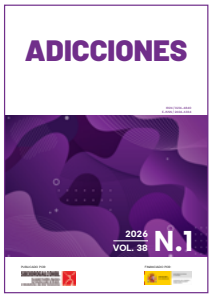
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Traditional gambling, betting in video games, and financial trading: Associations with gambling severity and associated harm in young adults

Juego tradicional, apuestas en videojuegos y trading financiero: Asociaciones con la gravedad del juego y el daño asociado en adultos jóvenes

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Abstract

The digitization of gambling has led to the proliferation of gambling-like products in areas such as video games and financial investment platforms. Although these practices share structural mechanisms and risk profiles with gambling, evidence on their relationship with associated harm and their joint role in predicting gambling severity remains limited. This study examined the association between recent participation (within the last 60 days) in these activities, along with traditional forms of gambling, and gambling severity (PGSI) and related harm (SGHS). The sample is derived from a randomized controlled trial (ClinicalTrials.gov ID: NCT06681103), from which only the pre-intervention baseline assessment data were utilized. A total of 1,889 young people aged 18–34 living in Spain were recruited, of whom 53.9% (n=1,018) had recently participated in gambling or similar activities, forming the sample analyzed. Both indicators were modelled using hierarchical ordinal regression, with adjustments made for overall involvement (frequency and number of activities) and sociodemographic factors. The associations with severity remained after all adjustments, with adjusted ORs (aORs) between 1.9 and 3.6 (p<0.01), with video game betting and commodity trading standing out, with magnitudes similar to those observed for slot machines, casinos, and sports betting. In the SGHS, only eSports betting and commodity trading (aOR=2.23, p<0.05) retained their association with a higher number of harms after sociodemographic adjustment, while lotteries showed inverse associations with both indicators (aOR=0.58 in PGSI, and aOR=0.56 in SGHS, p<0.05). The results emphasize the importance of incorporating these new forms of digital spending into the detection and prevention of gambling harm among young adults.

Keywords: gambling harms, problem gambling severity index, Esports betting, skin gambling, cryptocurrency, financial trading, young adults

Resumen

La digitalización del juego ha favorecido la expansión de productos análogos al juego de azar en espacios como los videojuegos y las plataformas de inversión financiera. Aunque estas prácticas comparten mecanismos estructurales y perfiles de riesgo con el juego de azar, la evidencia sobre su relación con el daño asociado y su papel conjunto en la predicción de la gravedad del juego sigue siendo limitada. Este estudio analizó si la participación reciente (últimos 60 días) en estas actividades, junto con las formas tradicionales de juego, se asocia con la gravedad del juego (PGSI) y el daño relacionado (SGHS). La muestra procede de un ensayo controlado aleatorizado (ClinicalTrials.gov ID: NCT06681103), del que se emplearon únicamente los datos de la evaluación inicial previos a la intervención. Se reclutaron 1.889 jóvenes de 18–34 años residentes en España, de los cuales el 53,9 % (n=1.018) había participado recientemente en actividades de juego o análogas, conformando la muestra analizada. Ambos indicadores se modelaron mediante regresión ordinal jerárquica ajustada por implicación global (frecuencia y número de actividades) y sociodemográficas. Las asociaciones con la gravedad se mantuvieron tras todos los ajustes, con OR ajustadas (ORa) entre 1,9 y 3,6 (p<0,01), destacando las apuestas en videojuegos y el trading de materias primas, con magnitudes similares a las observadas para máquinas tragaperras, casino y apuestas deportivas. En el SGHS, solo las apuestas en eSports y el trading de materias primas (ORa=2,23, p<0,05) conservaron su asociación con un mayor número de daños tras el ajuste sociodemográfico, mientras que las loterías mostraron asociaciones inversas con ambos indicadores (ORa=0,58 en PGSI, y ORa=0,56 en SGHS, p<0,05). Los resultados subrayan la necesidad de incorporar estas nuevas formas de gasto digital en la detección y prevención del daño asociado al juego entre jóvenes adultos.

Palabras clave: daño asociado al juego, índice de gravedad de problemas con el juego, apuestas en Esports, apuestas con skins, criptomonedas, trading financiero, adultos jóvenes

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The expansion of the gambling industry and the global increase in participation in gambling activities, particularly among younger populations, have become an emerging public health challenge (Reith et al., 2019; Tran et al., 2024; Wardle et al., 2024). Accumulating evidence increasingly indicates an association between gambling involvement, especially in online contexts, and multiple forms of harm that extend beyond financial impact (e.g., Browne, Tulloch et al., 2025; Davis et al., 2025; Marionneau et al., 2023; Riley et al., 2021; Suomi et al., 2023; Wall et al., 2025). Problem gambling has been linked to elevated levels of psychological distress, substance use, and an increased risk of suicidal behaviour (Dowling et al., 2015, 2017; Kristensen et al., 2024; Moreira et al., 2023), functioning both as a contributing factor to these problems and as a consequence of them (Cowlishaw & Kessler, 2016; Fonseca-Pedrero & Al-Halabí, 2024; Wardle et al., 2024). These effects tend to intensify in the presence of debt, although they may emerge even before financial harm is formally recognised (Håkansson & Widinghoff, 2020; Kristensen et al., 2024; Marko et al., 2023; Oksanen et al., 2018; Ronzitti et al., 2017).

The development of harm is not limited to individuals who meet clinical criteria for a gambling disorder, but extends across the entire risk spectrum, including people whose gambling involvement is considered low risk (Browne et al., 2017, 2018; Browne & Rockloff, 2017; Canale et al., 2016; Hwang et al., 2024; Wardle et al., 2024). Indeed, it has been documented that most harms, including some severe consequences such as job loss, relationship breakdown, or the need to sell personal belongings, are more frequent among those at lower levels of risk, who, due to their high population prevalence, account for the largest share of the overall burden of harm (Browne et al., 2017, 2018; Hwang et al., 2024; Tulloch et al., 2024). These findings reinforce the view that harm constitutes an inherent risk of gambling, regardless of severity level, which is particularly relevant given that these negative effects may persist beyond 12 months after cessation of gambling behaviour and affect not only the individual's life course but also their immediate social environment and even future generations (Dowling et al., 2025; Hing, Russell, et al., 2022; Rockloff et al., 2022; Suomi et al., 2023). From a public health perspective, these results also underscore the need to examine gambling-related harm not exclusively in terms of gambling severity, but by considering the contextual factors on which its emergence depends (Al-Halabí & Fonseca-Pedrero, 2024; Fonseca-Pedrero & Al-Halabí, 2024).

Although gambling can entail negative consequences across the population, young people constitute a particularly vulnerable group to the development of addictive disorders and the emergence of gambling-related harm (Gavriel-Fried et al., 2024; Grande-Gosende et al., 2020; Raisamo et al., 2015; Tran et al., 2024; Tulloch et al., 2024; Wardle et al., 2024). In Spain, in line with global trends (Tran et al., 2024), land-based gambling has declined since 2020, while online participation continues to increase, with an estimated prevalence of 6–7% in the general population. These figures rise to 7.4% among those aged 15–24 and to 8.8% among those aged 25–34, exceeding 13% among men in the latter age group (Spanish Observatory of Drugs and Addictions [OEDA], 2024). Furthermore, although disaggregated data simultaneously by age and gambling modality are not available, the Survey on Alcohol, Drugs and Other Addictions in Spain (Encuesta sobre Alcohol, Drogas y otras Adicciones en España, EDADES, EDADES; OEDA, 2024) shows that online gambling is associated with a higher prevalence of problem gambling (18.4%) than land-based gambling (4.3%), and that the 25–34 age group consistently presents one of the highest rates of problem gambling in recent years (OEDA, 2024).

This pattern of greater youth involvement in online gambling also extends to new forms of digital spending which, although not legally classified as gambling, reproduce many of its structural dynamics (Andrade & Newall, 2023; Coloma-Carmona, Carballo, Sancho-Domingo, et al., 2024; Griffiths, 2018). The digitalisation of gambling has facilitated the expansion of gamblified or gambling-analogous products across spaces such as video games, social media, and even financial investment platforms (Andrade & Newall, 2023; Brock & Johnson, 2021; Coloma-Carmona, Carballo, Sancho-Domingo, et al., 2024; Davies & Ferris, 2022; Macey & Hamari, 2024). Spending on these products has been linked in multiple studies to indicators of problem gambling (e.g., Coloma-Carmona, Carballo, Miró-Llinares, & C. Aguerri, 2025; Coloma-Carmona, Carballo, Sancho-Domingo, et al., 2024; Drummond et al., 2020; Greer et al., 2021, 2022, 2023; Johnson et al., 2023; Oksanen, Hagfors, et al., 2022; Wardle & Tipping, 2023), and an increase has also been observed in the number of individuals seeking help for difficulties arising from participation in these activities (Marionneau et al., 2024). Within the video game context, the purchase of loot boxes (packages containing randomised rewards that provide virtual items in exchange for real money) has been consistently associated with higher levels of problem gambling (González-Cabrera et al., 2022; King & Delfabbro, 2018; Raneri et al., 2022; Zendle, 2020; Zendle & Cairns, 2018). Other practices such as betting with skins or virtual items that hold economic value (skin betting), despite receiving less empirical attention, have shown an even stronger association with gambling severity and related harm, even after controlling for involvement in traditional forms of gambling (Greer et al., 2023; H. S. Kim et al., 2023; Wardle & Tipping, 2023).

In parallel with betting within video games, the use of financial trading platforms, particularly those oriented toward short-term strategies such as day trading or scalping, in which financial asset transactions are completed within the same day or even within hours, has also become increasingly popular among young adults (Andrade & Newall, 2023; Coloma-Carmona, Carballo, Miró-Llinares, et al., 2024; Roza et al., 2024). This activity is characterised by conducting financial operations in highly volatile markets, making decisions under conditions of uncertainty, and assuming a high risk of economic loss (Andrade & Newall, 2023; Coloma-Carmona, Carballo, Miró-Llinares, & C. Aguerri, 2025; Coloma-Carmona, Carballo, Miró-Llinares, C. Aguerri, et al., 2025; Delfabbro, King, & Williams, 2021; Guzmán et al., 2021; Oksanen, Mantere, et al., 2022; Roza et al., 2024). For this reason, it has been described as a gambling-like activity not only because of its structure and dynamics, but also because it shares profiles and psychological consequences similar to those observed among individuals involved in gambling (Coloma-Carmona, Carballo, Miró-Llinares, & C. Aguerri, 2025; Coloma-Carmona, Carballo, Sancho-Domingo, et al., 2024; Delfabbro, King, & Williams, 2021; Jain et al., 2025; Johnson et al., 2023; Mosbey et al., 2024). Recent studies have shown that frequent involvement in speculative trading is associated with a higher prevalence of problem gambling and with specific psychological, financial, and social harms, particularly among young people with risk profiles (Coloma-Carmona, Carballo, Miró-Llinares, C. Aguerri, et al., 2025; Jain et al., 2025; Johnson et al., 2023; Loscalzo et al., 2025; Mosbey et al., 2024). Moreover, individuals who combine trading with other gambling activities, especially those conducted online, share similar vulnerability profiles, including younger age, higher levels of impulsivity, gambling-related cognitive distortions, and substance use (Coloma-Carmona, Carballo, Miró-Llinares, & C. Aguerri, 2025; Delfabbro, King, Williams, et al., 2021).

Despite the growing evidence on the association between these emerging forms of digital spending and gambling-related harm, no study to date has jointly examined the extent to which participation in video-game related betting and financial trading, together with traditional forms of gambling, is associated with the severity of gambling-related harm. Moreover, the limited literature available on harm linked to trading has predominantly focused on cryptocurrencies, without considering the trading of other financial assets such as exchange-traded funds or foreign exchange markets, whose popularity has increased among the general population. This gap limits the understanding of the specific impact of each of these practices, particularly among young adults, where their prevalence is higher (Coloma-Carmona, Carballo, Miró-Llinares, et al., 2024).

Furthermore, although part of the literature suggests that gambling-related risk is more strongly determined by the overall level of involvement, that is, by the frequency and variety of activities undertaken (Baggio et al., 2017; Greer et al., 2021, 2023; LaPlante et al., 2013, 2014), other studies have shown that mere participation in specific modalities such as casino gambling, electronic gaming machines, and online gambling more broadly is already associated with greater risk, even after controlling for this level of involvement (Allami et al., 2021; Binde et al., 2017; Gainsbury et al., 2019; Gooding & Williams, 2024; Mazar et al., 2020; Nelson et al., 2018; Wardle & Tipping, 2026). However, this hypothesis has not yet been tested in relation to gambling-like practices, which makes it difficult to assess their relative contribution to gambling-related harm.

Accordingly, the present study aimed to examine among young adults (18–34 years): (1) the association between participation in different gambling activities, including traditional forms of gambling, betting integrated within video games, and financial asset trading, and both gambling severity and related harm; and (2) whether these associations remained after controlling for overall gambling involvement and sociodemographic factors.

Methods

Design and procedure

The sample analyzed in this study derives from a registered randomised controlled trial (ClinicalTrials.gov ID: NCT06681103), whose overall aim was to evaluate the effectiveness of a brief online intervention designed to promote intention to change and treatment-seeking among young adults with problematic behaviours related to gambling and financial investments. The detailed study protocol has been described elsewhere (Coloma-Carmona et al., 2026). Inclusion criteria were being aged between 18 and 34 years, residing in Spain, having participated at least once in the past 60 days in traditional forms of gambling, betting within video games, or financial asset trading, and providing informed consent.

The sample was recruited through an online panel managed by an external company specialised in quantitative and qualitative research. Data collection took place between December 2024 and January 2025. Each participant could access the survey only once via a personalised link. Invitations were sent exclusively to panel members who met the established age range (18–34 years), through the provider's email and mobile application. Those who agreed to participate completed a brief eligibility assessment to verify compliance with the inclusion criteria. Participation was voluntary and followed the provision of informed consent. Individuals who completed the questionnaire received non-monetary incentives (points redeemable for products), managed by the recruitment

company. For the analyses presented in this study, only data collected at baseline, prior to any exposure to the experimental conditions, were used.

The study was approved by the Research Ethics Committee of Miguel Hernández University of Elche (reference: DPS.ACC.150523) and complies with the ethical principles set out in the Declaration of Helsinki.

Participants

Of the 1,889 individuals who accessed the survey, 1,112 met the inclusion criteria. Given that the primary aim of the study was to analyse the relative contribution of emerging forms to gambling severity and gambling-related harm, in comparison with traditional gambling activities, participants whose involvement was limited exclusively to betting within video games or financial asset trading were excluded from the analyses (n = 94), resulting in a final sample of 1,018 participants.

Regarding the sociodemographic profile, the mean age of participants was 28.6 years (SD = 4.4), and 55.8% (n = 568) were women. The majority identified as single (82.5%, n = 840). More than half had completed university education (54.6%, n = 556), and 61.8% (n = 629) were employed full-time. The mean monthly income was €1,343 (SD = €890.9). Table 1 presents the full sociodemographic characteristics of the sample.

Table 1

Sociodemographic characteristics of the sample (N = 1,018)

Variables	Total sample (N = 1,018)
Age, M (SD; Range)	28.6 (4.4; 18-34)
Sex, % (n)	
Female	55.8 (568)
Male	44.2 (450)
Marital status, % (n)	
Single	82.5 (840)
Married	16.6 (169)
Divorced	0.9 (9)
Educational level, % (n)	
No formal education	0.8 (8)
Primary education	2.8 (28)
Secondary education	41.8 (426)
University education	54.6 (556)
Employment status, % (n)	
Employed full-time	61.8 (629)
Employed part-time	12.6 (128)
Student	15.9 (162)
Unemployed or on sick leave	8.3 (85)
Domestic worker	1.2 (12)
Retired	0.2 (2)
Monthly income (excluding extreme values), M (SD; Range)[a]	1,325.6€ (884.4; 0-8.000)
Monthly income (transforming extreme values), M (SD; Range)[b]	1,343€ (890.9; 0-8.000)

Note. [a] 23 responses were excluded due to extreme values (z > 3.29), with reported incomes between €15,000 and €45,000.
[b] Extreme values were considered possible reporting errors of annual income and were adjusted by dividing the value by 12 months to estimate the monthly income.
Abbreviations: n = frequency, M = mean, SD = standard deviation.

Variables and measures

Outcome variables

Gambling severity. This was assessed using the *Problem Gambling Severity Index*, Spanish version (PGSI; Ferris & Wynne, 2001; López-González et al., 2018), with a reference period of the past 12 months. Total scores range from 0 to 27, with higher values indicating greater gambling severity. For the analyses, the standard four-level categorisation of the scale was applied: non-problem gambling (PGSI = 0), low risk (PGSI = 1–2), moderate risk (PGSI = 3–7), and problem gambling (PGSI ≥ 8). The Spanish version of the PGSI has shown excellent internal consistency (ordinal α = 0.97) and good convergent validity with DSM-IV scores (r = 0.77). In the present sample, the internal consistency of the PGSI was ω = 0.94.

Gambling-related harm. This was measured using the *Short Gambling Harm Screen* (SGHS; Browne et al., 2018), also with a reference period of the past 12 months. The SGHS comprises 10 dichotomous items (yes/no) assessing harms associated with gambling involvement across financial, emotional/psychological, and social domains. Total scores range from 0 to 10, with higher scores indicating a greater accumulation of harms. In its original validation, the SGHS showed a unidimensional structure with high internal reliability (α = 0.93; ω = 0.83) and a strong correlation with the PGSI (r = 0.68) (Browne et al., 2018). For the analyses, the number of harms was categorised into four groups: 0 harms, 1–2 harms, 3–5 harms, and 6 or more (Boyle et al., 2022; Browne et al., 2022). In the present sample, the internal consistency of the SGHS was ω = 0.86.

Predictor variables

Participation in traditional gambling and betting activities. Participation (yes/no) in the past 60 days was assessed for eight gambling products included in the EDADES survey of the Spanish National Plan on Drugs (OEDA, 2024): (1) lotteries, coupons, football pools, scratch cards; (2) sports betting; (3) horse race betting; (4) slot machines, slots, electronic gaming machines; (5) card games (e.g., poker); (6) bingo; (7) casino games or gaming venues; and (8) contests involving a monetary stake (e.g.,

television contests). Access channels (online, land-based, or mixed) were not differentiated for each activity; however, participants were asked about their main form of gambling ("Overall, which would you say is your main way of gambling with money?"), with three response options: land-based (e.g., casinos, physical venues, betting shops), online (e.g., websites or mobile applications), or mixed (e.g., land-based and online equally).

Participation in gambling-like activities. Involvement (yes/no) in the past 60 days was recorded for activities with gambling-analogous components identified in recent literature (Zendle, 2020): (1) eSports betting, (2) betting for skins or in-game equipment upgrades (skin betting), (3) purchasing loot boxes, and (4) betting on players/characters during live video game streaming (e.g., Twitch). Participation in financial trading activities was also assessed across the following assets: (1) foreign exchange (Forex), (2) cryptocurrencies (e.g., Bitcoin, Ether, Ripple), (3) commodities (e.g., precious metals, agricultural products), (4) exchange-traded funds (ETFs), (5) contracts for difference (CFDs), (6) futures (contracts on assets exchanged at a future date), (7) options (contracts with the right, but not the obligation, to buy/sell an asset), and (8) stock markets (e.g., shares, stock indices, penny stocks, high-risk investment funds).

Control variables

Overall gambling involvement. In line with the proposal by LaPlante et al. (2014), two indicators were included to control for the level of gambling involvement: (1) the total number of activities in which each participant reported participation in the past 60 days, considering both traditional and gambling-like forms; and (2) the maximum frequency of participation during the past year in any of the reported activities, measured across five levels (once or twice a year, monthly, fortnightly, weekly, and more than once per week). The total number of activities was categorised into three groups (1–2, 3–4, 5 or more) for the regression analyses, following criteria used in previous studies (Wardle & Tipping, 2023, 2026).

Sociodemographic variables. Age, sex (male/female), marital status (single, married, divorced, widowed), educational level (no formal education, primary education, secondary education, university education), employment status (full-time employed, part-time employed, student, unemployed or on sick leave, domestic worker, retired), and monthly income (in euros, recorded as a numeric value) were collected. Following the strategy applied in previous studies (Wardle & Tipping, 2023, 2026), several variables were recategorized: monthly income was grouped into three ranges (≤ €499, €500–1,499, and ≥ €1,500), educational level into two categories (university education vs. no university education), and employment status into two groups (employed or student/in training vs. neither employed nor student/in training).

Data analysis

Statistical analyses were conducted using SPSS (version 27). Descriptive statistics (means, standard deviations, frequencies, and percentages) were calculated to describe the sociodemographic characteristics of the sample, and cross-tabulations were used to examine the distribution of gambling severity and gambling-related harm levels across each gambling and gambling-like activity. Outliers were examined for all variables, and for the monthly income variable 23 extreme values were identified ($z > 3.29$), corresponding to possible self-report errors. These responses, which included annual income figures ranging between €15,000 and €45,000, were corrected by dividing the reported value by 12 to estimate monthly income (Table 1). The mean income did not change substantially either when these cases were removed or when they were corrected; therefore, they were retained following correction.

Ordinal logistic regression models were used to examine the association between participation in gambling and gambling-like activities and the outcome variables: gambling severity (PGSI) and gambling-related harm (SGHS). Both variables were modelled as ordinal, using the four categories described in the Variables and measures section. Following procedures used in previous studies (LaPlante et al., 2014; Wardle & Tipping, 2026), three hierarchical models were estimated for each outcome variable: Model 1 (unadjusted) included only participation (yes/no) in each gambling and gambling-like activity over the past 60 days as predictor variables; Model 2 additionally adjusted for overall gambling involvement, including maximum participation frequency over the past 12 months and the number of different activities undertaken in the past 60 days; and Model 3 (fully adjusted) further incorporated sociodemographic variables (age, sex, marital status, educational level, monthly income, and employment or training status).

Adjusted odds ratios (aOR) and their 95% confidence intervals (CI) were calculated from the estimated coefficients. In ordinal logistic regression, coefficients are interpreted as common ORs for each predictor, assuming that the effect is constant across all thresholds of the outcome variable (the proportional odds assumption). To assess compliance with this assumption, the test of parallel lines was used. For the PGSI, the test indicated a violation of this assumption in adjusted Models 2 and 3 ($p < 0.001$). This result is common in contexts with multiple predictors, particularly when continuous variables are included and large samples are used (Brant, 1990; O'Connell, 2006), as in the present study. To evaluate the robustness of the findings, the analyses were replicated using multinomial logistic regression models, which do not require this assumption (McNulty, 2021). The observed associations were consistent in magnitude and direction with those obtained in the ordinal models;

therefore, the latter are presented due to their greater parsimony and comparability with previous studies that used the same analytical approach (e.g., Greer et al., 2023).

Model fit was evaluated using Nagelkerke's pseudo-R^2, with values around 0.20 considered indicative of satisfactory fit (Hosmer et al., 2013). Results from the fully adjusted models were illustrated using forest plot graphics generated with the *forestplot* package in R (version 05.1+513).

Results

Participation in gambling and gambling-like activities in the sample

In the total sample (N = 1,018), the most frequent activity was participation in lotteries and coupons (87.9%, n = 895), followed at a distance by bingo (19.0%, n = 193), sports betting (18.2%, n = 185), cryptocurrency trading (13.1%, n = 133) and stock market trading (10.4%, n = 106), and slot machine gambling (8.5%, n = 87). Other activities with prevalences between 6% and 7% included trading in exchange-traded funds (6.8%, n = 69) and commodities (6.5%, n = 66), as well as purchasing loot boxes (6.4%, n = 65) and betting for skins in video games (6.4%, n = 65). The remaining activities showed prevalences below 6% (Table 2).

Regarding combinations of activities, 66.8% of participants (n = 680) reported involvement exclusively in traditional modalities (e.g., lotteries, bingo, casino). A further 18.2% (n = 185) combined traditional gambling with financial asset trading, and 7.2% (n = 73) combined it with betting within video games. An additional 7.9% (n = 80) reported involvement in all three types of activity. Concerning mode of access, 49.6% (n = 223) considered land-based formats (i.e., casinos, betting shops, physical venues) to be their primary mode of access, whereas 42% (n = 189) reported online access (i.e., via websites or applications). A total of 8.4% (n = 38) indicated using both access formats equally. With respect to the maximum frequency of participation in any of these activities over the past 12 months, 59.6% (n = 607) reported participating at least monthly.

Mean gambling severity score (PGSI) among participants was 2 (SD = 4.3, range: 0–22), and 11.2% (n = 114) obtained scores indicative of possible problem gambling (PGSI ≥ 8). Regarding harm derived from gambling involvement, the mean score on the SGHS was 1.1 (SD = 2, range: 0–10). Most participants (68.5%, n = 697) reported no gambling-related harm, whereas 5.7% (n = 58) reported experiencing six or more harms (Table 2).

Distribution of gambling-related harm and gambling severity by activities undertaken

Figure 1 presents the distribution of gambling severity and Figure 2 the number of gambling-related harms reported by those who participated in each type of activity over the past 60 days. As multiple activities could be selected, the same participant may be represented in more than one category.

As shown in Figure 1, gambling-like activities, particularly those linked to high-risk financial asset trading (contracts for difference, futures, and options), concentrated the highest proportions of participants with scores indicative of problem gambling (PGSI ≥ 8), ranging between 61.4% and 69.4%. High percentages of problem gambling were also observed among those participating in gamblified video game–related activities, such as betting on players/characters in streaming contexts (60.3%), eSports betting (58.5%), skin betting (53.8%), and the purchase of loot boxes (46.2%).

Table 2

Participation in gambling and gambling-like activities and distribution of gambling severity (PGSI) and gambling-related harm (SGHS) in the sample (N=1,018)

Variables	Total sample (N = 1,018)
Traditional gambling, % (n)	
Lotteries, Coupons, Football pools, Scratchcards	87.9 (895)
Sports betting	18.2 (185)
Horse race betting	4.4 (45)
Slot machines, electronic gaming machines	8.5 (87)
Card games for money (e.g., poker, blackjack...)	7.2 (73)
Bingo	19 (193)
Casino or gaming hall games	11.7 (119)
Contests with monetary stake (e.g., television, radio, press...)	5.6 (57)
Betting within video games, % (n)	
eSports betting	5.2 (53)
Betting in video games for skins or equipment upgrades (skin betting)	6.4 (65)
Buying loot boxes in video games	6.4 (65)
Betting on players/characters during online game broadcasts on streaming platforms (e.g., Twitch)	5.7 (58)
Financial asset trading, % (n)	
Forex (foreign exchange)	4.3 (44)
Cryptocurrency (e.g., Bitcoin, Ether, Ripple...)	13.1 (133)
Commodities (precious metals -gold, silver-, agricultural products, etc.)	6.5 (66)
Exchange-traded funds (ETFs)	6.8 (69)
Contracts for difference (CFDs)	3.5 (36)
Futures (contracts on assets exchanged at a future date)	4.1 (42)
Options (contracts with the right, but not the obligation, to buy/sell an asset)	3.3 (34)
Stock market (e.g., stocks, stock market index, penny stocks, high-risk mutual funds...)	10.4 (106)

Table 2 (cont.)

Participation in gambling and gambling-like activities and distribution of gambling severity (PGSI) and gambling-related harm (SGHS) in the sample (N=1,018)

Variables	Total sample (N = 1,018)
Frequency of participation in the past 12 months, % (n)	
1 or 2 times a year	40.4 (411)
Monthly	23.5 (239)
Every two weeks	11.8 (120)
Weekly	18.8 (191)
More than once a week	5.6 (57)
Predominant access mode (self-reported)[a], % (n)	
Land-based	49.6 (223)
Online	42 (189)
Mixed (land-based and online equally)	8.4 (38)
Gambling severity (PGSI classification), % (n)	
Non-problem gambling (PGSI = 0)	65.9 (671)
Low-risk gambling (PGSI 1-2)	14.5 (148)
Moderate-risk gambling (PGSI 3-7)	8.3 (85)
Problem gambling (PGSI ≥ 8)	11.2 (114)
Total PGSI score, M (SD; Range)	2 (4.3; 0-22)
Gambling-related harm (SGHS classification), % (n)	
0 harms (SGHS = 0)	68.5 (697)
1-2 harms (SGHS = 1-2)	14.6 (149)
3-5 harms (SGHS = 3-5)	11.2 (114)
≥ 6 harms (SGHS = 6-10)	5.7 (58)
Total SGHS score, M (SD; Range)	1.1 (2; 0-10)

Note. [a] Given that the access mode (online or land-based) was not recorded for each specific activity, information from a general question regarding the primary mode of gambling reported by each participant was used.
Abbreviations: *n* = frequency, *M* = mean, *SD* = standard deviation, *PGSI* = Problem Gambling Severity Index, *SGHS* = Short Gambling Harm Screen.

Among traditional forms of gambling, horse race betting (64.4%), contests involving a monetary stake (59.6%), and playing card games with money (53.4%) also showed a high proportion of participants grouped in the problem gambling category. In contrast, participation in lotteries presented the lowest risk levels, with 69.3% of participants classified as non-problem gamblers (PGSI = 0) and the lowest rates of problem gambling (8.7%).

Figure 2 shows a similar pattern regarding perceived harm, with activities linked to speculative trading and betting within video games concentrating the highest percentages of participants who reported multiple gambling-related harms. The highest proportions of participants reporting at least one harm corresponded to contracts for difference (CFD) trading (83.3%), foreign exchange (Forex) markets (81.8%), futures (78.6%), options (79.4%), and betting on characters in streaming platforms (75.9%). In these five activities, more than one third of participants reported experiencing six or more harms, with contracts for difference (44.4%) and options (38.2%) being particularly notable.

High proportions were also observed in other gambling-like activities, such as eSports betting (37.7% with ≥ 6 harms), skin betting (32.3%), and betting on characters in streaming contexts (31%). Among traditional modalities, horse race betting, slot machine gambling, and card games played for money stood out, with proportions of participants reporting ≥ 6 harms ranging between 24.7% and 26.7%. In contrast, lotteries were the only activity in which more than 70% of participants reported no harm, followed by bingo (51.3%) and trading in exchange-traded funds (50.7%). Stock market trading (46.2%), cryptocurrencies (42.9%), and the purchase of loot boxes (41.5%) also showed a high proportion of participants without harm and relatively low rates of cases with ≥ 6 harms (≤ 15%). However, in the case of loot boxes, a polarised distribution was observed, as 21.5% of those participating in this activity also reported six or more harms.

Association between gambling severity (PGSI) and participation in gambling and gambling-like activities

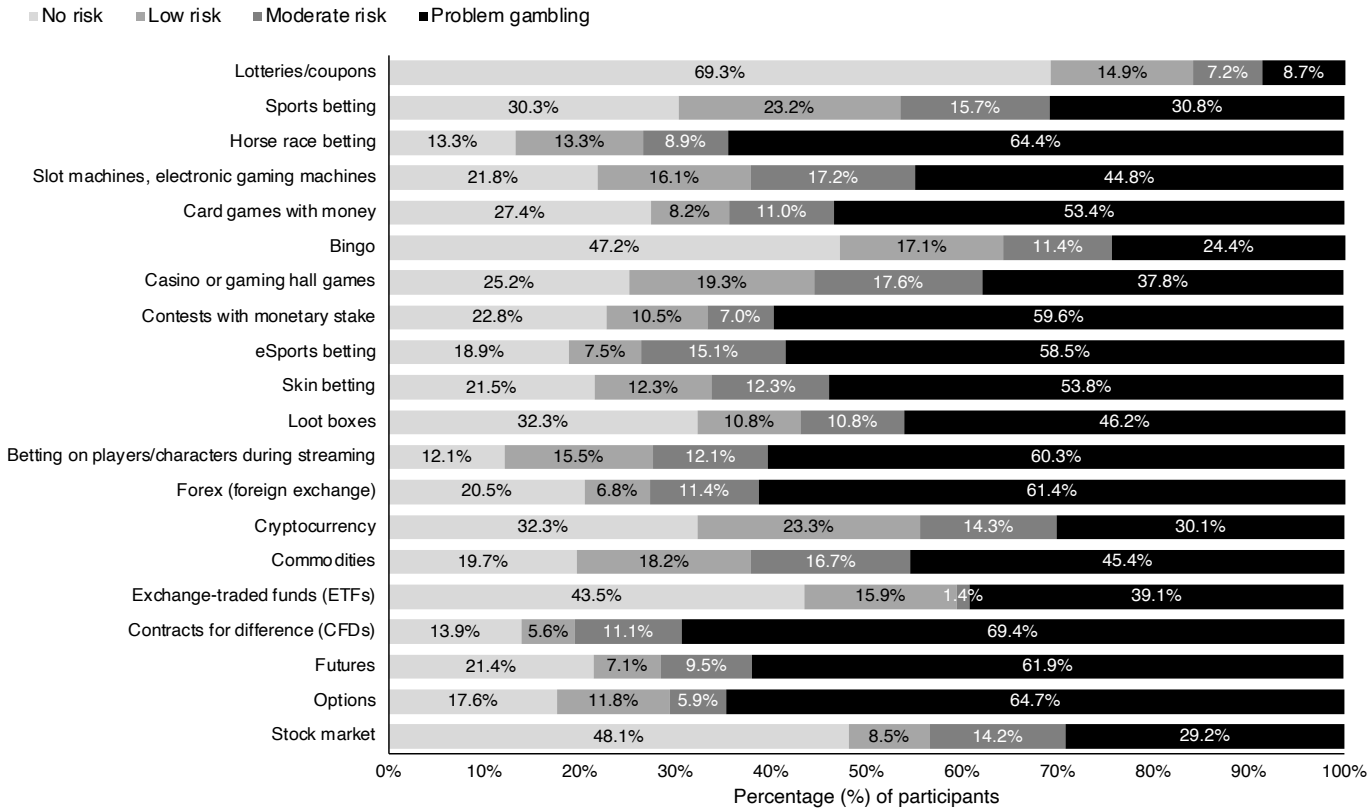
The majority of the associations observed in the unadjusted model (Model 1) remained after adjustment for overall gambling involvement (Model 2) and sociodemographic variables (Model 3), with no relevant changes in the direction of the effects. The only exception was for betting on players or on streamed matches, which was not statistically significant in the initial model (p = 0.074) but became significant after incorporating the control variables and remained significant in the final model.

In Model 3 (Nagelkerke R^2 = 0.418), the traditional activities associated with greater gambling severity were horse race betting (aOR = 3.61, 95% CI [1.65, 7.91]), slot machine gambling (aOR = 2.89, 95% CI [1.65, 5.06]), casino gambling (aOR = 2.17, 95% CI [1.30, 3.63]), and sports betting (aOR = 1.91, 95% CI [1.22, 2.98]). In contrast, participation in lotteries was inversely associated with PGSI (aOR = 0.58, 95% CI [0.36, 0.93]).

Among gambling-like activities, gambling severity was associated with all examined video game–related betting modalities, except for the purchase of loot boxes (p = 0.431). Individuals who had participated in eSports betting (aOR = 2.81, 95% CI [1.37, 5.76]), skin betting or betting on players (aOR = 2.43, 95% CI [1.28, 4.60]), or betting on streamed matches (aOR = 2.29, 95% CI [1.10, 4.77]) in the past 60 days were more likely to be classified in higher PGSI categories compared with those who did

Figure 1

Distribution of gambling severity (PGSI) among participants for each type of gambling activity



not participate in these activities. Similarly, participation in commodity trading (aOR = 2.86, 95% CI [1.52, 5.37]) and cryptocurrencies (aOR = 1.90, 95% CI [1.20, 3.00]) was also associated with greater gambling severity.

Regarding covariates, maximum frequency of participation in the reported activities over the past year was consistently associated with gambling severity. Compared with those who gambled only once or twice a year, any higher frequency of participation was linked to higher levels of severity, with the strongest associations observed for fortnightly participation (aOR = 3.08; 95% CI [1.89, 5.01]) and participation more than once per week (aOR = 3.25; 95% CI [1.76, 5.99]). In contrast, having a university education (aOR = 0.67; 95% CI [0.49, 0.91]) and being employed or in education/training (aOR = 0.51; 95% CI [0.32, 0.82]) were associated with lower gambling severity. No significant associations were found between PGSI levels and sex, age, marital status, or monthly income ($p > 0.05$).

Association between gambling-related harm (SGHS) and participation in gambling and gambling-like activities

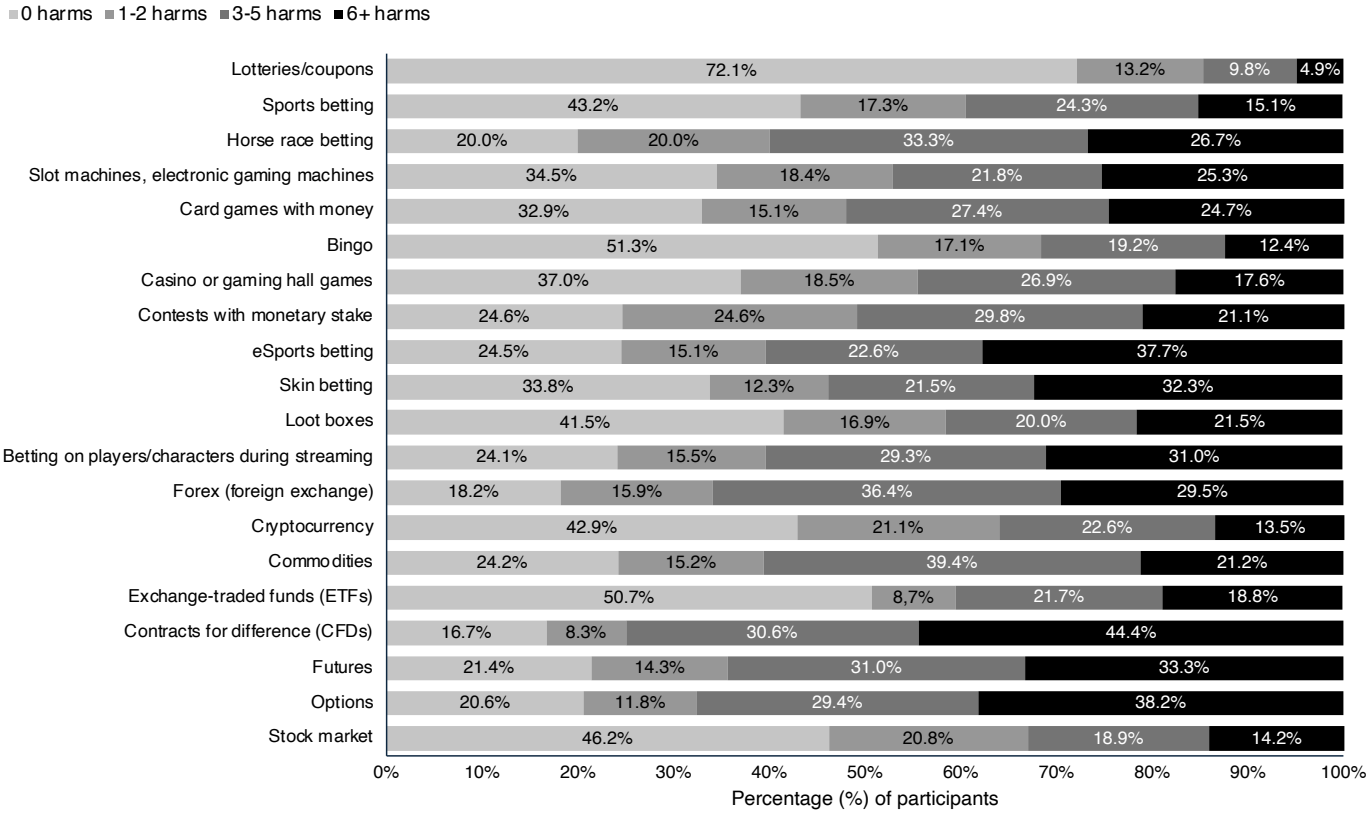
Sports betting, slot machine gambling, eSports betting, the purchase of loot boxes, and commodity trading were significantly associated ($p < 0.05$) with experiencing a higher number of harms in Models 1 and 2; however, these associations were no longer significant after incorporating sociodemographic variables in Model 3. In this fully adjusted model (Nagelkerke $R^2 = 0.296$), only eSports betting (aOR = 2.23, 95% CI [1.18, 4.22]) and commodity trading (aOR = 2.23, 95% CI [1.24, 4.02]) remained associated with a higher number of harms, whereas participation in lotteries showed an inverse association (aOR = 0.56, 95% CI [0.37, 0.86]).

Regarding covariates, individuals who had participated fortnightly (aOR = 1.52, 95% CI [1.02, 2.25]) or weekly (aOR = 2.13, 95% CI [1.32, 3.45]) in any of the reported activities over the past year were more likely to be classified in higher SGHS categories compared with those who participated only once or twice a year. Men also showed higher odds of accumulating a greater number of harms than women (aOR = 1.38, 95% CI [1.00, 1.89]). In contrast, having a university education was associated with a lower number of harms (aOR = 0.68, 95% CI [0.50, 0.91]). No statistically significant associations were observed between SGHS and age, employment status, income, or marital status ($p > 0.05$).

Figure 3 displays the aORs from Model 3, adjusted for overall gambling involvement and sociodemographic

Figure 2

Distribution of the number of gambling-related harms (SGHS) among participants for each type of gambling activity



variables, for each activity in relation to gambling severity and gambling-related harm. The full results of this model, together with those from Models 1 and 2, are presented in Table S1 of the supplementary material (https://osf.io/svzf4).

Discussion

The present study examined, in a sample of Spanish young adults, the relationship between recent participation in different traditional gambling activities (e.g., bingo, casino gambling, lotteries, sports betting) and gambling-like activities (video game–related betting and financial trading), with gambling severity and gambling-related harm.

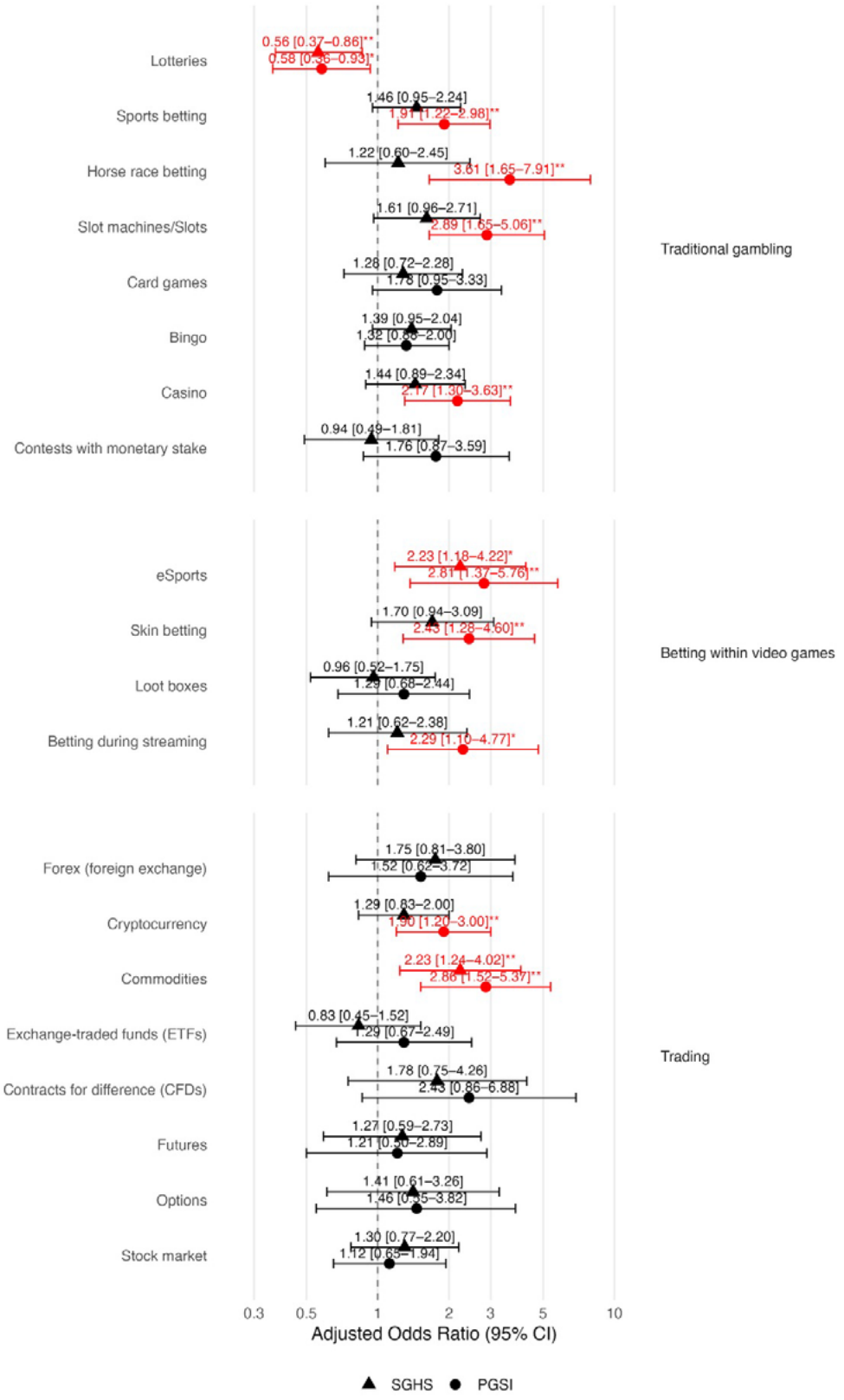
The most frequent traditional gambling modalities were consistent with those reported in national surveys, with the purchase of lotteries and coupons being the most widespread gambling modality in this sample (OEDA, 2024). However, the results also indicate a diversification of monetary expenditure towards products considered gamblified or gambling-analogous (Brock & Johnson, 2021; López-González & Griffiths, 2018; Macey & Hamari, 2024; Newall & Weiss-Cohen, 2022). Specifically, 33.2% of young people combined traditional gambling with spending on video game–related betting or financial asset trading, a pattern consistent with recent reports documenting an increase in these practices among the Spanish population (Coloma-Carmona, Carballo, Miró-Llinares, et al., 2024; Coloma-Carmona, Carballo, Sancho-Domingo, et al., 2024; Johnson et al., 2023; Spanish Observatory of Drugs and Addictions, 2024).

Regarding the distribution of the number of gambling-related harms, most young people (68.5%) did not report negative consequences derived from their involvement in gambling, a finding consistent with previous studies conducted in other populations (Browne et al., 2022; Tulloch et al., 2024). In terms of gambling severity, 11.2% reached scores consistent with problem gambling (PGSI ≥ 8), a prevalence higher than that observed in the general population but in line with that reported among young people (Nowak, 2018; OEDA, 2024).

In the descriptive analyses, it was observed that, alongside horse race betting, gambling-like activities, particularly high-risk financial asset trading (CFDs, futures, options) and betting within video game environments, concentrated a higher proportion of participants with scores indicative of problem gambling and of young people reporting six or more harms on the SGHS. At the opposite end, lotteries

Figure 3

Adjusted odds ratios from the fully adjusted model (Model 3) for gambling severity (PGSI) and gambling-related harm (SGHS) according to participation in each activity



Note. The model includes adjustments for maximum participation frequency, total number of activities, and sociodemographic variables (age, sex, marital status, educational level, income, and employment or education/training status), which are not shown in the figure.

grouped the highest percentage of participants without associated harms and the lowest rates of problem gambling.

Ordinal regression models, which simultaneously included all gambling and gambling-like activities, confirmed this general pattern. The explanatory capacity of both models was high ($R^2 = 0.418$ for gambling severity and $R^2 = 0.296$ for gambling-related harm) and greater than that observed in previous studies that have assessed gambling participation using broader time frames, such as the past year (Greer et al., 2023; Krotter et al., 2024). This finding suggests that the use of recent participation measures (past 60 days) may contribute to a better explanation of gambling severity and related harms.

Ordered by strength of association, the activities related to gambling severity were horse race betting, slot machine gambling/electronic gaming machines, commodity trading, eSports betting, skin betting, betting on live-streamed matches, casino gambling, sports betting, and cryptocurrency trading. In contrast, participation in lotteries was consistently associated with lower severity, in line with evidence indicating a lower relative risk for this activity compared with other gambling products (Booth et al., 2020; Tran et al., 2024; Wardle & Tipping, 2023, 2026).

Involvement in gambling-like activities was associated with a two- to threefold higher likelihood of being classified in higher severity categories (aOR = 1.90–2.86), magnitudes comparable to those observed for traditional gambling products considered high risk, such as slot machines, casino games, and sports betting, whose elevated potential to generate gambling-related problems has been widely documented (Allami et al., 2021; Currie et al., 2021; Luquiens et al., 2022; Tran et al., 2024; Wardle & Tipping, 2026).

Within gamblified products, betting in video game environments stood out among those most strongly associated with gambling severity, with the exception of loot box purchases, which did not show significant associations with either severity or gambling-related harm. This finding is consistent with international evidence identifying a stronger role for eSports betting and skin betting than for loot boxes in predicting gambling problems (Greer et al., 2023; Hing et al., 2021; Kim et al., 2023; Wardle & Tipping, 2023), despite the latter having received greater research attention.

However, the model results also indicate that the analytical focus should not be limited to the video game ecosystem. In this regard, although cryptocurrency trading has been the primary focus of the literature examining the intersection between speculative investment and problem gambling (Davies & Ferris, 2022; Johnson et al., 2023; Kim, 2024; Loscalzo et al., 2025), the data from the present study indicate that commodity trading (e.g., gold, agricultural products) was the gambling-like activity most strongly associated with gambling severity, showing a stronger relationship than cryptocurrency trading (aOR = 2.83 vs. 1.90). Moreover, participation in commodity trading, together with eSports betting, was the only activity associated with a higher number of gambling-related harms, doubling the likelihood of experiencing negative consequences. These findings are consistent with recent studies suggesting that the relationship between cryptocurrency trading and problem gambling is not necessarily consistent, and that participation in markets characterised by greater volatility and risk, such as commodities or Forex, may be more closely linked to gambling severity (Coloma-Carmona, Carballo, Miró-Llinares, & C. Aguerri, 2025).

To test the hypothesis proposed by LaPlante et al. (2013, 2014), the models included adjustments for maximum participation frequency (depth) and the number of gambling activities undertaken (breadth). The number of gambling activities was not a significant predictor of either gambling severity or gambling-related harm, whereas participation frequency was. Moreover, the associations initially observed did not attenuate after introducing these adjustments. This pattern has also been reported in other studies, where mere participation in activities such as casino gambling or those conducted predominantly in online environments remains associated with gambling severity even after controlling for overall involvement (Allami et al., 2021; Binde et al., 2017; Gainsbury et al., 2019; Gooding & Williams, 2024; Mazar et al., 2020; Nelson et al., 2018; Wardle & Tipping, 2026).

In the present study, activities such as slot machine use, casino gambling, and betting within video games not only retained their association but showed stronger effects after adjustment, suggesting that controlling for maximum annual participation frequency in these activities may help isolate the specific contribution that recent participation in these modalities has on gambling severity.

The final adjustment for sociodemographic variables (specifically age, sex, marital status, educational level, monthly income, and employment or training status) did not substantially modify the associations observed with gambling severity. However, in this model, employment and university education appeared to act as protective factors, in line with previous findings (Moreira et al., 2023) and with the importance attributed to social determinants in shaping vulnerability to mental health problems (Al-Halabí & Fonseca-Pedrero, 2024). By contrast, in the gambling-related harm model, sociodemographic adjustment reduced the magnitude of the associations with sports betting, slot machine gambling, and skin betting, which were no longer significant. In this case, having a university education was associated with a lower number of harms, whereas being male was associated with a higher number of reported harms (Browne et al., 2019; Raisamo et al., 2013; Raybould et al., 2021).

Across the models, differences in the explanatory capacity of the various activities to predict gambling severity and

gambling-related harm were observed, with explanatory power being lower for harm. This pattern, also described in the literature (Gainsbury et al., 2019; Greer et al., 2023), reinforces evidence that both measures capture related but non-equivalent dimensions (Browne et al., 2022). Whereas the PGSI assesses behaviours associated with excessive gambling or loss of control, the SGHS captures negative consequences that have actually been experienced (Browne et al., 2018, 2022; Delfabbro et al., 2020).

Accordingly, the fact that certain activities did not remain statistically significant after sociodemographic adjustment suggests that the experience of harm may be particularly sensitive to sociodemographic or contextual factors. This may also help explain why negative effects of gambling can emerge even at subclinical levels of severity (Browne et al., 2017, 2018, 2022; Browne & Rockloff, 2017; Canale et al., 2016; Hwang et al., 2024; Wardle et al., 2024), highlighting the importance of not focusing the analysis of harm on static risk categories that may be insufficient to capture processes that, in addition to being dynamic, are highly dependent on the context in which they occur (Al-Halabí & Fonseca-Pedrero, 2024; Fonseca-Pedrero & Al-Halabí, 2024).

The findings of the present study should be interpreted in light of several limitations. The use of an online panel as a recruitment strategy limits the generalisability of the results, as individuals who are members of such panels may have greater engagement with digital environments or higher rates of problem gambling (Hays et al., 2015; Hing, Dittman, et al., 2022; Williams & Volberg, 2012). Nevertheless, the rates of problem gambling observed in this study are consistent with those reported in national surveys for this age group (OEDA, 2024). Moreover, several studies have shown that online panels consistently reproduce associations between gambling-related variables, supporting the validity of this methodology for the purposes of the present study (Delfabbro, King, Williams, et al., 2021; Lee et al., 2023; Russell et al., 2022; Wardle & Tipping, 2023).

Another limitation of the study is its cross-sectional design, which prevents establishing causal relationships between participation in the activities assessed and gambling severity or related harm. Likewise, although the study focused on analysing the relationship between recent participation and indicators of severity and harm, activities were assessed without differentiating the specific access channel (online or land-based). Future studies could incorporate this distinction, allowing a more precise examination of the potential role of the gambling context in the emergence of problems or negative consequences. Finally, although the SGHS is a widely used instrument for measuring harm and has strong psychometric support (Browne et al., 2021), its brief 10-item format may not comprehensively cover all harm domains described in the literature (Langham et al., 2016). Future studies could use broader measures of gambling-related harm, such as the extended GHS-20 version (Browne, Rawat, et al., 2025), to assess different domains of impact in greater detail and provide a more comprehensive estimate of harm.

Despite these limitations, the present study contributes to addressing an important gap in the literature by jointly analysing the impact of participation in video game–related betting and financial trading alongside traditional forms of gambling on gambling severity and gambling-related harm among young adults. This approach advances understanding of the role of these emerging forms of digital expenditure in a context where video games and cryptocurrencies already constitute the first and third forms of monetary spending among young people in Spain (OEDA, 2024). In addition, the use of a recent time frame to measure participation, together with adjustment for overall involvement and sociodemographic factors to replicate the analytical approach of previous studies (LaPlante et al., 2014; Wardle & Tipping, 2023, 2026), enabled the identification of differential patterns between traditional and gambling-like activities, with the latter showing associations comparable to those observed for higher-risk traditional gambling products.

From a public health perspective, the evidence that activities not legally recognised as gambling can be associated with gambling severity and related harm underscores the need to incorporate them into assessment and prevention strategies.

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Conflict of interest

All authors declare no conflicts of interest related to the research, authorship, and publication of this article.

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