight (with ADHD: 67.9% vs. without ADHD: 52.2%), suggesting a higher risk of exposure. In this sense, the literature highlights the challenges faced by parents of adolescents with ADHD in managing their children's smartphone use (Chou et al., 2022). Additionally, a higher percentage of girls with ADHD report having active accounts on three or more social media platforms compared to their peers without the disorder. This result is consistent with previous research indicating that social media addiction is more prevalent among girls with ADHD (Yen et al., 2017). On the other hand, although boys with ADHD, like those in the general population, engage in video gaming more frequently (Masi et al., 2021), the present study found their prevalence of use to be comparable to that of their male peers without the disorder. This contrasts with the statistically significant differences observed in the case of girls (with ADHD: 81% vs. without ADHD: 69.2%), which has been noted in previous studies (Bolic et al., 2015). It is important to note that video games provide stimulating environments, characterized by frequent activity changes and immediate rewards—factors that reinforce the impulsive behaviour typical of adolescents with ADHD (Isorna et al., 2024). Moreover, this impulsive trait might serve as an enabler or competitive advantage for girls with ADHD in online gaming, compared to girls in the general population, who often leave such environments due to perceived hostility (López-Fernández et al., 2019). In any case, this increased video game use could be seen as an increased risk of exposure, not only in terms of greater frequency and intensity but also because ADHD is specifically associated with video game addiction (Andreassen et al., 2016), regardless of the type of game played (Mathews et al., 2019). This is particularly concerning, as some studies suggest that video game addiction has distinct effects by gender, with a significantly more negative emotional impact on girls with ADHD (André et al., 2022).

Regarding PIU, our data align with those of other studies, showing that ADHD is associated with PIU (Menéndez-García et al., 2022). In the present study, it was found that 25.8% of adolescents with ADHD were screened for PIU, a significantly higher percentage than their peers without the diagnosis. This prevalence is notably lower than those reported in previous studies. Piplani et al. (2019) found a prevalence of internet addiction of 37.78% among young people with ADHD. Lee et al. (2014) reported a PIU prevalence of 35.5% in adolescents with ADHD, like the 37.2% reported by Kaess et al. (2014). However, comparisons with other studies should be interpreted with caution due to important differences in participant age, sample type (e.g., clinical vs. community), sampling methods (probabilistic vs. non-probabilistic), and the scales or screening tools used. Furthermore, more research is needed to clarify the causal direction of this relationship. On one hand, ADHD symptoms could predispose individuals to develop PIU; on the other hand, excessive internet use could exacerbate ADHD symptoms (Wang et al., 2017).

In the present study, the prevalence of PIU was found to be significantly higher in both girls and boys with ADHD. This finding is consistent with the recent longitudinal study by Wang et al. (2024), which reveal not significant gender differences in the associations between hyperactivity, inattention, impulsivity, and PIU. These elevated prevalences in the ADHD group are particularly concerning, as the literature has identified numerous negative consequences of PIU, both in terms of physical and mental health, as well as social functioning (de la Villa & Suárez, 2016; Kokka et al., 2021; Lee et al., 2014; Panova & Lleras, 2016; Zakaria et al., 2023). However, it should be noted that PIU has been found to be a complex and multidimensional phenomenon that is difficult to predict based on just a few factors (ADHD and demographic variables). Additionally, PIU in adolescence often overlaps with other substance and behavioural addictions (Golpe et al., 2017; Liñares, 2023). In summary, the results support the notion that adolescents with ADHD may constitute a vulnerable group for the development of PIU. Given the potential adverse consequences mentioned above, it is crucial to develop selective prevention programs that address the specific vulnerability factors of this population.

Online risky practices also exhibit differences between adolescents with and without ADHD. First, the overall prevalence of sextortion exposure is more than double among adolescents with ADHD. Researchers such as Wiener (2020) highlight the heightened vulnerability of this group to peer victimization experiences, such as sextortion. This is particularly concerning, as victims of sextortion often face severe psychological consequences, including anxiety, depression, social exclusion, feelings of guilt, humiliation, low self-esteem, and an increased risk of suicide (O'Malley, 2023). Second, the percentage of adolescents with ADHD participating in online gambling is also twice as high as that of their peers. The literature emphasizes that adolescents with ADHD are particularly susceptible to gambling due to alterations in reward processing and decision-making mechanisms (Groen et al., 2013; Rubiales et al., 2017). Third, although other studies have suggested that pornography consumption and passive sexting are more prevalent among adolescents and young people with ADHD (Niazof et al., 2019; Ozdag et al., 2025), in the present study, only girls with ADHD exhibited a significantly higher prevalence of these risky practices compared to their peers, even reversing the typical gender pattern in the case of passive sexting. These findings align with research linking ADHD symptoms to risky sexual behaviours in young women (Hosain et al., 2012). A potential explanation for this pattern is the "self-medication" hypothesis, which suggests that these activities may serve as mood regulators for individuals with ADHD (Privara & Bob, 2023). These findings warrant special attention, as children and adolescents with ADHD are particularly vulnerable to addiction problems related to the excessive consumption of pornography (Villena-Moya et al., 2024). However, it should also be mentioned that in comparisons between children with and without ADHD, the effect sizes found were very small, which should temper the findings, given the complexity of the phenomenon under study.

In conclusion, gender differences between boys and girls with ADHD remain a relevant topic in the literature, and the findings of the present study contribute new evidence in this regard. Overall, girls with ADHD exhibit riskier internet use habits, a higher rate of PIU, and a greater percentage of participation in risky practices compared to their female peers without the disorder. In contrast, boys with ADHD show less pronounced differences from their male peers without the disorder (with only the differences in PIU prevalence being statistically significant). A potential explanation for this finding could be the "Gender Paradox", in which the gender with the lower prevalence of a disorder is more severely affected (Eme, 1992). Another possible explanation is that ADHD diagnoses are often delayed in girls, leading to a postponement in access to treatment, support, and interventions during critical developmental years (Almerkhlafi &

Jain, 2024). Nevertheless, as Young et al. (2020) suggest, future studies should aim to deepen our understanding of the challenges and barriers faced by girls and women with ADHD.

This study has several limitations. The cross-sectional design prevents the establishment of causal relationships between the variables under investigation. Additionally, despite using a sample of more than 4,000 adolescents, the use of non-probabilistic sampling, selecting adolescents from only Santiago de Compostela and surrounding areas, limits the external validity of the results. Furthermore, data collection in a school setting, rather than in primary care or paediatric services, meant that the variables were self-reported, which could have led to either underestimation or overestimation of reported prevalences, including the diagnosis of ADHD. However, it should be noted that for decades, several experts have established that anonymous and confidential self-reported measures have proven to be reliable and, in some cases, more effective than other methods for assessing addictive and risky behaviours (Winters et al., 1990), and that previous studies in ADHD have used this approach (Isorna et al., 2021; Niazof et al., 2019); so despite being a limitation, it does not invalidate the results obtained. In addition, considering that this is a school-based study, the verification of the ADHD diagnosis by medical records could have implications in terms of confidentiality of student data, as pointed out by the Bioethics Committee.

This study offers valuable insights into the PIU prevalence, the Internet use habits and online risky behaviours among adolescents who report a diagnosis of ADHD. The results of this study suggest that adolescents with ADHD constitute a particularly vulnerable group for developing PIU and engaging in risky online behaviours. Furthermore, notable gender differences were observed. Girls with ADHD showed increased susceptibility to risky online behaviours, including earlier access to smartphones, more frequent late-night internet use, a higher engagement in social media activities, and higher rates of passive sexting and pornography consumption. Therefore, it is crucial to implement targeted prevention and intervention strategies that address the specific needs of this population, such as routinary screening protocols for problematic internet use in ADHD clinics, family-based selective prevention programs, and gender-specific preventive programs and intervention guidelines, with a special emphasis on the Comprehensive Sexuality Education component.

## Author Contributions

**Manuel Isorna:** Conceptualization, Investigation, Writing - Original draft. **David Liñares:** Data curation, Formal analysis, Investigation, Writing – Review & editing. **Patricia Gómez:** Formal analysis, Methodology, Visualization, Writing – Review & editing. **Víctor José Villanueva-Blasco:** Formal analysis, Validation, Writing – Review & editing. **Antonio Rial-Boubeta:** Conceptualization, Funding acquisition, Project administration, Supervision, Writing – Review & editing.

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## Conflict of Interest

The authors declare that there is no conflict of interest.

## Data Availability Statement

The research data associated with this article are not publicly available. Requests can be submitted to the corresponding author and may be provided on reasonable request.

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