

Programa de Doctorat en Recerca en Psicologia



**Beyond Entertainment: Gaming and Internet Gaming
Disorder (IGD) in University Students from Spain, Italy, and
Mexico**

*Més enllà de l'entreteniment: Videojocs i Addicció a Videojocs en
estudiants universitaris d'Espanya, Itàlia i Mèxic*

Tesi doctoral amb Menció Internacional

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CERTIFIQUEN

Que la Tesi Doctoral amb Menció Internacional presentada per Júlia Gisbert Pérez, amb el títol *Beyond Entertainment: Gaming and Internet Gaming Disorder (IGD) in University Students from Spain, Italy, and Mexico* ha sigut realitzada baix la seua direcció. Havent-la examinada, certifiquen per la present l'autorització perquè es duguen a terme els tràmits per a la seua defensa.

I per a constància, a tots els efectes oportuns, signen aquest informe favorable a València, el 23 de març de 2026.

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Gisbert-Pérez, J., Martí-Vilar, M., Merino-Soto, C., Chans, G. M., & Badenes-Ribera, L. (2024). Gender differences in internet gaming among university students: a discriminant analysis. *Frontiers in Psychology*, 15, 1412739.

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Gisbert-Pérez, J., Martí-Vilar, M., Chans, G. M., & Badenes-Ribera, L. Gender gaps in gaming: a discriminant analysis of Mexican university students. (*Under review*)

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¹**Gisbert-Pérez, J.,** Cejalvo, E., Martí-Vilar, M., & Badenes-Ribera, L. (2025). Psychosocial Factors Linked to Online Gaming: Differences Between Current Gamers, Non-current Gamers and Non-gamers. *Psychological Reports*, 332941251351231. <https://doi.org/10.1177/00332941251351231>

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Gisbert-Pérez, J., Longobardi, C., Martí-Vilar, M., Mastrokourou, S., & Badenes-Ribera, L. (2025). Exploring Psychosocial Traits Across Italian Current Gamers, Non-Current Gamers, and Non-Gamers. *Journal of Genetic Psychology*, 1–13.
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Gisbert-Pérez, J., Martí-Vilar, M., Chans, G. M., & Badenes-Ribera, L. (2025). Gaming onset and engagement among university students: a question of mismanaged emotions?. *BMC Psychology*, 13(1), 1347. <https://doi.org/10.1186/s40359-025-03657-1>

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Gisbert-Pérez, J., Longobardi, C., Martí-Vilar, M., Fabris, M. A., & Badenes-Ribera, L. (2026). Comparative analysis of internet gaming disorder prevalence and gaming-related and psychosocial correlates in Spain and Italy. *International Journal of Adolescence and Youth*, 31(1).
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Gisbert-Pérez, J., García-Mollá, A., Longobardi, C., Chans, G. M., Martí-Vilar, M., Mastrokourou, S., & Badenes-Ribera, L. High engagement or disorder? A latent class analysis of Internet Gaming Disorder among university students in Spain, Italy, and Mexico. (*Under review*)

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RESUM

Introducció

Els videojocs han evolucionat d'un simple passatemps a una important indústria cultural i de l'entreteniment. Defïnits com una activitat immersiva vinculada a tecnologia audiovisual (Gursesli et al., 2025; Jenkins, 2009), aquest sector va créixer significativament durant la pandèmia, gràcies a avanços com la realitat virtual i augmentada i a millores en l'accessibilitat. Aquests desenvolupaments han ampliat encara més l'ús de videojocs o *gaming*, consolidant-lo com un fenomen global amb importants implicacions socials, econòmiques i psicològiques.

L'impacte socioeconòmic de la indústria del gaming varia considerablement entre països. Mentre que països com Xina i els Estats Units contribueixen a quasi la meitat dels beneficis totals generats a escala mundial, hi ha altres països on la indústria del gaming està en creixement. Entre aquests països es troben Espanya, Itàlia i Mèxic, entre altres. En 2024, Itàlia va generar al voltant de 2.500 milions de dòlars, Mèxic aproximadament 2.300 milions i Espanya prop de 2.800 milions en ingressos per videojocs (Visual Capitalist, 2025). No obstant això, l'expansió de la indústria del gaming en aquests països també ha sigut desigual. Mentre que Espanya i Itàlia han mostrat un creixement més estable, Mèxic s'ha expandit ràpidament en els últims anys, convertint-se en la regió llatinoamericana amb major consum de videojocs en 2024 (Newzoo, 2024). Aquest creixement divers posa de relleu la importància d'examinar els comportaments de gaming en aquests països més enllà dels principals líders mundials.

L'expansió de la indústria del gaming també ha donat lloc a una evolució en l'estereotip tradicional dels gamers. L'estereotip de gamer solia representar xics adolescents aïllats jugant a videojocs. El panorama actual del gaming presenta una àmplia varietat de gèneres, plataformes i tipus de contingut, donant lloc a canvis significatius tant en la distribució per gènere com per edat dins de la comunitat gamer. Respecte al gènere, informes recents suggereixen que aquesta bretxa de gènere s'està reduint. En 2025, les dones representen el 48% dels gamers (Entertainment Software Association [ESA], 2025). Respecte a l'edat, el Global Video Games Report 2025 (ESA, 2025) informa que, a partir d'una enquesta realitzada a més de 24.000 gamers actius de 16 anys o més en 21 països, el grup més nombrós se situa en el rang de 25 a 34 anys (26%). Aquests resultats ressalten un canvi en els patrons de gaming i la necessitat d'examinar possibles diferències per gènere i grup d'edat. En aquesta tesi doctoral, els estudiants universitaris constitueixen la població objectiu, ja que tenen un ampli accés a les tecnologies digitals i es troben en una etapa evolutiva crítica per a l'establiment d'hàbits culturals i patrons de consum de mitjans digitals.

Per a examinar possibles diferències relacionades amb el gaming per gènere entre estudiants universitaris, és necessari diferenciar entre gaming recreatiu i gaming problemàtic, com l'addicció a videojocs o *Internet Gaming Disorder* (IGD). El gaming recreatiu pot entendre's com una activitat d'oci integrada en la vida quotidiana que pot proporcionar diversos beneficis als usuaris. Aquest tipus de gaming s'associa amb experiències positives com el gaudi, la sensació d'assoliment i la connexió social, contribuint a la satisfacció de necessitats psicològiques bàsiques (Castro & Neto, 2025; Sublette & Mullan, 2012). A més, el gaming recreatiu s'ha relacionat amb beneficis cognitius, com una millora de l'atenció, la memòria de treball i la percepció espacial

(Granic et al., 2013). Finalment, els videojocs també poden servir com un espai emocionalment segur, on els gamers poden gestionar el seu estrès diari i aconseguir estats d'immersió.

Les motivacions per a jugar no són universals, sinó que varien segons factors demogràfics i socioculturals com el gènere, l'edat i el context cultural. La investigació identifica tres dimensions motivacionals principals (assoliment, interacció social i immersió) que es distribueixen de manera desigual entre les poblacions (Yee, 2006). Els estudis suggereixen que els homes tendeixen a orientar-se més cap a la competició i l'assoliment, mentre que les dones informen amb més freqüència de motivacions socials i relacionades amb la immersió (Martucci et al., 2023). L'edat també influeix en les motivacions, ja que solen ser més intenses durant la joventut i tendeixen a desplaçar-se amb el temps des de la fantasia i l'exploració cap a l'assoliment en l'edat adulta. A més, el context cultural influencia aquests patrons, ja que la importància de motivacions específiques i les diferències de gènere varien entre països (Ratan et al., 2022).

Encara que hi ha diversos beneficis associats al gaming recreatiu, l'evidència suggereix que poden sorgir patrons problemàtics que podrien afectar negativament el funcionament personal. Algunes persones utilitzen el gaming per afrontar el malestar emocional o les dificultats vitals de forma desadaptativa, fet que pot contribuir al desenvolupament de l'IGD (Brand et al., 2014). Aquest patró es va fer més evident durant la pandèmia de COVID-19, quan l'aïllament social va portar molts estudiants a recórrer al gaming per gestionar el malestar psicològic i la soledat, incrementant potencialment el risc d'IGD (Malak et al., 2023).

L'IGD va ser inclòs en el *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) com una condició que requereix més investigació a causa de les seues similituds amb altres trastorns addictius (American Psychiatric Association [APA], 2013). El DSM-5 defineix l'IGD com un patró persistent i recurrent de joc que causa malestar o deteriorament significatiu. Els criteris diagnòstics de l'IGD inclouen preocupació, abstinència, tolerància, pèrdua de control, reducció de l'interés per altres activitats, ús continuat malgrat les conseqüències negatives, engany sobre el temps de joc, joc per a escapar de l'estat d'ànim negatiu i deteriorament funcional. El diagnòstic requereix acomplir almenys cinc criteris dins d'un període de 12 mesos. El DSM-5-TR manté aquest marc i destaca la necessitat de distingir entre alta implicació i IGD (APA, 2022). A més, la *International Classification of Diseases* (ICD-11) reconeix el trastorn per gaming o *gaming disorder* com una condició clínica caracteritzada per un control deteriorat sobre el joc, la prioritització del gaming davant d'altres activitats i la continuació malgrat les conseqüències negatives (World Health Organization [WHO], 2018).

La investigació també destaca la importància de distingir el gaming problemàtic de l'alta implicació. L'alta implicació implica un gaming freqüent i entusiasta com a part de la vida diària sense un deteriorament funcional significatiu. Els estudis mostren que comportaments sovint associats amb l'addicció, com pensar amb freqüència en el gaming o voler jugar durant més temps, poden reflectir una forta implicació més que una patologia (Charlton & Danforth, 2007). Però, aquest fet comporta un risc de falsos positius d'IGD (Kardefelt-Winther et al., 2017). Aquesta perspectiva situa el gaming en un continu que va des d'un ús recreatiu adaptatiu fins a patrons desadaptatius que produïxen un deteriorament significatiu.

L'IGD s'ha relacionat amb símptomes psicofisiològics, deteriorament funcional i comorbiditats. La investigació mostra associacions consistents entre IGD i malestar psicològic, particularment depressió, ansietat i estrès (Gursesli et al., 2025). A més, l'IGD coexistix amb freqüència amb altres trastorns psicològics, com el trastorn per dèficit d'atenció/hiperactivitat (TDAH), depressió i ansietat, o ansietat social i símptomes obsessivocompulsius (Coutelle et al., 2024; González-Bueso et al., 2018; Liu et al., 2018). També s'han descrit manifestacions físiques com alteracions del son, fatiga visual, problemes posturals i altres problemes de salut relacionats amb el sedentarisme (Zajac et al., 2024). Totes aquestes dificultats poden contribuir a un deteriorament més ampli, inclosos problemes acadèmics o laborals, conflictes familiars i una reducció de les relacions socials en la vida real (Chen et al., 2018).

Els estudis metaanalítics estimen que la prevalença de l'IGD en la població general oscil·la entre el 2,4% i el 6,7%, amb una variabilitat significativa deguda a diferències demogràfiques, culturals i metodològiques (Kim et al., 2022; Stevens et al., 2021). L'IGD sol desenvolupar-se durant l'adolescència, amb estimacions entre l'1% i el 9% i una taxa agrupada del 4,6%, predominantment en homes (Fam et al., 2018; Gentile et al., 2017). No obstant això, estudis recents indiquen una prevalença del 9,9% entre adults joves, superior a l'observada entre adolescents (Gao et al., 2022). També hi ha variabilitat geogràfica, amb una prevalença en població general d'al voltant del 2,6% a Espanya i de l'1,4% a Itàlia, mentre que les mostres universitàries informen de taxes més elevades (p. ex., 5,2% entre estudiants mexicans; Borges et al., 2019; De Pasquale et al., 2018; Fuster et al., 2016). Aquestes variacions poden estar influïdes per distints marcs diagnòstics i instruments d'avaluació (Király et al., 2015; King et al., 2020; Stevens et

al., 2020), fet que ressalta la necessitat d'obtenir estimacions de prevalença més específiques segons el context.

S'han utilitzat diversos marcs teòrics per explicar el desenvolupament de l'IGD, particularment el model *Interaction of Person–Affect–Cognition–Execution* (I-PACE) (Brand et al., 2016, 2019), que proposa que el gaming problemàtic sorgeix de la interacció entre predisposicions individuals i factors situacionals, més enllà d'una única causa. El model destaca quatre components: vulnerabilitats personals (p. ex., edat, gènere, psicopatologia), estats emocionals que desencadenen el joc, expectatives cognitives sobre les recompenses del gaming i processos de control executiu que regulen la conducta. Amb el temps, el gaming pot passar de ser una activitat gratificant a convertir-se en una estratègia d'afrontament, arribant finalment a fer-se habitual o compulsiva quan el control conductual es debilita.

La investigació identifica múltiples factors de risc i de protecció associats a l'IGD. Entre les variables predisponents es troben dificultats psicològiques com depressió o ansietat, impulsivitat, problemes de regulació emocional, baixa autoestima i factors interpersonals com la soledat o el suport social limitat, entre altres (Dang et al., 2019; Kuss et al., 2018; Männikkö et al., 2017; Schneider et al., 2018; Zhuang et al., 2023). Els factors relacionats amb el gaming, com els comportaments tòxics en entorns online, també s'han vinculat amb una major gravetat de l'IGD (Gandolfi et al., 2023).

A més, els contextos socioculturals poden influir en el comportament de gaming i en la importància relativa d'aquests factors. Els marcs culturals suggereixen que les diferències entre societats individualistes i col·lectivistes configuren les relacions socials i les normes conductuals (Hofstede, 2001; Hofstede et al., 2010). Des d'aquesta

perspectiva, Itàlia tendix a ser més individualista, Espanya ocupa una posició intermèdia i Mèxic reflectix orientacions més col·lectivistes, fet que pot influir en com es manifesten els processos relacionats amb l'IGD en cada context sense alterar els mecanismes centrals proposats pel model I-PACE (Brand, 2025).

Malgrat els avanços en l'estudi del gaming i de l'IGD, continuen existint diverses llacunes. Les estimacions de prevalença varien àmpliament a causa de diferents metodologies i característiques poblacionals, remarcant la necessitat de metaanàlisis, especialment entre estudiants universitaris i adults joves. La intel·ligència emocional, rellevant en marcs com el model I-PACE, ha rebut una atenció limitada en la investigació. A més, les diferències transnacionals en el comportament de gaming i l'IGD no es comprenen bé a causa de la falta d'estudis comparables. Els mètodes diagnòstics tradicionals poden no reflectir amb precisió la diversitat de símptomes de l'IGD, donant lloc a falsos positius. Aquestes limitacions manifesten la necessitat d'una investigació integradora que utilitze mètodes metaanalítics, en diferents països i noves perspectives per a millorar la nostra comprensió del comportament de gaming i de l'IGD en poblacions universitàries.

Objectius

Aquesta tesi doctoral té com a objectiu reforçar les bases teòriques i metodològiques de la investigació sobre l'ús de videojocs i l'IGD entre estudiants universitaris d'Espanya, Itàlia i Mèxic. Per aquest motiu, la tesi s'organitza en quatre categories temàtiques, cadascuna amb objectius generals i específics.

Actualització teòrica i metodològica de l'IGD

L'objectiu general 1 va ser sintetitzar i actualitzar, mitjançant metaanàlisi, l'evidència empírica sobre l'IGD en adults joves i població universitària, integrant estimacions de prevalença, correlats psicosocials i propietats psicomètriques dels instruments de mesura.

Els objectius específics van ser:

- 1.1 Estimar la prevalença mitjana de l'IGD en poblacions d'adults joves i universitaris i analitzar l'heterogeneïtat en funció de les característiques dels estudis (p. ex., país/regió, any, criteris diagnòstics i instrument). **Estudi 1.**
- 1.2 Quantificar l'associació mitjana entre IGD i intel·ligència emocional i examinar possibles moderadors metodològics i poblacionals (p. ex., instrument, tipus de mostra, sexe, edat, país/regió). **Estudi 2.**
- 1.3 Avaluar la fiabilitat de l'IGDS mitjançant una metaanàlisi de generalització de la fiabilitat i identificar factors associats a la variació en els coeficients (p. ex., versió/idioma de l'escala, format de resposta i característiques de la mostra). **Estudi 3.**

Caracterització del gaming entre estudiants universitaris d'Espanya, Itàlia i Mèxic

L'objectiu general 2 va ser caracteritzar el fenomen del gaming entre la població universitària dels tres països i descriure els seus perfils de participació, així com les diferències sociodemogràfiques i psicosocials associades. Els objectius específics van ser:

- 2.1 Descriure els perfils de participació en gaming per gènere en la mostra universitària de cada país. **Estudis 4-6.**
- 2.2 Descriure els perfils de participació en gaming (gamers actuals, exgamers i no gamers) en la mostra universitària de cada país. **Estudis 7-9.**
- 2.3 Analitzar, en cada país, les diferències en variables sociodemogràfiques i psicosocials entre els perfils de participació en gaming. **Estudis 4-9.**

Caracterització de l'IGD entre estudiants universitaris d'Espanya, Itàlia i Mèxic

L'objectiu general 3 va ser analitzar la manifestació de la simptomatologia d'IGD entre estudiants universitaris dels tres països, estimar la proporció d'estudiants que compleixen criteris d'IGD i identificar diferències sociodemogràfiques i psicosocials associades a estudiants amb i sense simptomatologia, utilitzant anàlisis independents en cada país. Els objectius específics van ser:

- 3.1 Estimar, en cada país, la proporció d'estudiants universitaris que compleixen els criteris d'IGD. **Estudis 10-11.**
- 3.2 Analitzar, en cada país, les diferències en variables sociodemogràfiques i psicosocials entre estudiants universitaris que compleixen els criteris d'IGD i els que no. **Estudis 10-11.**

3.3 Explorar, en cada país, l'associació entre la simptomatologia d'IGD i variables psicosocials rellevants, controlant covariables pertinents. **Estudis 10-11.**

Nous enfocaments metodològics de l'IGD

L'objectiu general 4 va ser analitzar i proposar un enfocament diagnòstic alternatiu a l'IGD en models unidimensionals basats en la suma de criteris per a captar millor la complexitat del trastorn. Els objectius específics van ser:

4.1 Examinar l'estructura factorial de la IGDS utilitzant enfocaments d'anàlisi emergents. **Estudi 12.**

4.2 Identificar classes latents de simptomatologia d'IGD en els tres països. **Estudi 13.**

Estudis

En aquesta secció es resumeixen els principals resultats dels estudis que componen la present tesi doctoral. Cada estudi correspon a un article independent que ha sigut publicat, acceptat o enviat a una revista científica.

Actualització teòrica i metodològica de l'IGD

Els tres primers estudis d'aquesta tesi doctoral tenen com a objectiu sintetitzar metaanalíticament l'evidència disponible sobre l'estat actual de la investigació sobre l'addicció als videojocs, proporcionant una base teòrica i metodològica per als estudis empírics posteriors.

L'**Estudi 1** va estimar la prevalença de l'IGD en adults joves mitjançant una revisió sistemàtica i una metaanàlisi (Obj. 1.1). La prevalença agrupada va ser del 6,1% (IC 95%: 5,03%, 7,4%). En considerar la composició de la mostra, la prevalença va ser significativament major en mostres compostes només per gamers (8,1%; IC 95%: 5,91%, 11,01%) que en mostres mixtes que incloïen tant gamers com no gamers (5,4%; IC 95%: 4,33%, 6,90%). Entre estudiants universitaris, la prevalença agrupada va ser del 6,04% (IC 95%: 4,78%, 7,61%). Les anàlisis de moderadors van mostrar que la variabilitat entre estudis estava influïda per factors com els instruments d'avaluació, els criteris diagnòstics i les característiques de les mostres, subratllant la rellevància de la consistència metodològica en la investigació epidemiològica.

L'**Estudi 2** va examinar la relació entre IGD i intel·ligència emocional mitjançant una revisió sistemàtica i una metaanàlisi basada en coeficients de correlació (Obj. 1.2). Es van dur a terme metaanàlisis separades segons diferents conceptualitzacions de la

intel·ligència emocional. Els resultats van revelar associacions negatives, significatives i de magnitud xicoteta a moderada entre els símptomes d'IGD i la regulació emocional ($-0,24$; IC 95%: $-0,28$, $-0,18$), la competència socioemocional ($-0,23$; IC 95%: $-0,33$, $-0,12$) i la intel·ligència emocional mesurada com a habilitat ($-0,25$; IC 95%: $-0,38$, $-0,10$). Les anàlisis de moderadors van indicar que la variabilitat en els resultats estava relacionada amb el disseny de l'estudi, el context geogràfic i els instruments utilitzats.

L'**Estudi 3** va avaluar la fiabilitat de l'instrument IGDS utilitzat en aquesta tesi mitjançant una metaanàlisi de generalització de la fiabilitat, emprant com a grandària de l'efecte els coeficients de fiabilitat informats en estudis primaris. Atés que la IGDS inclou quatre versions —les versions original i abreujada amb formats de resposta dicotòmics i ordinals—, es van dur a terme metaanàlisis separades per a cadascuna. Els resultats van mostrar valors de fiabilitat superiors a 0,80 per a les versions ordinals (IGDS9P i IGDS27P) i la versió dicotòmica de 27 ítems (IGDS27D), mentre que la versió dicotòmica de 9 ítems (IGDS9D) va presentar valors de fiabilitat superiors a 0,70.

En conjunt, aquests estudis aporten evidència complementària sobre l'epidemiologia, un factor psicològic associat i les propietats de mesura de l'IGD en adults joves. En conjunt, els resultats contribueixen a una comprensió més sòlida de la prevalença de l'IGD, la seua relació amb les competències emocionals i la fiabilitat dels instruments d'avaluació més utilitzats en poblacions universitàries.

Caracterització del gaming entre estudiants universitaris d'Espanya, Itàlia i Mèxic

Aquesta secció se centra a caracteritzar el fenomen del gaming entre estudiants universitaris dels tres països, considerant el gènere i l'estatus de gaming. Els **Estudis 4-6** van examinar les diferències de gènere en els patrons de gaming en estudiants universitaris (Obj. 2.1). Els **Estudis 7-9** van examinar les diferències en variables sociodemogràfiques i psicosocials entre estudiants universitaris classificats segons la seua relació actual amb el gaming (gamers actuals, no actuals i no gamers; Obj. 2.2). Estes comparacions es van realitzar utilitzant tres mostres independents d'Espanya, Itàlia i Mèxic seguint el mateix disseny metodològic, fet que va permetre analitzar tant patrons comuns com possibles diferències entre països (Obj. 2.3).

Pel que fa als resultats dels **Estudis 4-6**, es van trobar diferències de gènere estadísticament significatives en variables relacionades amb el gaming en els tres països. Els homes semblen començar a jugar a videojocs a una edat més primerenca, dedicar més hores setmanals al gaming i assenyalar que juguen en comunitats de joc amb una major toxicitat percebuda.

En relació amb les motivacions per a jugar, la gratificació violenta va ser major entre els homes en els tres països i també va emergir com un predictor important en les anàlisis discriminants per gènere. També es van observar algunes diferències estadísticament significatives específiques segons el país. En les mostres espanyola i mexicana, van aparèixer diferències de gènere en diverses motivacions (personalització, repte cognitiu, interacció social i competició). Els homes dels dos països van puntuar més alt en repte cognitiu, competició i interacció social, mentre que les dones van puntuar més alt en personalització. En la mostra italiana, es van trobar diferències de gènere

estadísticament significatives en l'edat i en diverses motivacions (afrontament, repte cognitiu i interacció social). Els homes italians eren majors i van puntuar més alt en afrontament, repte cognitiu i interacció social.

Les anàlisis discriminants lineals van mostrar que, en la mostra espanyola, les variables que diferenciaven amb major força el gènere eren un inici més primerenc en el gaming, motius més intensos de gratificació violenta, una major toxicitat percebuda en la comunitat i menor personalització. En la mostra italiana, els principals predictors que distingien el gènere van ser les hores setmanals de joc i la gratificació violenta. En la mostra mexicana, els principals predictors que distingien el gènere van ser una major gratificació violenta, un inici més primerenc en el gaming, una major toxicitat percebuda en la comunitat, un major nombre d'hores setmanals de joc i motivacions d'interacció social.

Pel que fa als resultats dels **Estudis 7-9**, s'han trobat semblances i diferències en variables demogràfiques i psicosocials entre Espanya, Itàlia i Mèxic entre gamers actuals, gamers no actuals i no gamers.

En la mostra espanyola, es van trobar diferències significatives entre els tres grups en sexe, conductes prosocials, apreciació de les emocions dels altres (un component de la intel·ligència emocional) i suport social familiar percebut, així com diferències marginals en suport social percebut global. La regressió logística binomial va indicar que ser home i tindre nivells més baixos de prosocialitat s'associaven amb una major probabilitat d'haver iniciat el gaming.

En la mostra italiana, els tres grups diferien significativament en sexe, edat, conductes prosocials, intel·ligència emocional global i suport social percebut. També van

sorgir diferències en components específics de la intel·ligència emocional: l'apreciació de les pròpies emocions i de les emocions dels altres diferia entre gamers actuals i no actuals, mentre que la consciència emocional i la regulació emocional diferien entre gamers actuals i no gamers. També es van observar diferències en el suport familiar percebut, el suport dels amics i el suport de persones significatives entre gamers actuals i no gamers, i en aquest últim cas també entre gamers no actuals i no gamers. Per això, es van realitzar dues anàlisis de regressió logística binomial per a examinar factors relacionats amb l'inici i el manteniment del gaming. Els resultats van mostrar que el sexe masculí, una major edat i una menor prosocialitat s'associaven amb una major probabilitat d'iniciar el gaming, mentre que el sexe masculí, una major edat i una major apreciació de les emocions dels altres s'associaven amb el manteniment del gaming.

En la mostra mexicana, es van trobar diferències significatives entre els tres grups en sexe, conductes prosocials i intel·ligència emocional global. Les anàlisis *post hoc* van indicar que els gamers actuals puntuaven més baix que tant els gamers no actuals com els no gamers en apreciació de les emocions dels altres, i més baix que els gamers no actuals en consciència emocional i regulació emocional. Les anàlisis de regressió logística van mostrar que el sexe masculí era l'únic factor associat amb una major probabilitat d'iniciar el gaming, mentre que el sexe masculí i una menor consciència emocional s'associaven amb el manteniment del gaming.

En conjunt, els resultats mostren patrons consistents en els tres països. El gaming entre estudiants universitaris sembla estar fortament associat al sexe, sent més probable que els homes comencen abans, juguen més hores i informen de motivacions relacionades amb la gratificació violenta i la participació en contextos de gaming més tòxics. L'inici i el manteniment del gaming també semblen estar vinculats a factors psicosocials com una

menor prosocialitat i components específics de la intel·ligència emocional, encara que estes associacions varien segons el context cultural. En conjunt, la salut mental no va diferenciar entre grups de gaming en cap país.

Caracterització de l'IGD entre estudiants universitaris d'Espanya, Itàlia i Mèxic

Aquesta secció examina la presència de simptomatologia d'IGD entre estudiants universitaris d'Espanya, Itàlia i Mèxic. Els **Estudis 10-11** van estimar la proporció d'estudiants que complien criteris d'IGD i van comparar característiques sociodemogràfiques, de gaming i psicosocials entre estudiants amb i sense símptomes d'IGD (Obj. 3.1). L'ús dels mateixos procediments analítics en les tres mostres nacionals també va permetre identificar possibles diferències entre països (Obj. 3.2).

Utilitzant el punt de tall polític proposat per Lemmens et al. (2015) —respondre almenys cinc dels nou criteris del DSM-5 en els nivells “sovint” o “molt sovint”—, la prevalença estimada d'IGD va ser d'aproximadament el 2,1% entre estudiants universitaris d'Espanya i Mèxic i del 2,4% a Itàlia. Quan es van considerar únicament gamers actius, la prevalença va augmentar fins aproximadament el 4–6%. Si s'aplicava un llindar menys estricte (incloent “una a tres vegades al mes”; Evren et al., 2017), la prevalença augmentava al 3,5% en la mostra espanyola (10,2% entre gamers), 3,9% en la mostra italiana (6,5% entre gamers) i 6.2% en la mostra mexicana (15.7% entre gamers).

En els tres països, l'IGD va mostrar associacions positives estadísticament significatives amb variables relacionades amb el gaming com les hores setmanals de joc, la toxicitat percebuda en la comunitat i jugar amb coneguts (i jugar amb desconeguts a Espanya). En totes les mostres, l'IGD es va relacionar positivament amb la gratificació violenta i les motivacions d'afrontament. No obstant això, alguns patrons motivacionals

van variar segons el país: la competició va ser el correlat més fort a Espanya i Itàlia, mentre que a Mèxic la motivació de diversió va mostrar una associació negativa amb l'IGD. Les anàlisis psicosocials van revelar una correlació negativa estadísticament significativa entre IGD i suport social percebut en els tres països. Es va trobar una correlació positiva estadísticament significativa amb la impulsivitat a Itàlia i Mèxic, mentre que es van trobar associacions negatives estadísticament significatives amb la intel·ligència emocional a Espanya i Mèxic.

La impulsivitat va emergir com un predictor comú del risc d'IGD, encara que la dimensió estadísticament significativa diferia segons el país: falta de premeditació a Espanya, urgència positiva a Itàlia i falta de perseverança a Mèxic. També es van identificar factors addicionals específics del context, com jugar amb desconeguts i una menor intel·ligència emocional a Espanya, un major nombre d'hores de joc a Itàlia i un menor suport social percebut a Mèxic.

En conjunt, els resultats suggereixen que, encara que la impulsivitat pot representar un factor de vulnerabilitat compartit, els correlats conductuals i psicosocials de l'IGD poden variar en funció del context.

Nous enfocaments metodològics de l'IGD

Aquesta secció respon a una necessitat identificada en blocs anteriors: tant els instruments actuals d'IGD com els models diagnòstics poden presentar limitacions estructurals i de classificació clínica. En concret, l'ús de models unidimensionals i d'enfocaments basats exclusivament en la suma de criteris diagnòstics pot limitar la capacitat per a captar la complexitat de l'IGD.

L'**Estudi 12** va examinar les propietats psicomètriques de la versió espanyola de la IGDS, utilitzant un *Exploratory Graph Analysis* per a examinar l'estructura dimensional de l'instrument. Els resultats van suggerir una estructura bidimensional dels criteris d'IGD: símptomes cognitiu-emocionals (preocupació, tolerància, abstinència i fugida) i conseqüències relacionals/problemàtiques (persistència, problemes, engany, desplaçament i conflicte). Esta estructura va ser recolzada per un Anàlisi Factorial Confirmatori, que va indicar millors índexs d'ajust per al model bidimensional que per al model unidimensional. Les dues dimensions van mostrar una fiabilitat sòlida, altes càrregues factorials i una validesa convergent adequada, aportant evidència que els símptomes de l'IGD poden organitzar-se en dimensions distintes però relacionades en poblacions universitàries.

L'**Estudi 13** va examinar classes latents de simptomatologia d'IGD utilitzant respostes a la IGDS en les tres mostres nacionals. Una solució de quatre classes va ser el model més interpretable, incloent gamers normatius (41,22%), gamers casuais (34,13%), gamers problemàtics (12,86%) i gamers altament implicats (11,79%). Mentre que els gamers problemàtics mostraven puntuacions altes en tots els símptomes, els gamers altament implicats presentaven puntuacions elevades principalment en preocupació, tolerància i escapament, però puntuacions baixes en els criteris restants. La pertinença a cada classe es va associar significativament amb diverses variables i motivacions de gaming.

En conjunt, aquests resultats posen de relleu la complexitat de l'IGD i suggereixen que tant els enfocaments dimensionals com els centrats en la persona poden contribuir a una comprensió més matisada dels problemes relacionats amb el gaming en poblacions universitàries.

Discussió

Actualització teòrica i metodològica de l'IGD

La primera secció va tindre com a objectiu sintetitzar l'evidència existent sobre l'estat actual de la investigació sobre l'IGD mitjançant un enfocament meta-analític.

Les estimacions meta-analítiques de prevalença suggereixen que els adults joves i els estudiants universitaris poden presentar una prevalença més alta que la informada per a la població general (Kim et al., 2022; Stevens et al., 2021; Zhou et al., 2024). L'elevada heterogeneïtat observada i l'anàlisi de moderadors van indicar que les estimacions de prevalença varien substancialment segons els instruments d'avaluació, els criteris diagnòstics i la composició de la mostra. Un factor rellevant que influïa en les estimacions de prevalença era la composició de la mostra. Les mostres compostes només per gamers mostraven una prevalença significativament major que les mostres mixtes de gamers i no gamers. Això suggereix que els estudis centrats exclusivament en gamers poden sobreestimar inadvertidament la prevalença de l'IGD.

Pel que fa a la relació entre IGD i intel·ligència emocional, es va observar una associació negativa de magnitud xicoteta a moderada segons els criteris de Cohen (1988). Aquests resultats estan en línia amb revisions prèvies que indiquen que els dèficits en regulació emocional s'associen amb una major vulnerabilitat a les addiccions comportamentals (Marchica et al., 2019; Estupiñá et al., 2024). En el marc del model I-PACE (Brand et al., 2016; 2019), la intel·ligència emocional pot conceptualitzar-se com una variable disposicional de tipus "Person" que influïx en la manera en què els individus processen respostes emocionals i cognitives davant d'estressors. Les persones amb major

intel·ligència emocional poden ser més capaces de regular emocions negatives i utilitzar estratègies d'afrontament adaptatives, reduint així la probabilitat d'utilitzar el gaming com un mecanisme d'escapament desadaptatiu (Dang et al., 2019). Per contra, els dèficits en claredat o regulació emocional poden augmentar la vulnerabilitat a l'IGD en reforçar expectatives disfuncionals relacionades amb el gaming i debilitar els processos de control executiu (Estévez et al., 2019; 2021). Aquests resultats donen suport a la idea que la intel·ligència emocional pot funcionar com un factor protector davant de comportaments de gaming problemàtics.

La metaanàlisi de generalització de la fiabilitat va mostrar que totes les versions de la IGDS presentaven una fiabilitat acceptable per a finalitats d'investigació. Donada tant la seua solidesa psicomètrica com la seua eficiència pràctica, la versió ordinal de 9 ítems de la IGDS va ser seleccionada com a instrument principal d'avaluació en aquesta tesi.

En conjunt, en identificar l'adulesa jove com un període de major vulnerabilitat, destacar la intel·ligència emocional com un possible factor protector i confirmar la fiabilitat d'instruments estandarditzats com la IGDS, aquests estudis reforcen el rigor metodològic i l'avanç teòric de la investigació sobre l'IGD.

Caracterització del gaming entre estudiants universitaris d'Espanya, Itàlia i Mèxic

La primera secció va tindre com a objectiu descriure els patrons de participació en gaming entre estudiants universitaris d'Espanya, Itàlia i Mèxic.

Un resultat consistent entre països va ser el paper del sexe i del gènere en la participació en gaming. Els homes tenien major probabilitat de començar abans a jugar i

de dedicar més hores setmanals als videojocs, un patró coherent amb estudis previs que mostren una major implicació en el gaming entre varons (Kuss & Griffiths, 2012; Stevens et al., 2021). L'inici primerenc del gaming també s'ha relacionat amb una major implicació posterior en el joc (Nakayama et al., 2020), fet que pot contribuir a hàbits de joc més persistents durant l'adulthood emergent.

Les diferències de gènere també van aparèixer en les motivacions per a jugar. Els homes van informar de motivacions més intenses relacionades amb la gratificació violenta, la interacció social i el repte cognitiu, fet que suggereix que el gaming pot funcionar com un àmbit per a la competició, el domini i l'assoliment. Aquestes diferències poden interpretar-se dins de marcs socioculturals com la teoria de la socialització de gènere (Bem, 1993) i la teoria de la identitat social (Tajfel & Turner, 1979), que proposen que els homes poden tindre més probabilitats d'implicar-se en entorns que reforcen identitats competitives i orientades a la dominància.

A més, els gamers homes tenien més probabilitats de participar en comunitats de gaming percebudes com més tòxiques, reflectint la naturalesa competitiva de molts jocs multijugador (Bopp et al., 2022; Kuss et al., 2022). Aquests entorns solen presentar interaccions hostils, especialment cap a les dones. Per contra, les dones poden buscar experiències de gaming més creatives i personalitzables (López-Fernández et al., 2020). La investigació indica que les gamers poden evitar espais competitius o tòxics per a minimitzar l'assetjament (Belskie et al., 2023; McLean & Griffiths, 2019; Kuss et al., 2022), afavorint jocs que permeten l'expressió personal i la implicació narrativa.

Més enllà de les diferències de gènere, els resultats van mostrar diferències entre gamers i no gamers en conducta prosocial i intel·ligència emocional, que s'han identificat

com a factors protectors davant de les addiccions comportamentals (Dang et al., 2019; Esparza-Reig et al., 2021; Marchica et al., 2019). A més, el paper del suport social percebut va variar entre països, indicant possibles diferències culturals en la importància de les relacions socials. No es van trobar diferències en salut mental global entre els grups de gaming, remarcant que el gaming és una activitat recreativa normativa per als estudiants universitaris més que un mecanisme d'afrontament desadaptatiu. Això dona suport a investigacions prèvies que mostren que la majoria de les persones juguen per entreteniment i interacció social sense deteriorament psicològic (Griffiths, 2010; Przybylski & Weinstein, 2019).

En conjunt, aquests resultats suggereixen que el gaming entre estudiants universitaris presenta tant patrons compartits com específics del context en relació amb les diferències de gènere i els grups de participació en gaming entre països. Encara que el sexe masculí va predir de manera consistent la participació i la implicació en el gaming, les associacions d'altres variables psicosocials, com la prosocialitat i la intel·ligència emocional, poden variar segons el context nacional.

Caracterització de l'IGD entre estudiants universitaris d'Espanya, Itàlia i Mèxic

La tercera secció va tindre com a objectiu examinar la prevalença i els correlats de l'IGD entre estudiants universitaris d'Espanya, Itàlia i Mèxic.

En els tres països, la prevalença de l'IGD en les mostres universitàries totals va ser relativament baixa, oscil·lant entre el 2,1% i el 2,4%, estimacions inferiors a les informades en metaanàlisis prèvies (Gao et al., 2022; Gisbert-Pérez et al., 2025). No obstant això, quan les anàlisis es van centrar exclusivament en gamers actius, la prevalença va augmentar aproximadament al 4–6%, ressaltant la importància de distingir

entre estimacions en població general i mostres compostes només per gamers. A més, les estimacions de prevalença augmentaven quan s'aplicaven llindars diagnòstics menys estrictes (Evren et al., 2017), il·lustrant com les decisions metodològiques, particularment l'elecció dels criteris de tall, poden influir significativament en les estimacions epidemiològiques.

Es van trobar associacions similars entre IGD i diverses variables relacionades amb el gaming en els diferents països, incloses les hores setmanals de joc, jugar amb coneguts i la toxicitat percebuda en les comunitats de gaming. Aquests resultats coincideixen amb investigacions prèvies que identifiquen la intensitat de joc com un predictor clau de l'IGD (King et al., 2017; Zhuang et al., 2023). L'IGD també es va associar positivament amb motivacions relacionades amb la gratificació violenta i l'afrontament, pel que algunes persones poden utilitzar el gaming per a regular emocions negatives o escapar d'estressors de la vida real. Investigacions prèvies han identificat de manera consistent les motivacions relacionades amb la fugida com a forts predictors de l'IGD (Bäcklund et al., 2022).

En relació amb les variables psicosocials, nivells més baixos de suport social percebut es van associar amb majors símptomes d'IGD, recolzant que el suport social pot actuar com un factor protector davant d'addiccions comportamentals (Durak et al., 2023; Malak et al., 2023). La intel·ligència emocional només es va associar de manera estadísticament significativa amb l'IGD en les mostres espanyola i mexicana, fet que pot reflectir característiques específiques de les mostres o diferències culturals més àmplies. No obstant això, la relació també pot ser bidireccional, ja que el gaming excessiu pot afectar negativament les relacions offline i reduir el suport percebut (Teng et al., 2020). A més, la impulsivitat va emergir com un factor comú de vulnerabilitat entre països,

encara que les dimensions específiques d'impulsivitat associades amb IGD diferien entre les mostres. Aquest resultat dona suport als models teòrics que conceptualitzen la impulsivitat com un factor de risc transdiagnòstic en les addiccions comportamentals (Király et al., 2017).

En conjunt, aquests resultats suggereixen que, encara que certs factors de risc per a l'IGD semblen consistents entre països (com la intensitat de joc, algunes interaccions multijugador, les motivacions relacionades amb l'afrontament i la competició, i la impulsivitat), altres poden variar en funció dels contextos socioculturals.

Nous enfocaments metodològics de l'IGD

L'última secció va explorar innovacions metodològiques dirigides a millorar la conceptualització i l'avaluació de l'IGD.

Els resultats van indicar que els símptomes de l'IGD poden estar millor representats mitjançant una estructura bidimensional, distingint entre símptomes cognitiu-emocionals i conseqüències relacionals o funcionals. Aquest resultat qüestiona l'assumpció que l'IGD siga un constructe purament unidimensional i s'alinea amb perspectives teòriques que suggereixen que els comportaments addictius impliquen tant símptomes interns com deteriorament funcional (Kelly & Hoeppner, 2014; Wakefield, 2015; Paschke et al., 2021).

L'anàlisi de classes latents va recolzar a més l'heterogeneïtat de l'IGD en identificar quatre perfils distints de gamers: gamers normatius, gamers casuais, gamers altament implicats i gamers problemàtics. És important destacar que la classe altament implicada mostrava puntuacions elevades en símptomes cognitiu-emocionals, però

baixos nivells de deteriorament funcional, suggerint que una alta implicació en el gaming no indica necessàriament un comportament patològic. Aquests resultats són coherents amb investigacions prèvies que emfatitzen la distinció entre alta implicació i IGD (Billieux et al., 2015). Els resultats també indiquen que el gaming problemàtic pot sorgir quan els símptomes cognitiu-emocionals coexisteixen amb deteriorament funcional, i no simplement com una escalada de la intensitat de joc.

En conjunt, aquesta secció posa de relleu la importància d'adoptar enfocaments conceptuals i metodològics més matisats respecte a l'IGD, incorporant tant perspectives dimensionals com centrades en la persona per a captar millor la complexitat dels comportaments relacionats amb el gaming.

Conclusions

Aquesta tesi doctoral va tindre com a objectiu reforçar les bases teòriques i metodològiques de la investigació sobre gaming i IGD entre estudiants universitaris d'Espanya, Itàlia i Mèxic. Considerant les limitacions inherents als estudis realitzats, el gaming és una activitat recreativa comuna entre els estudiants universitaris, particularment entre els homes, que mostren patrons de joc, interessos i motivacions distints en comparació amb les dones. Encara que el gaming pareix ser principalment recreatiu, es van observar diferències entre gamers actuals, gamers no actuals i no gamers en diverses variables psicosocials. No obstant això, no es van trobar diferències estadísticament significatives en salut mental general entre aquests grups. Estos resultats suggerixen que, encara que el gaming en les mostres analitzades representa en general una activitat recreativa sense impacte psicològic negatiu, la relació entre el gaming i certes variables psicosocials pot dependre de factors socioculturals.

Els resultats metaanalítics van indicar estimacions de prevalença de l'IGD superiors a les observades en les mostres empíriques, amb taxes que augmentaven quan les anàlisis se centraven únicament en gamers actius, remarcant la forta influència de factors metodològics com la composició de la mostra i els criteris diagnòstics. La *Internet Gaming Disorder Scale* (IGDS), particularment la versió politèmica de 9 ítems utilitzada en aquesta tesi, va mostrar una fiabilitat adequada per a avaluar l'IGD en contextos d'investigació. A més, la intel·ligència emocional va mostrar una associació negativa de magnitud xicoteta a moderada amb l'IGD, encara que aquesta relació va variar entre països en els estudis empírics, suggerint possibles influències socioculturals.

Finalment, l'IGD pot comprendre's millor mitjançant models conceptuals més matisats. Els resultats van recolzar una estructura bidimensional dels símptomes de l'IGD i van identificar quatre perfils de gamers (normatius, casuals, altament implicats i problemàtics), demostrant que una alta implicació en el gaming no implica necessàriament la presència d'un trastorn.

En conjunt, aquesta tesi doctoral posa de relleu la importància de distingir entre gaming recreatiu, alta implicació i gaming problemàtic entre estudiants universitaris. També subratlla la necessitat de considerar factors individuals, contextuais i socioculturals en estudiar el gaming i l'IGD per a contextualitzar millor els patrons de joc i informar estratègies de prevenció específiques.

RESUMEN

Introducción

Los videojuegos han evolucionado de un simple pasatiempo a una importante industria cultural y del entretenimiento. Definidos como una actividad inmersiva vinculada a tecnología audiovisual (Gursesli et al., 2025; Jenkins, 2009), el sector creció significativamente durante la pandemia, gracias en parte a avances como la realidad virtual y aumentada y al aumento de la accesibilidad. Estos desarrollos han ampliado aún más el uso de videojuegos o *gaming*, consolidándolo como un fenómeno global con importantes implicaciones sociales, económicas y psicológicas.

El impacto socioeconómico de la industria del gaming varía enormemente entre países. Mientras que países como China y Estados Unidos aportan casi la mitad de los beneficios totales generados a nivel mundial, hay otros países donde la industria del gaming está creciendo actualmente. Entre estos países se encuentran España, Italia y México, entre otros. En 2024, Italia generó alrededor de 2.500 millones de dólares, México aproximadamente 2.300 millones y España cerca de 2.800 millones en ingresos por videojuegos (Visual Capitalist, 2025). Sin embargo, la expansión de la industria del gaming en estos países ha sido desigual. Mientras que España e Italia han mostrado un crecimiento más estable, México se ha expandido rápidamente en los últimos años, convirtiéndose en la región latinoamericana con mayor consumo de videojuegos en 2024 (Newzoo, 2024). Este crecimiento diverso resalta la importancia de examinar los comportamientos de gaming en estos países más allá de los principales líderes mundiales.

La expansión de la industria del gaming también ha dado lugar a una evolución en el estereotipo tradicional de los gamers. El estereotipo de gamer solía representar a chicos adolescentes aislados jugando a videojuegos. El panorama actual del gaming presenta una amplia variedad de géneros, plataformas y tipos de contenido, lo que ha dado lugar a cambios significativos tanto en la distribución por género como por edad dentro de la comunidad gamer. Informes recientes sugieren que la brecha de género se está reduciendo. En 2025, las mujeres representan el 48% de los gamers (Entertainment Software Association [ESA], 2025). En cuanto a la edad, el Global Video Games Report 2025 (ESA, 2025) informa de que, a partir de una encuesta realizada a más de 24.000 gamers activos de 16 años o más en 21 países, el grupo más numeroso se sitúa en el rango de 25 a 34 años (26%). Estos hallazgos remarcen un cambio en los patrones de gaming y la necesidad de examinar posibles diferencias por género y grupo de edad. En esta tesis doctoral, los estudiantes universitarios constituyen la población objetivo, ya que tienen un amplio acceso a las tecnologías digitales y se encuentran en una etapa evolutiva crítica para el establecimiento de hábitos culturales y patrones de consumo de medios digitales.

Para examinar posibles diferencias relacionadas con el gaming por género y entre estudiantes universitarios, es necesario diferenciar entre gaming recreativo y gaming problemático, como la adicción a videojuegos o *Internet Gaming Disorder* (IGD). El gaming recreativo puede entenderse como una actividad de ocio integrada en la vida cotidiana que puede proporcionar diversos beneficios a los usuarios. Este tipo de gaming se asocia con experiencias positivas como el disfrute, la sensación de logro y la conexión social, contribuyendo a la satisfacción de necesidades psicológicas básicas (Castro & Neto, 2025; Sublette & Mullan, 2012). Además, el gaming recreativo se ha relacionado con beneficios cognitivos, como una mejora de la atención, la memoria de trabajo y la

percepción espacial (Granic et al., 2013). Por último, los videojuegos también pueden servir como un espacio emocionalmente seguro, donde los gamers pueden gestionar su estrés diario y alcanzar estados de inmersión.

Las motivaciones para jugar no son universales, sino que varían según factores demográficos y socioculturales como el género, la edad y el contexto cultural. La investigación identifica tres dimensiones motivacionales principales (logro, interacción social e inmersión) que se distribuyen de forma desigual entre las poblaciones (Yee, 2006). Los estudios sugieren que los hombres tienden a orientarse más hacia la competición y el logro, mientras que las mujeres informan con mayor frecuencia motivaciones sociales y de inmersión (Martucci et al., 2023). La edad también influye en las motivaciones, que suelen ser más intensas durante la juventud y tienden a desplazarse con el tiempo desde la fantasía y la exploración hacia el logro en la edad adulta. Además, el contexto cultural configura estos patrones, ya que la importancia de las motivaciones específicas y las diferencias de género varían entre países (Ratan et al., 2022).

Aunque existen diversos beneficios asociados al gaming recreativo, la evidencia sugiere que pueden surgir patrones problemáticos que podrían afectar negativamente al funcionamiento personal. Algunas personas utilizan el gaming para afrontar el malestar emocional o las dificultades vitales de forma desadaptativa, lo que puede contribuir al desarrollo del IGD (Brand et al., 2014). Este patrón se hizo más evidente durante la pandemia de COVID-19, cuando el aislamiento social llevó a muchos estudiantes a recurrir al gaming para gestionar el malestar psicológico y la soledad, incrementando potencialmente el riesgo de IGD (Malak et al., 2023).

El IGD fue incluido en el *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) como una condición que requiere más investigación debido a sus similitudes con otros trastornos adictivos (American Psychiatric Association [APA], 2013). El DSM-5 define el IGD como un patrón persistente y recurrente de juego que causa malestar o deterioro significativo. Los criterios diagnósticos del IGD incluyen preocupación, abstinencia, tolerancia, pérdida de control, reducción del interés por otras actividades, uso continuado a pesar de las consecuencias negativas, engaño sobre el tiempo de juego, juego para escapar del estado de ánimo negativo y deterioro funcional. El diagnóstico requiere al menos cinco criterios dentro de un periodo de 12 meses. El DSM-5-TR mantiene este marco y destaca la necesidad de distinguir entre la alta implicación y la IGD (APA, 2022). Además, la *International Classification of Diseases* (ICD-11) reconoce el trastorno por gaming o *gaming disorder* como una condición clínica caracterizada por un control deteriorado sobre el juego, la priorización del gaming frente a otras actividades y la continuación a pesar de las consecuencias negativas (World Health Organization [WHO], 2018).

La investigación también destaca la importancia de distinguir el gaming problemático de la alta implicación. La alta implicación implica un gaming frecuente y entusiasta como parte de la vida diaria sin un deterioro funcional significativo. Los estudios muestran que comportamientos a menudo asociados con la adicción —como pensar con frecuencia en el gaming o querer jugar durante más tiempo— pueden reflejar una fuerte implicación más que una patología (Charlton & Danforth, 2007), lo que conlleva un riesgo de falsos positivos de IGD (Kardefelt-Winther et al., 2017). Esta perspectiva sitúa el gaming en un continuo que va desde un uso recreativo adaptativo hasta patrones desadaptativos que producen un deterioro significativo.

El IGD se ha relacionado con síntomas psicofisiológicos, deterioro funcional y comorbilidad. La investigación muestra asociaciones consistentes entre IGD y malestar psicológico, particularmente depresión, ansiedad y estrés (Gursesli et al., 2025). Además, el IGD coexiste con frecuencia con otros trastornos psicológicos, como el trastorno por déficit de atención/hiperactividad (TDAH), depresión y ansiedad, o ansiedad social y síntomas obsesivo-compulsivos (Coutelle et al., 2024; González-Bueso et al., 2018; Liu et al., 2018). También se han descrito manifestaciones físicas como alteraciones del sueño, fatiga visual, problemas posturales y otros problemas de salud relacionados con el sedentarismo (Zajac et al., 2024). Todas estas dificultades pueden contribuir a un deterioro más amplio, incluidos problemas académicos o laborales, conflictos familiares y una reducción de las relaciones sociales en la vida real (Chen et al., 2018).

Los estudios metaanalíticos estiman que la prevalencia del IGD en la población general oscila entre el 2,4% y el 6,7%, con una variabilidad significativa debida a diferencias demográficas, culturales y metodológicas (Kim et al., 2022; Stevens et al., 2021). El IGD suele desarrollarse durante la adolescencia, con estimaciones entre el 1% y el 9% y una tasa agrupada del 4,6%, predominantemente en varones (Fam et al., 2018; Gentile et al., 2017). Sin embargo, estudios recientes indican una prevalencia del 9,9% entre adultos jóvenes, superior a la observada entre adolescentes (Gao et al., 2022). También existe variabilidad geográfica, con una prevalencia en población general de alrededor del 2,6% en España y del 1,4% en Italia, mientras que las muestras universitarias informan de tasas más elevadas (p. ej., 5,2% entre estudiantes mexicanos; Borges et al., 2019; De Pasquale et al., 2018; Fuster et al., 2016). Estas variaciones pueden estar influidas por distintos marcos diagnósticos e instrumentos de evaluación (Király et

al., 2015; King et al., 2020; Stevens et al., 2020), lo que subraya la necesidad de obtener estimaciones de prevalencia más específicas según el contexto.

Se han utilizado diversos marcos teóricos para explicar el desarrollo del IGD, particularmente el modelo *Interaction of Person–Affect–Cognition–Execution* (I-PACE) (Brand et al., 2016, 2019), que propone que el gaming problemático surge de la interacción entre predisposiciones individuales y factores situacionales, más que de una única causa. El modelo destaca cuatro componentes: vulnerabilidades personales (p. ej., edad, género, psicopatología), estados emocionales que desencadenan el juego, expectativas cognitivas sobre las recompensas del gaming y procesos de control ejecutivo que regulan la conducta. Con el tiempo, el gaming puede pasar de ser una actividad gratificante a convertirse en una estrategia de afrontamiento, llegando finalmente a hacerse habitual o compulsiva cuando el control conductual se debilita.

La investigación identifica múltiples factores de riesgo y de protección asociados al IGD. Entre las variables predisponentes se encuentran dificultades psicológicas como depresión o ansiedad, impulsividad, problemas de regulación emocional, baja autoestima y factores interpersonales como la soledad o el apoyo social limitado, entre otros (Dang et al., 2019; Kuss et al., 2018; Männikkö et al., 2017; Schneider et al., 2018; Zhuang et al., 2023). Los factores relacionados con el gaming, como los comportamientos tóxicos en entornos online, también se han vinculado con una mayor gravedad del IGD (Gandolfi et al., 2023).

Además, los contextos socioculturales pueden influir en el comportamiento de gaming y en la importancia relativa de estos factores. Los marcos culturales sugieren que las diferencias entre sociedades individualistas y colectivistas influyen en las relaciones

sociales y las normas conductuales (Hofstede, 2001; Hofstede et al., 2010). Desde esta perspectiva, Italia tiende a ser más individualista, España ocupa una posición intermedia y México refleja orientaciones más colectivistas, lo que puede influir en cómo se manifiestan los procesos relacionados con el IGD en cada contexto sin alterar los mecanismos centrales propuestos por el modelo I-PACE (Brand, 2025).

A pesar de los avances en el estudio del gaming y del IGD, siguen existiendo varias lagunas. Las estimaciones de prevalencia varían ampliamente debido a diferentes metodologías y características poblacionales, lo que pone de relieve la necesidad de metaanálisis, especialmente entre estudiantes universitarios y adultos jóvenes. La inteligencia emocional, relevante en marcos como el modelo I-PACE, ha recibido una atención limitada en la investigación. Además, las diferencias transnacionales en el comportamiento de gaming y el IGD no se comprenden bien debido a la falta de estudios comparables. Los métodos diagnósticos tradicionales pueden no reflejar con precisión la diversidad de síntomas del IGD, lo que podría dar lugar a falsos positivos. Estas limitaciones evidencian la necesidad de una investigación integradora que emplee métodos metaanalíticos, en diferentes países y nuevas perspectivas para mejorar nuestra comprensión del comportamiento de gaming y del IGD en poblaciones universitarias.

Objetivos

Esta tesis doctoral tiene como objetivo fortalecer las bases teóricas y metodológicas de la investigación sobre el uso de videojuegos y el IGD entre estudiantes universitarios de España, Italia y México. Para ello, la tesis se organiza en cuatro categorías temáticas, cada una con objetivos generales y específicos.

Actualización teórica y metodológica del IGD

El objetivo general 1 fue sintetizar y actualizar, mediante metaanálisis, la evidencia empírica sobre el IGD en adultos jóvenes y población universitaria, integrando estimaciones de prevalencia, correlatos psicosociales y propiedades psicométricas de los instrumentos de medida. Los objetivos específicos fueron:

- 1.1 Estimar la prevalencia media del IGD en poblaciones de adultos jóvenes y universitarios y analizar la heterogeneidad en función de las características de los estudios (p. ej., país/región, año, criterios diagnósticos e instrumento). **Estudio 1.**
- 1.2 Cuantificar la asociación media entre IGD e inteligencia emocional y examinar posibles moderadores metodológicos y poblacionales (p. ej., instrumento, tipo de muestra, sexo, edad, país/región). **Estudio 2.**
- 1.3 Evaluar la fiabilidad de IGDS mediante un metaanálisis de generalización de la fiabilidad e identificar factores asociados a la variación en los coeficientes (p. ej., versión/idioma de la escala, formato de respuesta y características de la muestra). **Estudio 3.**

Caracterización del gaming entre estudiantes universitarios de España, Italia y México

El objetivo general 2 fue caracterizar el fenómeno del gaming entre la población universitaria de los tres países y describir sus perfiles de participación, así como las diferencias sociodemográficas y psicosociales asociadas. Los objetivos específicos fueron:

- 2.1 Describir los perfiles de participación en gaming por género en la muestra universitaria de cada país. **Estudios 4-6.**
- 2.2 Describir los perfiles de participación en gaming (gamers actuales, exgamers y no gamers) en la muestra universitaria de cada país. **Estudios 7-9.**
- 2.3 Analizar, en cada país, las diferencias en variables sociodemográficas y psicosociales entre los perfiles de participación en gaming. **Estudios 4-9.**

Caracterización del IGD entre estudiantes universitarios de España, Italia y México

El objetivo general 3 fue analizar la manifestación de la sintomatología de IGD entre estudiantes universitarios de los tres países, estimar la proporción de estudiantes que cumplen criterios de IGD e identificar diferencias sociodemográficas y psicosociales asociadas a estudiantes con y sin sintomatología, utilizando análisis independientes en cada país. Los objetivos específicos fueron:

- 3.1 Estimar, en cada país, la proporción de estudiantes universitarios que cumplen los criterios de IGD. **Estudios 10-11.**

3.2 Analizar, en cada país, las diferencias en variables sociodemográficas y psicosociales entre estudiantes universitarios que cumplen los criterios de IGD y los que no. **Estudios 10-11.**

3.3 Explorar, en cada país, la asociación entre la sintomatología de IGD y variables psicosociales relevantes, controlando covariables pertinentes. **Estudios 10-11.**

Nuevos enfoques metodológicos del IGD

El objetivo general 4 fue analizar y proponer un enfoque diagnóstico alternativo al IGD en modelos unidimensionales basados en la suma de criterios para captar mejor la complejidad del trastorno. Los objetivos específicos fueron:

4.1 Examinar la estructura factorial de la IGDS utilizando enfoques de análisis emergentes. **Estudio 12.**

4.2 Identificar clases latentes de sintomatología de IGD en los tres países. **Estudio 13.**

Estudios

En esta sección se resumen los principales resultados de los estudios que componen la presente tesis doctoral. Cada estudio corresponde a un artículo independiente que ha sido publicado, aceptado o enviado a una revista científica.

Actualización teórica y metodológica del IGD

Los tres primeros estudios de esta tesis doctoral tienen como objetivo sintetizar metaanalíticamente la evidencia disponible sobre el estado actual de la investigación sobre la adicción a los videojuegos, proporcionando una base teórica y metodológica para los estudios empíricos posteriores.

El **Estudio 1** estimó la prevalencia del IGD en adultos jóvenes mediante una revisión sistemática y un metaanálisis (Obj. 1.1). La prevalencia agrupada fue del 6,1% (IC 95%: 5,03%, 7,4%). Al considerar la composición de la muestra, la prevalencia fue significativamente mayor en muestras compuestas solo por gamers (8,1%; IC 95%: 5,91%, 11,01%) que en muestras mixtas que incluían tanto gamers como no gamers (5,4%; IC 95%: 4,33%, 6,90%). Entre estudiantes universitarios, la prevalencia agrupada fue del 6,04% (IC 95%: 4,78%, 7,61%). Los análisis de moderadores mostraron que la variabilidad entre estudios estaba influida por factores como los instrumentos de evaluación, los criterios diagnósticos y las características de las muestras, subrayando la relevancia de la consistencia metodológica en la investigación epidemiológica.

El **Estudio 2** examinó la relación entre IGD e inteligencia emocional mediante una revisión sistemática y un metaanálisis basado en coeficientes de correlación (Obj. 1.2). Se llevaron a cabo metaanálisis separados según diferentes conceptualizaciones de

la inteligencia emocional. Los resultados revelaron asociaciones negativas, significativas y de magnitud pequeña a moderada entre los síntomas de IGD y la regulación emocional ($-0,24$; IC 95%: $-0,28$, $-0,18$), la competencia socioemocional ($-0,23$; IC 95%: $-0,33$, $-0,12$) y la inteligencia emocional medida como habilidad ($-0,25$; IC 95%: $-0,38$, $-0,10$). Los análisis de moderadores indicaron que la variabilidad en los resultados estaba relacionada con el diseño del estudio, el contexto geográfico y los instrumentos utilizados.

El **Estudio 3** evaluó la fiabilidad del instrumento IGDS utilizado en esta tesis mediante un metaanálisis de generalización de la fiabilidad, empleando como tamaño del efecto los coeficientes de fiabilidad informados en estudios primarios. Dado que la IGDS incluye cuatro versiones (las versiones original y abreviada con formatos de respuesta dicotómicos y ordinales), se llevaron a cabo metaanálisis separados para cada una de ellas. Los hallazgos mostraron valores de fiabilidad superiores a $0,80$ para las versiones ordinales (IGDS9P e IGDS27P) y la versión dicotómica de 27 ítems (IGDS27D), mientras que la versión dicotómica de 9 ítems (IGDS9D) presentó valores de fiabilidad superiores a $0,70$.

En conjunto, estos estudios aportan evidencia complementaria sobre la epidemiología, un factor psicológico asociado y las propiedades de medida del IGD en adultos jóvenes. En su conjunto, los hallazgos contribuyen a una comprensión más sólida de la prevalencia del IGD, su relación con las competencias emocionales y la fiabilidad de los instrumentos de evaluación más utilizados en poblaciones universitarias.

Caracterización del gaming entre estudiantes universitarios de España, Italia y México

Esta sección se centra en caracterizar el fenómeno del gaming entre estudiantes universitarios de los tres países, considerando el género y el estatus de gaming. Los **Estudios 4-6** examinaron las diferencias de género en los patrones de gaming en estudiantes universitarios (Obj. 2.1). Los **Estudios 7-9** examinaron las diferencias en variables sociodemográficas y psicosociales entre estudiantes universitarios clasificados según su relación actual con el gaming (gamers actuales, no actuales y no gamers; Obj. 2.2). Estas comparaciones se realizaron utilizando tres muestras independientes de España, Italia y México siguiendo el mismo diseño metodológico, lo que permitió analizar tanto patrones comunes como posibles diferencias entre países (Obj. 2.3).

En cuanto a los resultados de los **Estudios 4-6**, se encontraron diferencias de género estadísticamente significativas en variables relacionadas con el gaming en los tres países. Los hombres parecen comenzar a jugar a videojuegos a una edad más temprana, dedicar más horas semanales al gaming y señalar que juegan en comunidades de juego con una mayor toxicidad percibida.

En relación con las motivaciones para jugar, la gratificación violenta fue mayor entre los hombres en los tres países y también emergió como un predictor importante en los análisis discriminantes por género. También se observaron algunas diferencias estadísticamente significativas específicas según el país. En las muestras española y mexicana, aparecieron diferencias de género en varias motivaciones (personalización, reto cognitivo, interacción social y competición). Los hombres de ambos países puntuaron más alto en reto cognitivo, competición e interacción social, mientras que las

mujeres puntuaron más alto en personalización. En la muestra italiana, se encontraron diferencias de género estadísticamente significativas en la edad y en varias motivaciones (afrentamiento, reto cognitivo e interacción social). Los hombres italianos eran mayores y puntuaron más alto en afrontamiento, reto cognitivo e interacción social.

Los análisis discriminantes lineales mostraron que, en la muestra española, las variables que diferenciaban con mayor fuerza el género eran un inicio más temprano en el gaming, motivos más intensos de gratificación violenta, una mayor toxicidad percibida en la comunidad y menor personalización. En la muestra italiana, los principales predictores que distinguían el género fueron las horas semanales de juego y la gratificación violenta. En la muestra mexicana, los principales predictores que distinguían el género fueron una mayor gratificación violenta, un inicio más temprano en el gaming, una mayor toxicidad percibida en la comunidad, un mayor número de horas semanales de juego y motivaciones de interacción social.

En cuanto a los resultados de los **Estudios 7-9**, se han encontrado similitudes y diferencias en variables demográficas y psicosociales entre España, Italia y México entre gamers actuales, gamers no actuales y no gamers.

En la muestra española, se encontraron diferencias significativas entre los tres grupos en sexo, conductas prosociales, apreciación de las emociones de los demás (un componente de la inteligencia emocional) y apoyo social familiar percibido, así como diferencias marginales en apoyo social percibido global. La regresión logística binomial indicó que ser hombre y tener niveles más bajos de prosocialidad se asociaban con una mayor probabilidad de haber iniciado el gaming.

En la muestra italiana, los tres grupos diferían significativamente en sexo, edad, conductas prosociales, inteligencia emocional global y apoyo social percibido. También surgieron diferencias en componentes específicos de la inteligencia emocional: la apreciación de las propias emociones y de las emociones de los demás difería entre gamers actuales y no actuales, mientras que la conciencia emocional y la regulación emocional diferían entre gamers actuales y no gamers. También se observaron diferencias en el apoyo familiar percibido, el apoyo de los amigos y el apoyo de personas significativas entre gamers actuales y no gamers, y en este último caso también entre gamers no actuales y no gamers. Por ello, se realizaron dos análisis de regresión logística binomial para examinar factores relacionados con el inicio y el mantenimiento del gaming. Los resultados mostraron que el sexo masculino, una mayor edad y una menor prosocialidad se asociaban con una mayor probabilidad de iniciar el gaming, mientras que el sexo masculino, una mayor edad y una mayor apreciación de las emociones de los demás se asociaban con el mantenimiento del gaming.

En la muestra mexicana, se encontraron diferencias significativas entre los tres grupos en sexo, conductas prosociales e inteligencia emocional global. Los análisis post hoc indicaron que los gamers actuales puntuaban más bajo que tanto los gamers no actuales como los no gamers en apreciación de las emociones de los demás, y más bajo que los gamers no actuales en conciencia emocional y regulación emocional. Los análisis de regresión logística mostraron que el sexo masculino era el único factor asociado con una mayor probabilidad de iniciar el gaming, mientras que el sexo masculino y una menor conciencia emocional se asociaban con el mantenimiento del gaming.

En conjunto, los resultados muestran patrones consistentes en los tres países. El gaming entre estudiantes universitarios parece estar fuertemente asociado al sexo, siendo

más probable que los hombres comiencen antes, jueguen más horas e informen de motivaciones relacionadas con la gratificación violenta y la participación en contextos de gaming más tóxicos. El inicio y el mantenimiento del gaming también parecen estar vinculados a factores psicosociales como una menor prosocialidad y componentes específicos de la inteligencia emocional, aunque estas asociaciones varían según el contexto cultural. En conjunto, la salud mental no diferenció entre grupos de gaming en ningún país.

Caracterización del IGD entre estudiantes universitarios de España, Italia y México

Esta sección examina la presencia de sintomatología de IGD entre estudiantes universitarios de España, Italia y México. Los **Estudios 10-11** estimaron la proporción de estudiantes que cumplían criterios de IGD y compararon características sociodemográficas, de gaming y psicosociales entre estudiantes con y sin síntomas de IGD (Obj. 3.1). El uso de los mismos procedimientos analíticos en las tres muestras nacionales también permitió identificar posibles diferencias entre países (Obj. 3.2).

Utilizando el punto de corte politético propuesto por Lemmens et al. (2015) —respondiendo al menos cinco de los nueve criterios del DSM-5 en los niveles “a menudo” o “muy a menudo”—, la prevalencia estimada de IGD fue de aproximadamente el 2,1% entre estudiantes universitarios de España y México y del 2,4% en Italia. Cuando se consideraron únicamente gamers activos, la prevalencia aumentó hasta aproximadamente el 4–6%. Si se aplicaba un umbral menos estricto (incluyendo “una a tres veces al mes”; Evren et al., 2017), la prevalencia aumentaba al 3,5% en la muestra española (10,2% entre gamers), 3,9% en la muestra italiana (6,5% entre gamers) y 6,2% en la muestra mexicana (15.7% entre gamers).

En los tres países, el IGD mostró asociaciones positivas estadísticamente significativas con variables relacionadas con el gaming como las horas semanales de juego, la toxicidad percibida en la comunidad y jugar con conocidos (y jugar con desconocidos en España). En todas las muestras, el IGD se relacionó positivamente con la gratificación violenta y las motivaciones de afrontamiento. Sin embargo, algunos patrones motivacionales también variaron según el país: la competición fue el correlato más fuerte en España e Italia, mientras que en México la motivación de diversión mostró una asociación negativa con el IGD. Los análisis psicosociales revelaron una correlación negativa estadísticamente significativa entre IGD y apoyo social percibido en los tres países. Se encontró una correlación positiva estadísticamente significativa con la impulsividad en Italia y México, mientras que se hallaron asociaciones negativas estadísticamente significativas con la inteligencia emocional en España y México.

La impulsividad emergió como un predictor común del riesgo de IGD, aunque la dimensión estadísticamente significativa difería según el país: falta de premeditación en España, urgencia positiva en Italia y falta de perseverancia en México. También se identificaron factores adicionales específicos del contexto, como jugar con desconocidos y una menor inteligencia emocional en España, un mayor número de horas de juego en Italia y un menor apoyo social percibido en México.

En conjunto, los hallazgos sugieren que, aunque la impulsividad puede representar un factor de vulnerabilidad compartido, los correlatos conductuales y psicosociales del IGD varían en función del contexto.

Nuevos enfoques metodológicos del IGD

Esta sección responde a una necesidad identificada en bloques anteriores: tanto los instrumentos actuales de IGD como los modelos diagnósticos pueden presentar limitaciones estructurales y de clasificación clínica. En concreto, el uso de modelos unidimensionales y de enfoques basados exclusivamente en la suma de criterios diagnósticos puede limitar la capacidad para captar la complejidad del IGD.

El **Estudio 12** evaluó las propiedades psicométricas de la versión española de la IGDS mediante un *Exploratory Graph Analysis* para analizar la estructura dimensional del instrumento. Los resultados sugirieron una estructura bidimensional de los síntomas de IGD: síntomas cognitivo-emocionales (preocupación, tolerancia, abstinencia y escape) y consecuencias relacionales/problemáticas (persistencia, problemas, engaño, desplazamiento y conflicto). Esta estructura fue respaldada por un Análisis Factorial Confirmatorio, que mostró mejores índices de ajuste para el modelo bidimensional que para el unidimensional. Ambas dimensiones mostraron una fiabilidad sólida, altas cargas factoriales y una validez convergente adecuada, aportando evidencia de que los síntomas del IGD pueden organizarse en dimensiones distintas pero relacionadas en poblaciones universitarias.

El **Estudio 13** examinó clases latentes de sintomatología de IGD utilizando respuestas a la IGDS en las tres muestras nacionales. Una solución de cuatro clases fue el modelo más interpretable, incluyendo gamers normativos (41,22%), gamers casuales (34,13%), gamers problemáticos (12,86%) y gamers altamente implicados (11,79%). Mientras que los gamers problemáticos mostraban puntuaciones altas en todos los síntomas, los gamers altamente implicados presentaban puntuaciones elevadas

principalmente en preocupación, tolerancia y escape, pero puntuaciones bajas en los criterios restantes. La pertenencia a cada clase se asoció significativamente con varias variables y motivaciones de gaming.

En conjunto, estos hallazgos destacan la complejidad del IGD y sugieren que tanto los enfoques dimensionales como los centrados en la persona pueden contribuir a una comprensión más matizada de los problemas relacionados con el gaming en poblaciones universitarias.

Discusión

Actualización teórica y metodológica del IGD

La primera sección tuvo como objetivo sintetizar la evidencia disponible sobre el estado actual de la investigación sobre el IGD mediante un enfoque metaanalítico.

Las estimaciones metaanalíticas de prevalencia sugieren que los adultos jóvenes y los estudiantes universitarios pueden presentar una prevalencia más alta que la informada para la población general (Kim et al., 2022; Stevens et al., 2021; Zhou et al., 2024). La elevada heterogeneidad observada y el análisis de moderadores indicaron que las estimaciones de prevalencia varían sustancialmente según los instrumentos de evaluación, los criterios diagnósticos y la composición de la muestra. Un factor relevante que influía en las estimaciones de prevalencia era la composición de la muestra. Las muestras compuestas solo por gamers mostraron una prevalencia significativamente mayor que las muestras mixtas de gamers y no gamers. Esto sugiere que los estudios centrados exclusivamente en gamers pueden sobrestimar inadvertidamente la prevalencia del IGD.

En cuanto a la relación entre IGD e inteligencia emocional, se observó una asociación negativa de magnitud pequeña a moderada según los criterios de Cohen (1988). Estos hallazgos están en línea con revisiones previas que indican que los déficits en regulación emocional se asocian con una mayor vulnerabilidad a las adicciones comportamentales (Marchica et al., 2019; Estupiñá et al., 2024). En el marco del modelo I-PACE (Brand et al., 2016; 2019), la inteligencia emocional puede conceptualizarse como una variable disposicional de tipo “Person” que influye en la forma en que los individuos procesan respuestas emocionales y cognitivas ante estresores. Las personas

con mayor inteligencia emocional pueden ser más capaces de regular emociones negativas y emplear estrategias de afrontamiento adaptativas, reduciendo así la probabilidad de utilizar el gaming como un mecanismo de escape desadaptativo (Dang et al., 2019). Por el contrario, los déficits en claridad o regulación emocional pueden aumentar la vulnerabilidad al IGD al reforzar expectativas disfuncionales relacionadas con el gaming y debilitar los procesos de control ejecutivo (Estévez et al., 2019; 2021). Estos hallazgos respaldan la idea de que la inteligencia emocional puede funcionar como un factor protector frente a comportamientos de gaming problemáticos.

El metaanálisis de generalización de la fiabilidad mostró que todas las versiones de la IGDS presentaban una fiabilidad aceptable para fines de investigación. Dada tanto su solidez psicométrica como su eficiencia práctica, la versión ordinal de 9 ítems de la IGDS fue seleccionada como instrumento principal de evaluación en esta tesis.

En conjunto, al identificar la adultez joven como un periodo de mayor vulnerabilidad, destacar la inteligencia emocional como un posible factor protector y confirmar la fiabilidad de instrumentos estandarizados como la IGDS, estos estudios refuerzan el rigor metodológico y el avance teórico de la investigación sobre el IGD.

Caracterización del gaming entre estudiantes universitarios de España, Italia y México

La primera sección tuvo como objetivo describir los patrones de participación en gaming entre estudiantes universitarios de España, Italia y México.

Un hallazgo consistente entre países fue el papel del sexo y el género en la participación en gaming. Los hombres tenían mayor probabilidad de comenzar antes a

jugar y de dedicar más horas semanales a los videojuegos, un patrón coherente con estudios previos que muestran una mayor implicación en el gaming entre varones (Kuss & Griffiths, 2012; Stevens et al., 2021). El inicio temprano del gaming también se ha relacionado con una mayor implicación posterior en el juego (Nakayama et al., 2020), lo que puede contribuir a hábitos de juego más persistentes durante la adultez emergente.

Las diferencias de género también aparecieron en las motivaciones para jugar. Los hombres informaron de motivaciones más intensas relacionadas con la gratificación violenta, la interacción social y el reto cognitivo, lo que sugiere que el gaming puede funcionar como un ámbito para la competición, el dominio y el logro. Estas diferencias pueden interpretarse dentro de marcos socioculturales como la teoría de la socialización de género (Bem, 1993) y la teoría de la identidad social (Tajfel & Turner, 1979), que proponen que los hombres pueden tener más probabilidades de implicarse en entornos que refuerzan identidades competitivas y orientadas a la dominancia.

Además, los gamers varones tenían más probabilidades de participar en comunidades de gaming percibidas como más tóxicas, reflejando la naturaleza competitiva de muchos juegos multijugador (Bopp et al., 2022; Kuss et al., 2022). Estos entornos suelen presentar interacciones hostiles, especialmente hacia las mujeres. Por el contrario, las mujeres pueden buscar experiencias de gaming más creativas y personalizables (López-Fernández et al., 2020). La investigación indica que las gamers pueden evitar espacios competitivos o tóxicos para minimizar el acoso (Belskie et al., 2023; McLean & Griffiths, 2019; Kuss et al., 2022), favoreciendo juegos que permitan la expresión personal y la implicación narrativa.

Más allá de las diferencias de género, los resultados mostraron diferencias entre gamers y no gamers en conducta prosocial e inteligencia emocional, que se han identificado como factores protectores frente a las adicciones comportamentales (Dang et al., 2019; Esparza-Reig et al., 2021; Marchica et al., 2019). Además, el papel del apoyo social percibido varió entre países, lo que indica posibles diferencias culturales en la importancia de las relaciones sociales. No se encontraron diferencias en salud mental global entre los grupos de gaming, lo que indica que el gaming es una actividad recreativa normativa para los estudiantes universitarios más que un mecanismo de afrontamiento desadaptativo. Esto respalda investigaciones previas que muestran que la mayoría de las personas juegan por entretenimiento e interacción social sin deterioro psicológico (Griffiths, 2010; Przybylski & Weinstein, 2019).

En conjunto, estos resultados sugieren que el gaming entre estudiantes universitarios presenta tanto patrones compartidos como específicos del contexto en relación con las diferencias de género y los grupos de participación en gaming entre países. Aunque el sexo masculino predijo de forma consistente la participación y la implicación en el gaming, las asociaciones de otras variables psicosociales, como la prosocialidad y la inteligencia emocional, pueden variar según el contexto nacional.

Caracterización del IGD entre estudiantes universitarios de España, Italia y México

La tercera sección tuvo como objetivo examinar la prevalencia y los correlatos del IGD entre estudiantes universitarios de España, Italia y México.

En los tres países, la prevalencia del IGD en las muestras universitarias totales fue relativamente baja, oscilando entre el 2,1% y el 2,4%, lo que es inferior a las estimaciones de prevalencia informadas en metaanálisis previos (Gao et al., 2022; Gisbert-Pérez et al.,

2025). Sin embargo, cuando los análisis se centraron exclusivamente en gamers activos, la prevalencia aumentó aproximadamente al 4–6%, lo que pone de relieve la importancia de distinguir entre estimaciones en población general y muestras compuestas solo por gamers. Además, las estimaciones de prevalencia aumentaban cuando se aplicaban umbrales diagnósticos menos estrictos (Evren et al., 2017), ilustrando cómo las decisiones metodológicas —particularmente la elección de los criterios de corte— pueden influir significativamente en las estimaciones epidemiológicas.

Se encontraron asociaciones similares entre IGD y varias variables relacionadas con el gaming en los distintos países, incluidas las horas semanales de juego, jugar con conocidos y la toxicidad percibida en las comunidades de gaming. Estos hallazgos coinciden con investigaciones previas que identifican la intensidad de juego como un predictor clave del IGD (King et al., 2017; Zhuang et al., 2023). El IGD también se asoció positivamente con motivaciones relacionadas con la gratificación violenta y el afrontamiento, lo que sugiere que algunas personas pueden utilizar el gaming para regular emociones negativas o escapar de estresores de la vida real. Investigaciones previas han identificado de forma consistente las motivaciones relacionadas con el escape como fuertes predictores de IGD (Bäcklund et al., 2022).

En relación con las variables psicosociales, niveles más bajos de apoyo social percibido se asociaron con una mayor gravedad de los síntomas de IGD, lo que respalda que el apoyo social puede actuar como un factor protector frente a las adicciones comportamentales (Durak et al., 2023; Malak et al., 2023). La inteligencia emocional solo se asoció de forma estadísticamente significativa con el IGD en las muestras española y mexicana, lo que puede reflejar características específicas de las muestras o diferencias culturales más amplias. No obstante, la relación también puede ser bidireccional, ya que

el gaming excesivo puede afectar negativamente a las relaciones offline y reducir el apoyo percibido (Teng et al., 2020). Además, la impulsividad emergió como un factor común de vulnerabilidad entre países, aunque las dimensiones específicas de impulsividad asociadas con IGD diferían entre las muestras. Este hallazgo respalda los modelos teóricos que conceptualizan la impulsividad como un factor de riesgo transdiagnóstico en las adicciones comportamentales (Király et al., 2017).

En conjunto, estos resultados sugieren que, aunque ciertos factores de riesgo para el IGD son consistentes entre países, como la intensidad de juego, algunas interacciones multijugador, las motivaciones relacionadas con el afrontamiento y la competición, y la impulsividad, otros pueden variar en función de los contextos socioculturales.

Nuevos enfoques metodológicos del IGD

La última sección exploró innovaciones metodológicas dirigidas a mejorar la conceptualización y la evaluación del IGD.

Los resultados indicaron que los síntomas del IGD pueden estar mejor representados mediante una estructura bidimensional, distinguiendo entre síntomas cognitivo-emocionales y consecuencias relacionales o funcionales. Este hallazgo cuestiona la asunción de que el IGD sea un constructo puramente unidimensional y se alinea con perspectivas teóricas que sugieren que los comportamientos adictivos implican tanto síntomas internos como deterioro funcional (Kelly & Hoeppe, 2014; Wakefield, 2015; Paschke et al., 2021).

El análisis de clases latentes respaldó además la heterogeneidad del IGD al identificar cuatro perfiles distintos de gamers: gamers normativos, gamers casuales,

gamers altamente implicados y gamers problemáticos. Es importante destacar que la clase altamente implicada mostraba puntuaciones elevadas en síntomas cognitivo-emocionales, pero bajos niveles de deterioro funcional, lo que sugiere que una alta implicación en el gaming no indica necesariamente un comportamiento patológico. Estos hallazgos son coherentes con investigaciones previas que enfatizan la distinción entre alta implicación y trastorno por gaming (Billieux et al., 2015). Los resultados también indican que el gaming problemático puede surgir cuando los síntomas cognitivo-emocionales coexisten con deterioro funcional, y no simplemente como una escalada de la intensidad de juego.

En conjunto, esta sección pone de relieve la importancia de adoptar enfoques conceptuales y metodológicos más matizados respecto al IGD, incorporando tanto perspectivas dimensionales como centradas en la persona para captar mejor la complejidad de los comportamientos relacionados con el gaming.

Conclusiones

Esta tesis doctoral tuvo como objetivo fortalecer las bases teóricas y metodológicas de la investigación sobre gaming e IGD entre estudiantes universitarios de España, Italia y México. Considerando las limitaciones inherentes a los estudios realizados, el gaming es una actividad recreativa común entre los estudiantes universitarios, particularmente entre los hombres, que muestran patrones de juego, intereses y motivaciones distintos en comparación con las mujeres. Aunque el gaming parece ser principalmente recreativo, se observaron diferencias entre gamers actuales, gamers no actuales y no gamers en diversas variables psicosociales. Sin embargo, no se encontraron diferencias estadísticamente significativas en salud mental general entre estos grupos. Estos hallazgos sugieren que, aunque el gaming en las muestras analizadas representa en general una actividad recreativa sin impacto psicológico negativo, la relación entre el gaming y ciertas variables psicosociales puede depender de factores socioculturales.

Los hallazgos metaanalíticos indicaron estimaciones de prevalencia del IGD superiores a las observadas en las muestras empíricas, con tasas que aumentaban cuando los análisis se centraban únicamente en gamers activos, lo que pone de relieve la fuerte influencia de factores metodológicos como la composición de la muestra y los criterios diagnósticos. La *Internet Gaming Disorder Scale (IGDS)*, particularmente la versión politómica de 9 ítems utilizada en esta tesis, mostró una fiabilidad adecuada para evaluar el IGD en contextos de investigación. Además, la inteligencia emocional mostró una asociación negativa de magnitud pequeña a moderada con el IGD, aunque esta relación varió entre países en los estudios empíricos, lo que sugiere posibles influencias socioculturales.

Por último, el IGD puede comprenderse mejor mediante modelos conceptuales más matizados. Los hallazgos respaldaron una estructura bidimensional de los síntomas del IGD e identificaron cuatro perfiles de gamers (normativos, casuales, altamente implicados y problemáticos), demostrando que una alta implicación en el gaming no implica necesariamente la presencia de un trastorno.

En conjunto, esta tesis doctoral pone de relieve la importancia de distinguir entre gaming recreativo, alta implicación y gaming problemático entre estudiantes universitarios. También subraya la necesidad de considerar factores individuales, contextuales y socioculturales al estudiar el gaming y el IGD para contextualizar mejor los patrones de juego e informar estrategias de prevención específicas.

ABSTRACT

Introduction

Video games have evolved from a simple pastime into a major cultural and entertainment industry. Defined as an immersive audiovisual technology-reliant activity (Gursesli et al., 2025; Jenkins, 2009), the sector grew significantly during the pandemic, thanks in part to advances such as virtual and augmented reality and increased accessibility. These developments have further expanded gaming, establishing it as a global phenomenon with significant social, economic, and psychological implications.

The socioeconomic impact of the gaming industry varies greatly between countries. While countries such as China and the United States contribute almost half of the total profits generated globally, there are other countries where the gaming industry is currently growing. These countries include Spain, Italy, and Mexico, among others. In 2024, Italy generated around \$2.5 billion, Mexico approximately \$2.3 billion, and Spain about \$2.8 billion in video game revenue (Visual Capitalist, 2025). However, the expansion of the gaming industry in these countries has been uneven. While Spain and Italy have shown more stable growth, Mexico has expanded rapidly in recent years, becoming the Latin American region with the highest video game consumption in 2024 (Newzoo, 2024). This diverse growth highlights the importance of examining gaming behaviors in these countries beyond the major global leaders.

The expansion of the gaming industry has also led to an evolution in the traditional stereotype of gamers. The gamer stereotype used to represent teenage boys who were isolated, playing video games. Today's gaming landscape features a wide variety of

genres, platforms, and content types, leading to significant shifts in both gender and age demographics within the gaming community. Regarding gender, recent reports suggest that this gender gap is narrowing. In 2025, women represent 48% of gamers (Entertainment Software Association [ESA], 2025). Regarding age, the Global Video Games Report 2025 (ESA, 2025) reports that, based on a survey of over 24,000 active gamers aged 16 and older across 21 countries, the largest share is in the 25-34 age range (26%). These findings highlight a change in gaming patterns and the need to examine potential differences by gender and age group. In this doctoral thesis, university students are the target demographic, as they have extensive access to digital technologies and are at a critical developmental stage for establishing cultural habits and patterns of digital media consumption.

To examine potential differences related to gaming by gender and among university students, it is necessary to differentiate between recreational gaming and problematic gaming, such as Internet Gaming Disorder (IGD). Recreational gaming can be understood as a leisure activity integrated into daily life that can provide various benefits to users. This type of gaming is associated with positive experiences such as enjoyment, a sense of achievement, and social connection, contributing to the satisfaction of basic psychological needs (Castro & Neto, 2025; Sublette & Mullan, 2012). Moreover, cognitive benefits have been linked to recreational gaming, such as improved attention, working memory, and spatial awareness (Granic et al., 2013). Finally, video games can also serve as an emotionally safe space, where gamers can manage their daily stress and achieve states of flow.

Gaming motivations are not universal but vary according to demographic and sociocultural factors such as gender, age, and cultural context. Research identifies three

main motivational dimensions—achievement, social interaction, and immersion—which are unevenly distributed across populations (Yee, 2006). Studies suggest that men tend to be more oriented toward competition and achievement, while women more often report social and immersion-related motivations (Martucci et al., 2023). Age also influences motivations, which are typically stronger during youth and tend to shift over time from fantasy and exploration toward achievement in adulthood. Moreover, cultural context shapes these patterns, as the importance of specific motivations and gender differences varies across countries (Ratan et al., 2022).

Although there are various benefits associated with recreational gaming, evidence suggests that problematic patterns may emerge, which could negatively impact personal functioning. Many individuals use gaming to cope with emotional distress or life difficulties, which can contribute to the development of IGD as a maladaptive coping strategy (Brand et al., 2014). This pattern became more evident during the COVID-19 pandemic, when social isolation led many students to rely on gaming to manage psychological distress and loneliness, potentially increasing IGD risk (Malak et al., 2023).

IGD was included in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) as a condition requiring further research due to its similarities with other addictive disorders (American Psychiatric Association [APA], 2013). The DSM-5 defines IGD as persistent and recurrent gaming that causes significant distress or impairment. IGD diagnostic criteria include preoccupation, withdrawal, tolerance, loss of control, reduced interest in other activities, continued use despite negative consequences, deception about gaming time, gaming to escape negative mood, and functional impairment. A diagnosis requires at least five criteria within a 12-month period. The DSM-5-TR maintains this framework and highlights the need to distinguish between high

engagement and disordered gaming (APA, 2022). Moreover, the *International Classification of Diseases* (ICD-11) recognizes gaming disorder as a clinical condition characterized by impaired control over gaming, prioritization of gaming over other activities, and continuation despite negative consequences (World Health Organization [WHO], 2018).

Research highlights the importance of distinguishing problematic gaming from high engagement. High engagement involves frequent and enthusiastic gaming as part of daily life without significant functional impairment. Studies show that behaviors often associated with addiction—such as thinking frequently about gaming or wanting to play longer—may reflect strong involvement rather than pathology (Charlton & Danforth, 2007), leading to a risk of IGD false positives (Kardefelt-Winther et al., 2017). This perspective frames gaming on a continuum ranging from adaptive recreational use to maladaptive patterns that produce significant impairment.

IGD has been linked to psychophysiological symptoms, functional impairment, and comorbid conditions. Research shows consistent associations between IGD and psychological distress, particularly depression, anxiety, and stress (Gursesli et al., 2025). Moreover, IGD frequently co-occurs with other psychological disorders, such as attention-deficit/hyperactivity disorder (ADHD), depression and anxiety, or social anxiety and obsessive–compulsive symptoms (Coutelle et al., 2024; González-Bueso et al., 2018; Liu et al., 2018). Physical manifestations such as sleep disturbances, eye strain, postural problems, and other sedentary-related health issues have also been reported (Zajac et al., 2024). All these difficulties may contribute to broader impairment, including academic or occupational problems, familiar conflicts, and reduced real-life social relationships (Chen et al., 2018).

Meta-analytic studies estimate that the prevalence of IGD in the general population ranged from 2.4% to 6.7%, with significant variability due to demographic, cultural, and methodological differences (Kim et al., 2022; Stevens et al., 2021). IGD typically develops during adolescence, with estimates between 1% and 9% and a pooled rate of 4.6%, predominantly among males (Fam et al., 2018; Gentile et al., 2017). However, recent studies indicate a prevalence of 9.9% among young adults, higher than among adolescents (Gao et al., 2022). There is also geographic variability, with a general population prevalence of around 2.6% in Spain and 1.4% in Italy, with university samples reporting higher rates (e.g., 5.2% among Mexican students; Borges et al., 2019; De Pasquale et al., 2018; Fuster et al., 2016). These variations may be influenced by different diagnostic frameworks and assessment tools (Király et al., 2015; King et al., 2020; Stevens et al., 2020), emphasizing the need for more context-specific prevalence estimates.

Several frameworks have been used to explain the development of IGD, particularly the *Interaction of Person–Affect–Cognition–Execution* (I-PACE) model (Brand et al., 2016, 2019), which proposes that problematic gaming emerges from the interaction between individual predispositions and situational factors rather than a single cause. The model highlights four components: personal vulnerabilities (e.g., age, gender, psychopathology), emotional states that trigger gaming, cognitive expectations about gaming rewards, and executive control processes that regulate behavior. Over time, gaming may shift from a rewarding activity to a coping strategy, eventually becoming habitual or compulsive when behavioral control weakens.

Research identifies multiple risk and protective factors associated with IGD. Predisposing variables include psychological difficulties such as depression or anxiety,

impulsivity, emotional regulation problems, low self-esteem, and interpersonal factors like loneliness or limited social support, among others (Dang et al., 2019; Kuss et al., 2018; Männikkö et al., 2017; Schneider et al., 2018; Zhuang et al., 2023). Gaming-related factors, such as toxic behaviors in online environments, have also been linked to higher IGD severity (Gandolfi et al., 2023).

Additionally, sociocultural contexts may influence gaming behavior and the relative importance of these factors. Cultural frameworks suggest that differences between individualistic and collectivistic societies shape social relationships and behavioral norms (Hofstede, 2001; Hofstede et al., 2010). In this perspective, Italy tends to be more individualistic, Spain occupies an intermediate position, and Mexico reflects more collectivistic orientations, which may influence how IGD-related processes manifest across contexts without altering the core mechanisms proposed by the I-PACE model (Brand, 2025).

Despite progress in the study of gaming and IGD, several gaps remain. Prevalence estimates vary widely due to different methodologies and population characteristics, emphasizing the need for meta-analyses, especially among university students and young adults. Emotional intelligence, relevant in frameworks like the I-PACE model, has received limited attention in research. Furthermore, cross-national differences in gaming behavior and IGD are not well understood due to a lack of comparable studies. Traditional diagnostic methods may not accurately reflect the diversity of IGD symptoms, potentially leading to false positives. These limitations highlight the necessity for integrative research that employs meta-analytic methods, in different countries, and new perspectives to enhance our understanding of gaming behavior and IGD in university populations.

Objectives

This doctoral thesis aims to strengthen the theoretical and methodological foundations of research on video game use and IGD among university students in Spain, Italy, and Mexico. To this end, the dissertation is organized into four thematic categories, each with general and specific objectives.

Theoretical and methodological update of IGD

The general objective 1 was to synthesize and update, through meta-analysis, the empirical evidence on IGD in young adults and university populations, integrating prevalence estimates, psychosocial correlates, and psychometric properties of measurement instruments. The specific objectives were:

- 1.1 To estimate the average prevalence of IGD in young adult and university populations and analyze heterogeneity according to study characteristics (e.g., country/region, year, diagnostic criteria, and instrument). **Study 1.**
- 1.2 To quantify the mean association between IGD and emotional intelligence and examine potential methodological and population moderators (e.g., instrument, sample type, sex, age, country/region). **Study 2.**
- 1.3 To evaluate the reliability of the IGDs using a reliability generalization meta-analysis and identify factors associated with variation in the coefficients (e.g., scale version/language, response format, and sample characteristics). **Study 3.**

Characterization of gaming among university students in Spain, Italy, and Mexico

The general objective 2 was to characterize the phenomenon of gaming among the university population in the three countries and describe their participation profiles, as well as the associated sociodemographic and psychosocial differences. The specific objectives were:

- 2.1 To describe the gaming participation profiles by gender in the university sample in each country. **Studies 4-6.**
- 2.2 To describe the gaming participation profiles (current gamers, ex-gamers, and non-gamers) in the university sample in each country. **Studies 7-9.**
- 2.3 To analyze, in each country, the differences in sociodemographic and psychosocial variables among the gaming participation profiles. **Studies 4-9.**

Characterization of IGD among university students in Spain, Italy, and Mexico

The general objective 3 was to analyze the manifestation of IGD symptomatology among university students in the three countries, estimate the proportion of students who meet IGD criteria, and identify sociodemographic and psychosocial differences associated with students with and without symptomatology, using independent analyses in each country.

The specific objectives were:

- 3.1 To estimate, in each country, the proportion of college students who meet the criteria for IGD. **Studies 10-11.**
- 3.2 To analyze, in each country, differences in sociodemographic and psychosocial variables between college students who meet the criteria for IGD and those who do not. **Studies 10-11.**

- 3.3 To explore, in each country, the association between IGD symptomatology and relevant psychosocial variables, controlling for pertinent covariates. **Studies 10-11.**

New methodological approaches to IGD

The general objective 4 was to analyze and propose an alternative diagnostic approach to IGD in unidimensional models based on a summation of criteria to better capture the disorder's complexity. The specific objectives were:

- 4.1 To examine the factorial structure of the IGDS using emergent analysis approaches. **Study 12.**
- 4.2 To identify latent classes of IGD symptomatology in the three countries. **Study 13.**

Studies

In this section, the main results of the studies that compose the present doctoral thesis are summarized. Each study corresponds to an independent article that has been published, accepted, or submitted to a scientific journal.

Theoretical and methodological update of IGD

The first three studies of this doctoral thesis aim to meta-analytically synthesize the available evidence on the current state of research on video game addiction, providing a theoretical and methodological foundation for the subsequent empirical studies.

Study 1 estimated the prevalence of IGD in young adults through a systematic review and meta-analysis (Obj 1.1). The pooled prevalence was 6.1% (95% CI: 5.03%, 7.4%). When considering sample composition, prevalence was significantly higher in gamer-only samples (8.1%; 95% CI: 5.91%, 11.01%) than in mixed samples including both gamers and non-gamers (5.4%; 95% CI: 4.33%, 6.90%). Among university students, the pooled prevalence was 6.04% (95% CI: 4.78%, 7.61%). Moderator analyses showed that variability across studies was influenced by factors such as the assessment instruments, diagnostic criteria, and characteristics of the samples, emphasizing the relevance of methodological consistency in epidemiological research.

Study 2 examined the relationship between IGD and emotional intelligence using a systematic review and meta-analysis based on correlation coefficients (Obj 1.2). Separate meta-analyses were conducted according to different conceptualizations of emotional intelligence. Results revealed significant negative small-to-moderate

associations between IGD symptoms and emotional regulation (-0.24 ; 95% CI: -0.28 , -0.18), socio-emotional competence (-0.23 ; 95% CI: -0.33 , -0.12), and emotional intelligence measured as an ability (-0.25 ; 95% CI: -0.38 , -0.10). Moderator analyses indicated that variability in results was related to study design, geographical context, and the instruments used.

Study 3 assessed the reliability of the IGDS instrument used in this thesis through a reliability generalization meta-analysis, employing reliability coefficients reported in primary studies as the effect size. Because the IGDS includes four versions—the original and short forms with dichotomous and ordinal response formats—separate meta-analyses were conducted for each. The findings showed reliability values above 0.80 for the ordinal versions (IGDS9P and IGDS27P) and the 27-item dichotomous version (IGDS27D), while the 9-item dichotomous version (IGDS9D) presented reliability values above 0.70.

Overall, these studies provide complementary evidence on the epidemiology, one associated psychological factor, and measurement properties of IGD in young adults. Together, the findings contribute to a more robust understanding of IGD prevalence, its relationship with emotional competencies, and the reliability of commonly used assessment instruments in university populations.

Characterization of gaming among university students in Spain, Italy, and Mexico

This section focuses on characterizing the phenomenon of gaming among university students in the three countries, considering gender and gaming status. **Study 4-6** examined gender differences in gaming patterns in university students (Obj. 2.1). **Studies 7-9** examined differences in sociodemographic and psychosocial variables among

university students classified according to their current relationship with gaming (current gamers, non-current gamers, and non-gamers; Obj. 2.2). These comparisons were conducted using three independent samples from Spain, Italy, and Mexico following the same methodological design, allowing for the analysis of both common patterns and potential cross-national differences (Obj. 2.3).

Regarding the results of **Studies 4-6**, statistically significant gender differences in gaming-related variables were found across the three countries. Men appear to start playing video games at an earlier age, spend more hours per week gaming, and report playing in gaming communities with higher perceived toxicity.

Regarding gaming motivations, violent gratification was higher among men in all three countries and also emerged as an important predictor in the gender discriminant analyses. Some country-specific statistically significant differences were also observed. In the Spanish and Mexican samples, gender differences appeared in several motivations (customization, cognitive challenge, social interaction, and competition). Men in both countries scored higher in cognitive challenge, competition, and social interaction, whereas women scored higher in customization. In the Italian sample, statistically significant gender differences were found in age and in several motivations (coping, cognitive challenge, and social interaction). Italian men were older and scored higher in coping, cognitive challenge, and social interaction.

The linear discriminant analyses showed that, in the Spanish sample, the variables that most strongly differentiated gender were earlier gaming onset, stronger violent gratification motives, higher perceived community toxicity, and lower customization. In the Italian sample, the main predictors distinguishing gender were weekly gaming hours

and violent gratification. In the Mexican sample, the main predictors distinguishing gender were higher violent gratification, earlier gaming onset, higher perceived community toxicity, higher weekly gaming hours, and social interaction motivations.

Regarding the results of **Studies 7-9**, similarities and differences have been found in demographic and psychosocial variables across Spain, Italy and Mexico among current gamers, non-current gamers and non-gamers.

In the Spanish sample, significant differences among the three groups were found in sex, prosocial behaviors, appraisal of others' emotions (a component of emotional intelligence), and perceived family social support, with marginal differences in overall perceived social support. Binomial logistic regression indicated that being male and having lower levels of prosociality were associated with a greater probability of having initiated gaming.

In the Italian sample, the three groups differed significantly in sex, age, prosocial behaviors, global emotional intelligence, and perceived social support. Differences also emerged in specific emotional intelligence components: appraisal of one's own and others' emotions differed between current and non-current gamers, while emotional awareness and emotional regulation differed between current gamers and non-gamers. Differences were also observed in perceived family support, friends' support, and support from significant others between current gamers and non-gamers, and in the latter case also between non-current gamers and non-gamers. Two binomial logistic regression analyses were therefore conducted to examine factors related to gaming initiation and maintenance. The results showed that male sex, older age, and lower prosociality were

associated with a higher likelihood of initiating gaming, whereas male sex, older age, and higher appraisal of others' emotions were associated with maintaining gaming.

In the Mexican sample, significant differences between the three groups were found in sex, prosocial behaviors, and global emotional intelligence. Post hoc analyses indicated that current gamers scored lower than both non-current gamers and non-gamers in appraisal of others' emotions, and lower than non-current gamers in emotional awareness and emotional regulation. Logistic regression analyses showed that male sex was the only factor associated with a higher likelihood of initiating gaming, while male sex and lower emotional awareness were associated with maintaining gaming.

Overall, the results show consistent patterns across the three countries. Gaming among university students seems strongly associated with sex, with men more likely to start earlier, play more hours, and report motivations related to violent gratification and participation in more toxic gaming contexts. Gaming initiation and maintenance seem also linked to psychosocial factors such as lower prosociality and specific components of emotional intelligence, although these associations vary by cultural context. Overall, mental health did not differentiate between gaming groups in any country.

Characterization of IGD among university students in Spain, Italy, and Mexico

This section examines the presence of IGD symptomatology among university students in Spain, Italy, and Mexico. **Studies 10-11** estimated the proportion of students meeting IGD criteria and compared sociodemographic, gaming, and psychosocial characteristics between students with and without IGD symptoms (Obj. 3.1). Using the same analytical procedures across the three national samples also allowed the identification of potential cross-national differences (Obj. 3.2).

Using the polythetic cutoff proposed by Lemmens et al. (2015)—endorsing at least five of the nine DSM-5 criteria at levels “often” or “very often”—the estimated prevalence of IGD was about 2.1% among university students in Spain and Mexico and 2.4% in Italy. When considering only active gamers, prevalence increased to approximately 4–6%. If a less strict threshold was applied (including “one to three times a month”; Evren et al., 2017), prevalence rose to 3.5% in the Spanish sample (10.2% among gamers), 3.9% in the Italian sample (6.5% among gamers), and 6.2% in the Mexican sample (15.7% in gamers).

Across the three countries, IGD showed statistically significant positive associations with gaming-related variables such as weekly gaming hours, perceived community toxicity, and playing with acquaintances (and playing with strangers in Spain). In all samples, IGD was positively related to violent gratification and coping motivations. However, some motivational patterns also varied by country: competition was the strongest correlate in Spain and Italy, whereas in Mexico, fun motivation showed a negative association with IGD. Psychosocial analyses revealed a statistically significant negative correlation between IGD and perceived social support in the three countries. A positive statistically significant correlation with impulsivity in Italy and Mexico, while negative statistically significant associations with emotional intelligence were found in Spain and Mexico.

Impulsivity emerged as a common predictor of IGD risk, although the statistically significant dimension differed by country: lack of premeditation in Spain, positive urgency in Italy, and lack of perseverance in Mexico. Additional context-specific factors were also identified, including gaming with strangers and lower emotional intelligence in Spain, greater gaming hours in Italy, and lower perceived social support in Mexico.

Overall, the findings suggest that while impulsivity may represent a shared vulnerability factor, the behavioral and psychosocial correlates of IGD vary depending on the context.

New methodological approaches to IGD

This section responds to a need identified in previous blocks: both current IGD instruments and diagnostic models may present structural and clinical classification limitations. Specifically, the use of unidimensional models and approaches based exclusively on summing diagnostic criteria may limit the ability to capture the complexity of IGD.

Study 12 examined the psychometric properties of the Spanish version of the IGDS, using Exploratory Graph Analysis to examine the instrument's dimensional structure. Results suggested a bidimensional structure of IGD symptoms: cognitive-emotional symptoms (preoccupation, tolerance, withdrawal, and escape) and relational/problem outcomes (persistence, problems, deception, displacement, and conflict). This structure was supported by Confirmatory Factor Analysis, which indicated better fit indices for the bidimensional model than for the unidimensional model. Both dimensions demonstrated strong reliability, high factor loadings, and adequate convergent validity, providing evidence that IGD symptoms may be organized into distinct but related dimensions in university populations.

Study 13 examined latent classes of IGD symptomatology using responses to the IGDS across the three national samples. A four-class solution was the most interpretable model, including normative gamers (41.22%), casual gamers (34.13%), problematic gamers (12.86%), and high-engaged gamers (11.79%). While problematic gamers

showed high scores across all symptoms, high-engaged gamers presented elevated scores mainly in preoccupation, tolerance, and escape, but low scores in the remaining criteria. Class membership was significantly associated with several gaming variables and motivations.

Overall, these findings highlight the complexity of IGD and suggest that both dimensional and person-centered approaches can contribute to a more nuanced understanding of gaming-related problems in university populations.

Discussion

Theoretical and methodological update of IGD

The first section aimed to synthesize existing evidence on the current state of research on IGD through a meta-analytical approach.

Meta-analytic prevalence estimates suggest that young adults and university students may have a higher prevalence than that reported for the general population (Kim et al., 2022; Stevens et al., 2021; Zhou et al., 2024). The observed high heterogeneity and moderator analysis indicated that prevalence estimates vary substantially depending on the assessment instruments, diagnostic criteria, and sample composition. One relevant factor influencing prevalence estimates was sample composition. Gamer-only samples showed significantly higher prevalence than mixed samples of gamers and non-gamers. This suggests that studies focusing exclusively on gamers may inadvertently overestimate IGD prevalence.

Regarding the relationship between IGD and emotional intelligence, a small-to-moderate negative association was observed, consistent with Cohen's (1988) criteria. These findings align with previous reviews indicating that deficits in emotional regulation are associated with increased vulnerability to behavioral addictions (Marchica et al., 2019; Estupiñá et al., 2024). Within the framework of the I-PACE model (Brand et al., 2016; 2019), emotional intelligence can be conceptualized as a dispositional "Person" variable that influences how individuals process emotional and cognitive responses to stressors. Individuals with higher emotional intelligence may be better able to regulate negative emotions and employ adaptive coping strategies, thereby reducing the likelihood of using gaming as a maladaptive escape mechanism (Dang et al., 2019). Conversely,

deficits in emotional clarity or regulation may increase vulnerability to IGD by reinforcing dysfunctional gaming-related expectancies and weakening executive control processes (Estévez et al., 2019; 2021). These findings support the notion that emotional intelligence may function as a protective factor against problematic gaming behaviors.

The reliability generalization meta-analysis showed that all IGDS versions displayed an acceptable reliability for research purposes. Given both its psychometric robustness and practical efficiency, the 9-item ordinal version of the IGDS was selected as the primary assessment instrument in this dissertation.

Overall, by identifying young adulthood as a period of increased vulnerability, highlighting emotional intelligence as a potential protective factor, and confirming the reliability of standardized instruments such as the IGDS, these studies strengthen the methodological rigor and theoretical advancement of research on problematic gaming.

Characterization of gaming among university students in Spain, Italy, and Mexico

The first section aimed to describe patterns of gaming participation among university students in Spain, Italy, and Mexico.

One consistent finding across countries was the role of sex and gender in gaming participation. Men were more likely to start gaming earlier and to spend more hours playing video games each week, a pattern consistent with previous studies showing higher gaming engagement among males (Kuss & Griffiths, 2012; Stevens et al., 2021). Early gaming onset has also been linked to increased gaming involvement later in life (Nakayama et al., 2020), which may contribute to more persistent gaming habits during emerging adulthood.

Gender differences also appeared in gaming motivations. Men reported stronger motivations related to violent gratification, social interaction, and cognitive challenge, suggesting that gaming may function as a domain for competition, mastery, and achievement. These differences can be interpreted within sociocultural frameworks such as gender socialization theory (Bem, 1993) and social identity theory (Tajfel & Turner, 1979), which propose that men may be more likely to engage in environments that reinforce competitive and dominance-oriented identities.

Furthermore, male gamers were more likely to participate in gaming communities perceived as more toxic, reflecting the competitive nature of many multiplayer games (Bopp et al., 2022; Kuss et al., 2022). These environments often feature hostile interactions, particularly towards women. Conversely, women may seek out more creative and customizable gaming experiences (López-Fernández et al., 2020). Research indicates that female gamers may avoid competitive or toxic spaces to minimize harassment (Belskie et al., 2023; McLean & Griffiths, 2019; Kuss et al., 2022), favoring games that allow for personal expression and narrative engagement.

Beyond gender differences, results showed differences between gamers and non-gamers in prosocial behavior and emotional intelligence, which have been identified as protective factors against behavioral addictions (Dang et al., 2019; Esparza-Reig et al., 2021; Marchica et al., 2019). Additionally, the role of perceived social support varied across different countries, indicating potential cultural differences in the importance of social relationships. No differences in overall mental health were found between gaming groups, indicating that gaming is a normative recreational activity for university students rather than a maladaptive coping mechanism. This supports previous research showing

that most individuals game for entertainment and social interaction without psychological impairment (Griffiths, 2010; Przybylski & Weinstein, 2019).

Overall, these results suggest that gaming among university students exhibits both shared and context-specific patterns regarding gender differences and gaming participation groups across countries. While male sex consistently predicted gaming participation and engagement, the associations of other psychosocial variables, such as prosociality and emotional intelligence, may vary by national context.

Characterization of IGD among university students in Spain, Italy, and Mexico

The third section aimed to examine the prevalence and correlates of IGD among university students in Spain, Italy, and Mexico.

Across the three countries, the prevalence of IGD in the total university samples was relatively low, ranging from 2.1% to 2.4%, which is lower than the prevalence estimates reported in previous meta-analyses (Gao et al., 2022; Gisbert-Pérez et al., 2025). However, when analyses focused exclusively on active gamers, prevalence increased to approximately 4–6%, highlighting the importance of distinguishing between general population estimates and gamer-only samples. Furthermore, prevalence estimates increased when less stringent diagnostic thresholds were applied (Evren et al., 2017), illustrating how methodological decisions—particularly the choice of cutoff criteria—can significantly influence epidemiological estimates.

Similar associations were found between IGD and several gaming-related variables across countries, including weekly gaming hours, playing with acquaintances, and perceived toxicity in gaming communities. These findings align with previous

research identifying gaming intensity as a key predictor of IGD (King et al., 2017; Zhuang et al., 2023). IGD was also positively associated with motivations related to violent gratification and coping, suggesting that some individuals may use gaming to regulate negative emotions or escape from real-life stressors. Previous research has consistently identified escape-related motivations as strong predictors of problematic gaming (Bäcklund et al., 2022).

Regarding psychosocial variables, lower levels of perceived social support were associated with greater IGD symptom severity, supporting that social support can act as a protective factor against behavioral addictions (Durak et al., 2023; Malak et al., 2023). Emotional intelligence was only statistically significantly associated with IGD in the Spanish and Mexican samples, which may reflect sample-specific characteristics or broader cultural differences. However, the relationship may also be bidirectional, as excessive gaming may negatively affect offline relationships and reduce perceived support (Teng et al., 2020). Moreover, impulsivity emerged as a common vulnerability factor across countries, although the specific impulsivity dimensions associated with IGD differed between samples. This finding supports theoretical models that conceptualize impulsivity as a transdiagnostic risk factor in behavioral addictions (Király et al., 2017).

Overall, these results suggest that while certain risk factors for IGD are consistent across countries—such as gaming intensity, some multiplayer interactions, motivations related to coping and competition, and impulsivity—others may vary depending on sociocultural contexts.

New methodological approaches to IGD

The final section explored methodological innovations aimed at improving the conceptualization and assessment of IGD.

Results indicated that IGD symptoms may be better represented by a bidimensional structure, distinguishing between cognitive–emotional symptoms and relational or functional consequences. This finding challenges the assumption that IGD is a purely unidimensional construct and aligns with theoretical perspectives suggesting that addictive behaviors involve both internal symptoms and functional impairment (Kelly & Hoeppepner, 2014; Wakefield, 2015; Paschke et al., 2021).

The latent class analysis further supported the heterogeneity of IGD by identifying four distinct gamer profiles: normative gamers, casual gamers, high-engaged gamers, and problematic gamers. Importantly, the high-engaged class showed elevated scores in cognitive-emotional symptoms but low levels of functional impairment, suggesting that high involvement in gaming does not necessarily indicate pathological behavior. These findings are consistent with previous research emphasizing the distinction between high engagement and gaming disorder (Billieux et al., 2015). The results also indicate that problematic gaming may arise when cognitive-emotional symptoms co-occur with functional impairment rather than as a simple escalation of gaming intensity.

Overall, this section highlights the importance of adopting more nuanced conceptual and methodological approaches to IGD, incorporating both dimensional and person-centered perspectives to better capture the complexity of gaming-related behaviors.

Conclusions

This doctoral thesis aimed to strengthen the theoretical and methodological foundations of research on gaming and IGD among university students in Spain, Italy, and Mexico. Considering the limitations inherent to the studies conducted, gaming is a common recreational activity among university students, particularly among men, who display distinct gaming patterns, interests, and motivations compared to women. Although gaming appears to be primarily recreational, differences were observed between current gamers, non-current gamers, and non-gamers in several psychosocial variables. However, non-statistically significant differences were found in general mental health across these groups. These findings suggest that, while gaming in the analyzed samples generally represents a recreational activity without negative psychological impact, the relationship between gaming and certain psychosocial variables may depend on sociocultural factors.

Meta-analytic findings indicated higher IGD prevalence estimates than those observed in the empirical samples, with rates increasing when analyses focused only on active gamers, highlighting the strong influence of methodological factors such as sample composition and diagnostic criteria. The Internet Gaming Disorder Scale (IGDS), particularly the 9-item polytomous version used in this thesis, demonstrated adequate reliability for assessing IGD in research contexts. Additionally, emotional intelligence showed a small-to-moderate negative association with IGD, although this relationship varied across countries in empirical studies, suggesting potential sociocultural influences.

Finally, IGD may be better understood through more nuanced conceptual models. The findings supported a bidimensional structure of IGD symptoms and identified four

gamer profiles (normative, casual, high-engaged, and problematic) demonstrating that high involvement in gaming does not necessarily imply disorder.

Overall, this doctoral thesis highlights the importance of distinguishing between recreational gaming, high engagement, and problematic gaming among university students. It also underscores the need to consider individual, contextual, and sociocultural factors when studying gaming and IGD to better contextualize gaming patterns and inform targeted prevention strategies.

THEORETICAL FRAMEWORK

Gaming as a global and expanding phenomenon

Video games have transformed over the years from a simple pastime into a significant cultural, artistic, and entertainment industry that continues to grow. Today, it is rare to find individuals who are unfamiliar with video games, do not play them, or whose economic activities are not related to the production, design, or creation of gaming content. Traditionally, a video game is defined as “an activity (often story-oriented) that relies on audio-visual peripherals” (Gursesli et al., 2025, p. 2).

The video game industry underwent a significant transformation in 2020, driven by the COVID-19 pandemic, which resulted in a surge in the use of digital platforms. This shift enabled video games to become one of the most profitable forms of entertainment globally, surpassing both the film and music industries. Additionally, the introduction of new gaming platforms, along with the use of virtual and augmented reality and advancements in accessibility have changed traditional forms of play, establishing gaming as a global cultural phenomenon with important social, economic, and psychological implications.

The normalization of gaming has become so evident that terms like “gamer” and “gaming” have entered everyday language, acquiring various meanings. A gamer is typically defined as anyone who plays video games, ranging from casual players to professionals. However, within the video game culture, gamers are often viewed as

individuals who have a deeper connection to that community. Furthermore, gaming specifically refers to the act of playing video games.

Global distribution of gaming

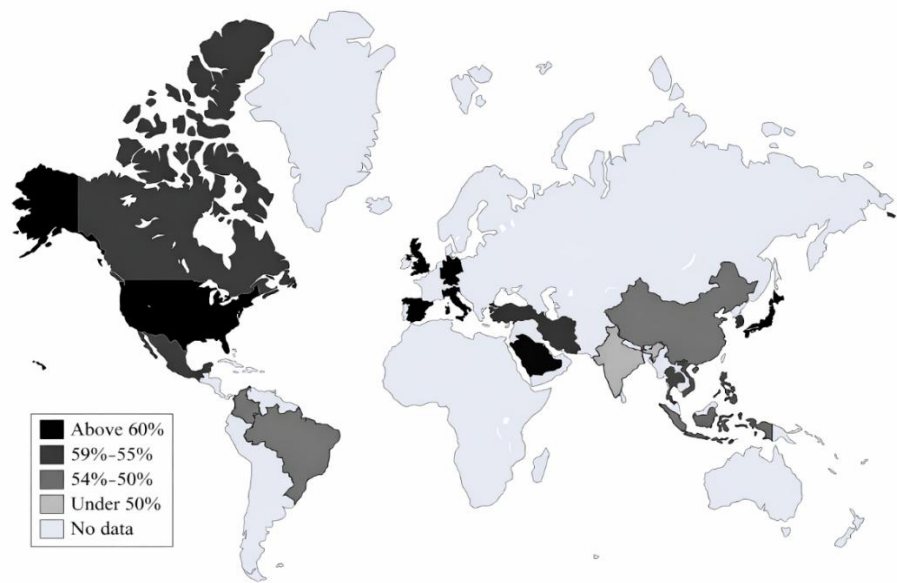
The growth of the gaming industry has had a significant impact on the global socioeconomic landscape. In 2024, the global video game industry generated approximately \$183 billion in revenue (Visual Capitalist, 2025), with China (\$48.7 billion) and the United States (\$47.6 billion) accounting for more than half of this total. Beyond these leading markets, countries like Spain, Italy, and Mexico are developing relevant gaming ecosystems. In this context, Italy generated around \$2.5 billion, while Mexico generated approximately \$2.3 billion in video game revenue in 2024, positioning both countries as notable markets outside of Asia and North America. Similarly, Spain recorded about \$2.8 billion in video game revenue, making it the third-largest market within the European Union (Asociación Española de Videojuegos [AEVI], 2024).

While market revenue illustrates the economic impact of the gaming industry, the percentage of gamers in relation to the country's population provides further insight into gaming participation levels across different countries (Figure 1). Although Spain, Italy, and Mexico show comparable revenue levels, they differ in terms of industry development and the size of their player bases (Table 1). Both Spain and Italy have exhibited gradual and sustained market growth, whereas Mexico has experienced accelerated expansion in recent years. This trend reflects the rapid development of the Latin American gaming market, which has become the fastest-growing region globally, with Brazil and Mexico playing crucial roles in this expansion (Statista, 2024). In 2024,

Mexico emerged as the leading country in video game consumption within the region (Newzoo, 2024).

Figure 1

Percentage of gamers relative to the total population of each country in the countries with the highest number of gamers (2024)



Note. Map created with Artificial Intelligence (AI) based on data from Top Countries by Number of Players (Newzoo, 2024).

Table 1

Estimated percentage of gamers in Spain, Italy, and Mexico

Country	Estimated population (millions)	Gamers (national research, millions)	% of population	Gamers (market research, millions)	% of population
Spain	49	22,1	~45%	33,2	~68%
Italy	59	14	~24%	37,1	~63%
Mexico	132	68,7	~52%	76	~58%

Note. National research data come from 2024 national reports and surveys (Spain: AEVI, 2024; Italy: IIDEA, 2024; Mexico: The Competitive Intelligence Unit [CIU], 2024). Large-scale market research data are global estimates including all ages and devices, useful for international comparisons (Newzoo, 2024; Statista, 2024).

Beyond the undisputed leaders in the gaming market, the economic importance, diverse growth trajectories, and evolving player populations in Spain, Italy, and Mexico emphasize their relevance in understanding player behavior and industry dynamics beyond the dominant global leaders.

Sociodemographic profile of gamers

Video games have become a major form of entertainment, offering players a diverse range of immersive experiences and changing the traditional stereotype of gamers. In the early 21st century, before the rise of multiplayer and socially connected gaming experiences, gamers were typically portrayed as isolated individuals—often seen as contemporary hermits, who engaged primarily with video games, disconnected from the outside world. Williams (2005) defined gamers as “isolated, pale-skinned teenage boys sit hunched forward on a sofa in some dark basement space, obsessively mashing buttons”. Such characterizations limit the portrayal of gamers to a specific gender and age group, which may not accurately reflect reality. Despite advancements in gaming research that challenge this outdated view, some stereotypes about gamers persist.

Today’s gaming landscape features a wide variety of genres, platforms, and content types, leading to significant shifts in both gender and age demographics within the gaming community. Historically, female gamers have been underrepresented, as early video games were primarily designed for a male audience (Lopez-Fernandez et al., 2019). This male-dominated culture has contributed to the excessive sexualization and objectification of female characters, creating hostile environments for women (Lynch et al., 2016). In some games, female gamers often face sexism, harassment, and abuse

(Belskie et al., 2023; Kuss et al., 2022), which undermines their recognition as skilled players (Vermeulen et al., 2017). As a result, only 35% of women identified themselves as gamers, compared to 51% of men (Le Ngoc, 2022). However, recent reports suggest that this gender gap is narrowing. In 2025, women represent 48% of gamers (ESA, 2025). Even with this shift toward parity, it is crucial to explore whether gaming behaviors differ between genders.

Moreover, to what extent does the stereotype of gamers as adolescents reflect the current demographic reality of gaming? The Global Video Games Report 2025 (ESA, 2025) reveals that, based on a survey of over 24,000 active gamers across 21 countries aged 16 and older, the highest proportion of gamers falls within the 25 to 34 age range (26%). These findings highlight a change in gaming patterns, as individuals who were introduced to video games in the 1990s and 2000s continue to engage in gaming into adulthood. Consequently, the participation of young adults in the global gaming community has increased substantially over time.

Additionally, national-level data emphasize the significant role of adolescents and young adults in gaming. In Spain (AEVI, 2024), gaming prevalence peaks among individuals aged 15 to 24 years (96%) and 25 to 34 years (89%). In Mexico (CIU, 2024), 87.5% of individuals under 20 identify as gamers, with 77.4% of young adults aged 21 to 30 also identifying as such. In Italy (IIDEA, 2024), most of the gaming audience consists of adults, with approximately 80% reporting engagement with video games. However, the highest number of gamers, in absolute terms, is still found among those aged 15 to 24 years.

These findings challenge the traditional stereotype of gamers as predominantly adolescent males, revealing greater gender parity and a progressive aging of the gaming population, and highlighting the central role of young adults in contemporary gaming participation. Given that prior research has largely focused on adolescent populations, the current doctoral thesis centers on young adults. University students have been selected as the target demographic, as they have extensive access to digital technologies and are at a vital developmental stage for establishing cultural habits and patterns of digital media consumption.

Gaming as a behavioral-clinical continuum

Recreational gaming and psychological functions

The expansion of the gaming industry and the transformation of the traditional gamer profile have consolidated video games as a widespread form of leisure across both geographic regions and generations. The adaptation of video games to everyday platforms, such as mobile devices, together with online accessibility and multiplayer modes, has transformed what was once an individual activity into a genuine phenomenon of social connection. In this context, the Entertainment Software Association (2025) identifies three primary reasons why people play video games: to have fun, to relieve stress or relax, and to exercise the mind. Complementarily, a systematic review by Martucci et al. (2023) identified three main motivational dimensions among gamers—social, achievement, and competition motivations—highlighting the psychological and relational functions of gaming beyond simple entertainment.

These motivations are commonly expressed within the framework of recreational gaming, understood as a leisure activity integrated into daily life that can provide various benefits to users. Sublette and Mullan (2012) emphasize that recreational gaming is associated with positive experiences such as enjoyment, a sense of achievement, and the formation of friendships and virtual communities. Similarly, Castro and Neto (2025) note that healthy gaming can contribute to the satisfaction of basic psychological needs, including competence, autonomy, and social relatedness, thereby fostering positive engagement and well-being. Recent data indicate that approximately 30% of gamers play weekly primarily to maintain social connections (ESA, 2025), both with individuals they know offline and with contacts established in online environments. Regarding achievement, video games offer structured goals and immediate feedback, thereby enhancing players' sense of competence and positioning gaming as a social and participatory space that promotes well-being and personal accomplishment. Additionally, gaming environments—particularly those involving prosocial content or cooperative mechanics—have been shown to promote helping behaviors, empathy, and positive social interactions, highlighting their potential to foster prosocial development alongside recreational and psychological benefits (Greitemeyer & Mügge, 2014).

In addition to social and achievement-related benefits, recreational gaming has also been linked to emotional and cognitive benefits. Castro and Neto (2025) found that gaming experiences characterized by autonomy and competence were linked to more positive mood states and greater enjoyment afterwards. Video games provide environments that enable players to experience positive emotions, manage their daily stress, and achieve a state of flow, particularly when the challenges are well matched to their skill level. As such, gaming can function as an emotionally safe space in which users

experience feelings of control, progress and social connection, thereby contributing to subjective well-being when used appropriately. Furthermore, recreational gaming has been linked to cognitive enhancements, such as improved attention, working memory, and spatial awareness, particularly among regular players and in games that necessitate swift information processing (Granic et al., 2013).

It is important to note that gaming motivations are not universal but are systematically associated with demographic variables such as gender, age, and sociocultural context. Yee's (2006) empirical model demonstrated that gaming motivations cluster into achievement, social, and immersion dimensions, which are significantly associated with players' gender and age, indicating that motivational profiles are not evenly distributed across populations. Consistent with this, several studies have reported that men tend to show greater orientation toward competition and achievement, whereas women more frequently report social and immersion-related motivations (Martucci et al., 2023). Regarding age, available research suggests that motivational intensity tends to be higher during youth and gradually declines over time, with a shift from motivations related to fantasy and exploration toward more achievement-oriented motivations in adulthood (Yee, 2006; Martucci et al., 2023). Importantly, these differences are not fixed but are shaped by cultural context, as the relative importance of specific motivations and the magnitude of gender differences vary across countries (Ratan et al., 2022). This body of evidence highlights the importance of examining recreational gaming from a perspective sensitive to demographic and cultural characteristics.

In summary, gaming has become a socially integrated practice embedded in everyday life, fulfilling relational and achievement-related functions and providing emotional and cognitive benefits beyond entertainment. Recreational gaming can satisfy

psychological needs for competence, autonomy, and social connection, while also offering positive experiences of enjoyment and flow. However, the variability of gaming motivations across sociodemographic groups underscores the need to conceptualize gaming as a diverse and context-dependent phenomenon.

When gaming becomes problematic: Internet Gaming Disorder

Despite the benefits associated with recreational video game use, research indicates that, under certain circumstances, this activity can develop into problematic patterns that negatively affect personal, social, and academic functioning. Many individuals engage in gaming as a way to cope with emotional distress or real-life difficulties, which may contribute to the development of gaming disorder as a maladaptive coping strategy (Brand et al., 2014). During the COVID-19 pandemic, characterized by social isolation and significant lifestyle disruptions, students increasingly relied on gaming to manage psychological challenges and feelings of loneliness (Malak et al., 2023). In such cases, this pattern of use may contribute to the emergence of Internet Gaming Disorder (IGD).

IGD was included in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5) as a condition for further study in Section III, due to its clinical similarities with other addictive disorders and the potential impact of loss of control over gaming behavior (APA, 2013; Ko, 2014). According to the DSM-5 (APA, 2013), IGD is defined as a pattern of persistent and recurrent video game use leading to clinically significant distress or impairment. Nine diagnostic criteria were proposed: (1) preoccupation with gaming, (2) withdrawal symptoms, (3) tolerance, (4) loss of control, (5) loss of interest in other activities, (6) continued gaming despite negative consequences, (7) deception regarding gaming time, (8) gaming to escape negative mood

states, and (9) significant functional impairment or conflicts. A diagnosis requires the presence of at least five of these criteria over a period of twelve months. The DSM-5-TR (APA, 2022) maintains a similar framework, continuing to classify IGD as a condition requiring further research and emphasizing the importance of distinguishing between high engagement and disordered gaming.

Similarly, the World Health Organization recognized Gaming Disorder as an official diagnosis in the *International Classification of Diseases, Eleventh Revision* (ICD-11; WHO, 2018). Gaming Disorder is defined as a pattern of gaming behavior characterized by three core features: impaired control over gaming, increasing priority given to gaming over other activities, and continuation or escalation of gaming despite negative consequences. Diagnosis requires significant impairment in personal, family, social, educational, or occupational functioning for at least twelve months. The ICD-11 specifies that Gaming Disorder applies to both online and offline gaming and places particular emphasis on functional impairment.

Beyond the formal recognition of IGD, the literature has emphasized the importance of distinguishing between problematic gaming and high engagement. High engagement is characterized by intense involvement, enthusiasm, and frequent gaming as part of daily life, but without significant functional impairment. Charlton and Danforth (2007) demonstrated that many indicators commonly associated with addiction—such as frequent thoughts about gaming, excitement during play, or a desire to play for longer periods—reflect strong engagement rather than pathological behavior. Only core criteria such as loss of control, conflict with daily life, and continued gaming despite negative consequences are indicative of IGD. Similarly, Ko et al. (2014) emphasized that gaming time alone is not a sufficient criterion, and that functional impairment represents the

defining feature of the disorder. This distinction has been further supported by subsequent reviews, which warn of the risk of false positives when enthusiasm is misinterpreted as addiction (Billieux et al., 2015; Kardefelt-Winther et al., 2017). This perspective enhances the understanding of gaming as a continuum, ranging from adaptive recreational use to clearly maladaptive patterns that result in functional impairment.

Clinical manifestations and comorbidity of IGD

Beyond the established diagnostic criteria, IGD has been associated with a range of psychophysiological manifestations, as well as impairments in academic, occupational, and social functioning, and frequent comorbidities.

Regarding psychological manifestations, a systematic review by Gursesli et al. (2025) reported consistent associations between IGD and symptoms of depression, anxiety, and stress. In this review, 67% of the studies examining correlations between psychological distress and IGD found moderate to strong associations. Furthermore, when comparing age groups, the relationship between IGD and psychological distress was more robust among young adults than among children and adolescents. Although this relationship may be bidirectional, these findings highlight young adulthood as a particularly relevant developmental stage for examining IGD.

Beyond psychological symptoms, physical manifestations have also been documented, including sleep disturbances and sedentary-related issues, as well as other health complaints such as eye strain, postural problems, and hand weakness resulting from prolonged screen exposure and sedentary behavior (Chen et al., 2018; Zajac et al., 2024). These manifestations reflect broader functional impairment, as untreated IGD has

been associated with higher rates of unemployment or academic difficulties, family conflict, and diminished real-life social relationships (Chen et al., 2018).

Concerning comorbidity, IGD rarely occurs in isolation and frequently coexists with other psychopathological conditions, particularly among adolescents and young adults. The most consistent associations have been reported with attention-deficit/hyperactivity disorder (ADHD), depression, and anxiety disorders (Coutelle et al., 2024; González-Bueso et al., 2018; Liu et al., 2018). To a lesser extent, IGD has also been associated with social anxiety and obsessive–compulsive symptoms (González-Bueso et al., 2018).

Epidemiology and variability of IGD

According to meta-analytic studies, the estimated prevalence of IGD in the general population ranges from 2.47% to 6.7% (Kim et al., 2022; Pan et al., 2020; Stevens et al., 2021). However, the variability in these prevalence rates may be influenced by demographic, cultural, and methodological characteristics of the studies conducted.

Estimates of the prevalence of IGD show substantial variability depending on the sociodemographic and contextual characteristics of the sample. IGD typically emerges during early adolescence, a developmental period in which higher rates of gaming-related problems have traditionally been reported. In samples of children and adolescents, prevalence rates generally range between 1% and 9%, with a pooled estimate of 4.6% (95% CI: 3.4%–6.0%; Gentile et al., 2017), and higher prevalence observed among adolescent males compared to females (6.8% vs. 1.3%, respectively; Fam et al., 2018). However, a meta-analysis by Gao et al. (2022) reported an overall prevalence of 9.9% among adolescents and young adults, with higher rates observed in young adults (10.4%)

compared to adolescents (8.8%). These findings suggest that IGD extends beyond adolescence and remains prevalent among young adults, underscoring the need to investigate this age group.

Significant geographic variability in IGD prevalence has also been reported. A meta-analysis by Stevens et al. (2021) found that prevalence rates in the general population ranged approximately from 2.72% to 5.08% across continents. In Europe, the estimated prevalence in the general population is approximately 2.6% in Spain and 1.4% in Italy (Di Carlo et al., 2023; Fuster et al., 2016). However, in university student samples, prevalence estimates tend to be higher. In Italy, reported prevalence rates among university students range from 5.3% to 14.9% (De Pasquale et al., 2018, 2020), whereas no study to date has specifically examined IGD prevalence in Spanish university populations. In Mexican university students, the estimated prevalence before the COVID-19 pandemic was 5.2% (95% CI: 4.7%–5.8%; Borges et al., 2019). However, these estimates are derived from studies with different objectives, sampling strategies and assessment instruments. This limits comparability across countries and hinders the development of an integrated understanding of IGD in university populations.

Importantly, one of the primary sources of epidemiological variability in IGD prevalence stems from differences in diagnostic criteria and assessment instruments. Previous studies have based their measurements on DSM-5 criteria, ICD-11 criteria, or theoretical frameworks adapted from other addictive disorders, such as gambling disorder and substance use disorders (Stevens et al., 2020). Furthermore, these instruments differ in response formats and cutoff thresholds used to identify potential IGD cases, directly influencing prevalence estimates (Király et al., 2015; Stevens et al., 2020). A systematic review by King et al. (2020) identified 32 instruments used to assess IGD, of which five—

AICA-Sgaming, GAS-7, IGDT-10, IGDS9-SF, and Lemmens IGDS—demonstrated the strongest psychometric evidence. This methodological heterogeneity complicates comparisons across studies and represents a key source of variability in epidemiological estimates.

Overall, this heterogeneity highlights the influence of sociodemographic, contextual, and methodological factors on IGD epidemiology and underscores the need for country-specific prevalence estimates and updated meta-analytic syntheses that systematically examine these sources of variability in specific age groups.

Theoretical models and associated factors

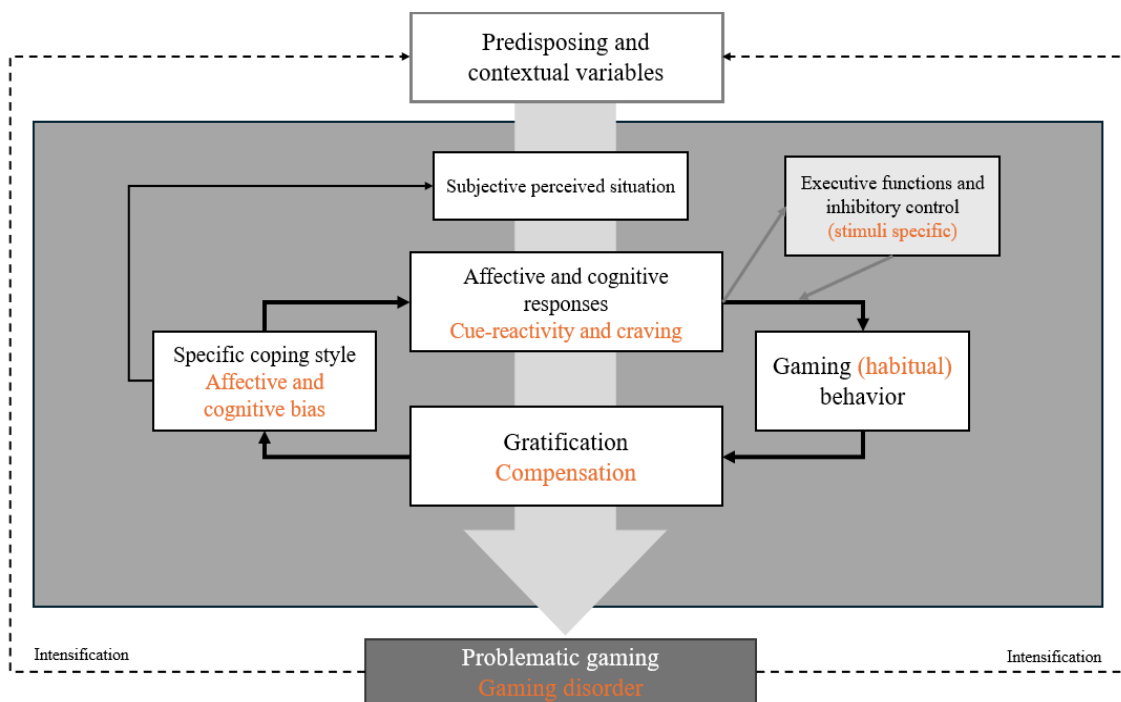
The development and maintenance of IGD can be understood within neurocognitive, cognitive-behavioral (Dong & Potenza, 2014), and integrative theoretical frameworks, such as the Interaction of Person–Affect–Cognition–Execution model (I-PACE; Brand et al., 2016; 2019). The I-PACE model (Brand et al., 2016) is one of the most comprehensive theoretical frameworks for explaining the development and maintenance of behavioral addictions. The I-PACE model proposes that IGD develops not from a single factor; it posits that problematic and addictive behavior develops through the interaction of individual predispositions and specific situational factors (Figure 2; Brand et al., 2019).

The name I-PACE reflects its four main components: (1) P-component or Person (predisposing personal factors), (2) A-component or Affect (emotional responses), (3) C-component or Cognition (cognitive processes), and (4) E-component or Execution (executive control and behavior). The model specifies that Person refers to predisposing personal factors, that is, individual vulnerabilities that increase risk. Affect refers to

emotional states that motivate gaming behavior and may therefore act as potential triggers for problematic gaming. Cognition includes expectations and beliefs about gaming, such that gaming behavior is reinforced because the individual learns that video games provide what they need. Finally, Execution refers to behavioral control processes.

Figure 2

I-PACE model specific to gaming behavior based on Brand et al. (2019)



Note. Components in orange represent those for later stages of the addiction process (Brand et al., 2019).

The I-PACE model explains that IGD develops progressively over time (Brand et al., 2016). In the early stages, individuals with specific vulnerabilities experience emotional responses and develop positive expectations about gaming, leading them to play and experience rewarding emotions that act as reinforcement and increase the likelihood of continued gaming. In intermediate stages, craving and positive expectations toward gaming intensify, and gaming becomes a coping strategy, even as behavioral control begins to weaken and both positive and negative consequences emerge. Thus,

gaming may also be maintained through negative reinforcement, as individuals increasingly use gaming to reduce or escape negative emotional states. In advanced stages, gaming behavior becomes increasingly habitual, with stronger craving and reduced behavioral control, and individuals continue gaming despite negative consequences. As a result, gaming behavior may transition into a compulsive pattern.

As discussed, the I-PACE model highlights that IGD arises from the interaction between predisposing and contextual factors. Among the predisposing variables, individual factors (e.g., sex, gender, age), psychopathological correlates such as depression or anxiety (Männikkö et al., 2017), temperamental features such as impulsivity (Kuss et al., 2018), emotional intelligence (Dang et al., 2019), or dysfunctional coping styles (Schneider et al., 2018), stand out. The systematic review and meta-analysis by Zhuang et al. (2023), which focused on longitudinal risk and protective factors of IGD, identified thirty-four modifiable variables. These included primarily intrapersonal factors (e.g., self-esteem, loneliness, emotional difficulties, and emotion regulation problems) and interpersonal factors (e.g., objective and perceived social support and relational skills). Regarding external factors, previous literature has identified gaming-related factors associated with IGD, as well as environmental factors (Király et al., 2023).

Regarding gaming-related factors, a relatively understudied variable is the perceived toxicity level in the games most frequently played. Toxicity refers to any anti-social and/or disruptive behavior toward other gamers, with examples ranging from verbal offense while playing to trolling and hate posts in game chats or social media (Gandolfi & Ferdig, 2021). Toxicity can emerge from factors such as anonymity, frustration toward less-skilled players, competitive dynamics, and social learning processes within gaming communities, where toxic norms may be adopted and reinforced

over time. Furthermore, toxicity has been identified as a significant positive predictor of IGD, suggesting that higher engagement in toxic behaviors is associated with greater severity of problematic gaming symptoms (Gandolfi et al., 2023).

Regarding interpersonal variables, social integration and perceived social support act as protective factors against behavioral addictions. Studies have shown that individuals with higher levels of social support are less likely to develop IGD (Malak et al., 2023; Uçur & Dönmez, 2021). Social support helps individuals to manage stress and negative emotions, thereby reducing their reliance on gaming as a means of escape. Thus, low social support is associated with problematic gaming, whereas higher support acts as a protective buffer (Uçur & Dönmez, 2021).

In summary, the I-PACE model suggests that IGD arises from the interaction between individual predispositions, affective and cognitive responses, and executive control processes in interaction with contextual factors over time. Among these contextual influences, sociocultural environments may shape gaming behaviors by influencing social norms, emotional expression, and patterns of social interaction. Cultural frameworks have suggested that societal values, such as differences in individualism and collectivism, structure social relationships and behavioral norms within societies (Hofstede et al., 2010).

According to Hofstede (2001), individualism characterizes societies in which ties between individuals are relatively loose and people are expected to take care primarily of themselves and their immediate families, whereas collectivism refers to societies in which individuals are integrated into strong and cohesive in-groups that provide protection and support in exchange for loyalty. Within this framework, the countries examined in this

dissertation represent culturally distinct contexts: Italy shows relatively higher levels of individualism, Spain occupies an intermediate position, and Mexico reflects more collectivistic orientations (Hofstede et al., 2010, pp. 95-97). Importantly, cultural tendencies do not alter the core mechanisms of the I-PACE model but may influence which components become more salient across contexts (Brand, 2025).

Research gaps

Despite significant advances in the study of gaming and IGD, some gaps still exist. Firstly, prevalence estimates of IGD vary widely, primarily due to differences in methodology, population characteristics, and the lack of a single standardized assessment tool. This highlights the need for meta-analytic approaches to obtain more precise and comparable estimates, especially among young adults and university populations. Secondly, while several risk and protective factors have been examined in depth, the role of emotional intelligence—identified as a key individual variable in theoretical frameworks like the I-PACE model—has not yet been extensively analyzed using meta-analytic methods. Thirdly, potential cross-national variation in gaming behavior and IGD among university students remains insufficiently documented. This is partly due to the scarcity of studies using harmonized designs and comparable measures across countries, which limits the analysis of gaming participation and IGD across countries. Finally, traditional diagnostic approaches like the DSM-5, which rely on symptom-count criteria, may not fully capture the heterogeneous nature of IGD. This could lead to inflated false-positive rates, especially among highly engaged gamers who do not experience significant functional impairment. All these gaps emphasize the need for integrative approaches that combine meta-analytic synthesis, cross-cultural investigations, and advanced methodological frameworks to enhance our understanding of gaming behavior and IGD among university populations.

OBJECTIVES

This doctoral thesis aims to strengthen the theoretical and methodological foundations of research on video game use and IGD among university students in Spain, Italy, and Mexico. To this end, the dissertation is organized into four thematic categories, each with general and specific objectives.

Theoretical and methodological update of IGD

General objective

To synthesize and update, through meta-analytic methods, the empirical evidence on IGD in young adult and university populations, integrating prevalence estimates, psychosocial correlates, and psychometric properties (with a focus on reliability) of an IGD measurement instrument in order to provide a theoretical and methodological foundation for the subsequent empirical studies in this dissertation.

Specific objectives

- 1.1. To estimate the pooled prevalence of IGD in young adult and university populations and to explain between-study variability by examining core moderators (e.g., diagnostic framework/criteria, assessment instrument and cut-off rules, sample composition such as gamer-only vs mixed samples, study year/region, and study quality).
- 1.2. To quantify the mean association between IGD symptomatology and emotional intelligence and examine potential methodological and population moderators (e.g., instrument, sample type, sex, age, country/region).

1.3. To evaluate the reliability of the IGDS using a reliability generalization meta-analysis and identify factors associated with variation in the coefficients (e.g., scale version/language, response format, and sample characteristics).

These objectives are addressed in **Studies 1-3**, respectively.

Characterization of gaming among university students in Spain, Italy, and Mexico

General objective

To characterize the phenomenon of gaming among the university population in the three countries and describe their participation profiles, as well as the associated sociodemographic and psychosocial differences.

Specific objectives

- 2.1. To describe the gaming participation profiles by gender in the university sample in each country.
- 2.2. To describe the gaming participation profiles (current gamers, ex-gamers, and non-gamers) in the university sample in each country.
- 2.3. To analyze, in each country, the differences in sociodemographic and psychosocial variables among the gaming participation profiles.

These objectives are addressed in **Studies 4-6** and **7-9**, respectively.

Characterization of IGD among university students in Spain, Italy, and Mexico

General objective

To analyze the manifestation of IGD symptomatology among university students in the three countries, estimate the proportion of students who meet IGD criteria, and identify sociodemographic and psychosocial differences associated with students with and without symptomatology, using independent analyses in each country.

Specific objectives

- 2.4. To estimate, in each country, the proportion of college students who meet the criteria for IGD.
- 2.5. To analyze, in each country, differences in sociodemographic and psychosocial variables between college students who meet the criteria for IGD and those who do not.
- 2.6. To explore, in each country, the association between IGD symptomatology and relevant psychosocial variables, controlling for pertinent covariates.

These objectives are addressed in **Studies 10** and **11**.

New methodological approaches to IGD

General objective

To analyze and propose an alternative diagnostic approach to IGD in unidimensional models based on a summation of criteria to better capture the disorder's complexity.

Specific objectives

- 4.1. To examine the factorial structure of the IGDS using emergent analysis approaches.

4.2. To identify latent classes of IGD symptomatology in the three countries.

These objectives are addressed in **Study 12** and **13**, respectively.

METHODOLOGY

Procedure

The present doctoral thesis includes systematic reviews, meta-analyses, and empirical studies. For the review studies and meta-analyses, a preliminary search was conducted in PROSPERO to identify potential study protocols that had already addressed the topics of interest. After confirming that none existed, the respective protocols were registered (IDs CRD42022330840, CRD42023400540, and CRD420251068921). The empirical studies adhered to the ethical principles outlined in the 1964 Declaration of Helsinki and its subsequent amendments or comparable ethical standards. Moreover, ethical approval was obtained from the Ethics Committees of the University of Valencia (Protocol 2023-MAG-2988759), the Università degli Studi di Torino (Protocol 0592473), and Tecnológico de Monterrey (Protocol EHE-2023-08). Subsequently, a general anonymized survey was created using the LimeSurvey platform to collect sociodemographic data, video game-related information, and various psychosocial variables, including informed consent prior to participation.

Participants

Samples were collected between the 2022–2023 and 2024–2025 academic years using a non-probabilistic convenience sampling method. This sampling approach was chosen due to the accessibility and availability of participants within the university environment. Recruitment was carried out through in-person invitations during university lectures across different undergraduate degree programs, where a brief presentation of the project

was provided and the survey link was shared. Participation was voluntary, and anonymity and confidentiality were guaranteed to reduce potential social desirability bias. No compensation was offered for the students' participation.

Inclusion criteria were being a university student, being Spanish-speaking in the case of Spain and Mexico, and Italian-speaking in the case of Italy, and being at least 18 years old. The final samples consisted of 798 university students in Spain (65% female), 717 in Italy (50% female), and 1,318 in Mexico (46% female). Some studies were conducted before data collection was completed, resulting in a smaller sample.

Measures

Sociodemographic information was collected, including sex, gender, age, educational institution, current academic/employment status, and monthly household income. Information related to video game use was also collected, including age of onset, current gaming status (current, non-current, and non-gamer), weekly gaming hours, the gaming mode (such as playing alone, with family or friends, with acquaintances, or with strangers), and the perceived toxicity of gaming communities. The perceived toxicity was reported on a five-point scale, where higher scores indicate greater perceived toxicity.

In addition, validated instruments assessing gaming motivations, IGD, and psychosocial variables (such as emotional intelligence, perceived social support, impulsivity, prosocial behavior, and general mental health) were included (see Table 2). When prior validated Spanish or Italian versions of the instruments were not available, a native researcher conducted forward and backward translations following the guidelines described by Wild et al. (2005).

Table 2

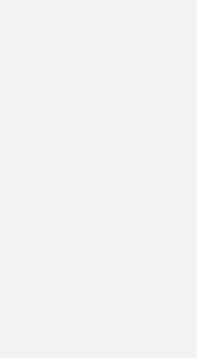
Survey instruments

Variable	Scale	Characteristics	Translations/Validations
Gaming Motivations	e-MUV (López-Fernández et al., 2019)	32 items; Likert scale 1–5; 8 dimensions: Immersion, Customization, Violent Gratification, Coping, Fun, Cognitive Challenge, Competition, and Social Interaction	Gisbert-Pérez et al. (2025); Forward and backward translation (Wild et al., 2005)
IGD	IGDS (Lemmens et al., 2015)	9 items (DSM-5 criteria); Likert scale 0–5	Forward and backward translation (Wild et al., 2005)
Emotional Intelligence	WLEIS-S (Wong & Law, 2002)	16 items; Likert scale 1–7; 4 dimensions: Interpersonal perception, Intrapersonal perception, Emotional awareness, and Emotional regulation	Extremiera et al. (2019) Iliceto & Fino (2017)
Perceived Social Support	MSPSS (Zimet et al., 1998)	12 items; Likert scale 1–4; 3 dimensions: Family, Friends, and Significant Others	Gisbert-Pérez et al. (2025) Di Fabio & Busoni (2008)
Impulsivity	UPPS-P (Billieux et al., 2012)	20 items; Likert scale 1–4; 5 dimensions: Positive urgency, Negative urgency, Lack of premeditation, Lack of perseverance, and Sensation seeking	Cándido et al. (2012) D’Orta et al. (2015)
Prosocial Behavior	PBS (Caprara et al., 2005)	16 items; Likert scale 1–5	Rodriguez et al. (2017)
General Mental Health	GHQ-12 (Goldberg & Williams, 1988)	12 items; Likert scale 0–3	Brabete et al. (2014) Politi et al. (1994)

Note. IGDS: Internet Gaming Disorder Scale; WLEIS-S: Wong & Law's Emotional Intelligence Scale; MSPSS: Multidimensional Scale of Perceived Social Support; UPPS-P: Short Impulsive Behavior Scale; PBS: Prosocial Behavior Scale (for adults); GHQ-12: General Health Questionnaire-12.

STUDIES²

² The original numbering of figures and tables in published articles is respected. Supplementary material of the articles is included in the Supplementary Materials section.



Theoretical and methodological update of IGD

Study 1. Prevalence of Internet gaming disorder in young adults: a systematic review and meta-analysis³

Gisbert-Pérez, J., Longobardi, C., Martí-Vilar, M., Mastrokoulou, S., & Badenes-Ribera, L. (2026). Prevalence of Internet gaming disorder in young adults: a systematic review and meta-analysis. *Addictive Behaviors*, 174, 108576. <https://doi.org/10.1016/j.addbeh.2025.108576>

Abstract

Internet Gaming Disorder (IGD) is recognized as a condition for further study in DSM-5-TR and officially classified in ICD-11. Although gaming problems seem like an adolescent concern, growing evidence indicates that young adults are also vulnerable. This systematic review and meta-analysis aimed to estimate the global prevalence of IGD among young adults and identify sociodemographic and methodological moderators associated with its variability. Ninety-six analytical samples from 93 studies published (2015-2025) were included, comprising 149,601 participants aged 18-35 ($M_{\text{age}} = 23.53$ years, $SD_{\text{age}} = 6.28$; 51.22% female). Generalized linear mixed models were applied to compute pooled prevalence estimates. The pooled prevalence of IGD was 6.1 % (95 % CI: 5.03-7.40). Prevalence was significantly higher in gamer-only samples (8.1 %, 95 % CI: 5.91-11.01) compared to mixed samples, including gamers and non-gamers (5.47 %, 95 % CI: 4.33-6.90). Moderator analyses showed that IGD prevalence differed by diagnostic instrument (IGDS and DSM-V criteria > IGDT-10) and by sample size, and a trend also emerged suggesting lower prevalence with higher proportions of women. In

³ All references of the studies included in the review and meta-analysis are listed in the Supplementary Material.

gamer-only samples, prevalence increased over time and in studies with a higher risk of bias. In mixed samples, prevalence differed by instrument (IGDS > GAS) and was negatively associated with sample size. These findings indicate that IGD is more prevalent among young adults than in the general population, especially among gamers. The variability observed across studies highlights the need for methodological consistency and the use of validated diagnostic tools to improve comparability and inform prevention and intervention strategies.

Keywords: Behavioral addiction; Internet gaming disorder; Meta-analysis; Prevalence; Young adulthood.

Introduction

To what extent can video games impact adult well-being? While the development of unhealthy gaming habits and Internet Gaming Disorder (IGD) has typically been associated with adolescence, the rising incidence of these issues in early adulthood is gaining attention from both academics and clinicians (Gao et al., 2022). Late adolescents and young adults tend to exhibit higher levels of depression, anxiety, and stress, along with lower self-esteem, compared to healthy regular gamers (Laconi et al., 2017, Rahul et al., 2025).

IGD is recognized in the DSM-5-TR as a condition for further study. It is characterized by persistent and recurrent use of the Internet to engage in gaming activities, often with other players, resulting in clinically significant impairment or distress (APA, 2022). The DSM-5-TR comprises nine diagnostic criteria. These criteria include (1) preoccupation with gaming (the individual frequently thinks about previous gaming experiences or anticipates playing the next game), (2) withdrawal symptoms (experiencing irritability, anxiety, or sadness when not gaming), (3) tolerance (an increasing need to spend more time gaming), (4) unsuccessful attempts to control gaming habits, (5) loss of interest in previous hobbies, (6) continued excessive gaming despite problems (such as social or psychological issues), (7) deception about the extent of their gaming, (8) using gaming to escape negative mood, (9) jeopardizing relationships or opportunities (APA, 2022). To receive a diagnosis, an individual must meet at least five of these criteria within 12 months, and the severity will depend on the disruption of their lives. Previously, the World Health Organization (WHO) included gaming disorder as an official diagnosis in the International Classification of Diseases, 11th edition (ICD-11; WHO, 2018). The three core diagnostic features must be present for a minimum of

12 months are (1) inability to control gaming behavior, (2) increasing priority given to gaming over other activities, and (3) persistent gaming behavior despite experiencing negative consequences.

According to meta-analyses by Kim et al. (2022), Stevens et al. (2021) and Zhou et al. (2024), the estimated prevalence of IGD at the general population ranges between 3.05 % and 6.7 %. However, these estimates vary significantly when reported for specific age groups or derived from samples across different countries or continents (Stevens et al., 2021). Considering samples of children and adolescents, the prevalence typically ranges between 1 % and 9 % (Gentile et al., 2017). In general, the prevalence of adolescent samples is estimated at 4.6 % (95 % CI: 3.4 %–6.0 %). When examining these samples by continent, the prevalence for adolescents ranges from 4 % to 10 %. Additionally, the meta-analysis by Gao et al. (2022) found an overall prevalence of IGD among adolescents and young adults to be 9.9 % (95 % CI: 8.6 %–11.3 %), with lower prevalence rates observed in adolescents (8.8 %) compared to young adults (10.4 %). This rising prevalence in young adults underscores the importance of providing age-specific prevalence estimates and considering various factors contributing to variability.

Young adulthood is a crucial stage for biological, psychological, and social development, typically defined as the period from 18 to 35 years of age (Verburgh et al., 2014; APA, 2025). Within this age range, the concept of emerging adulthood specifically addresses individuals aged 18 to 29 (Arnett et al., 2014). Additionally, the WHO (2024) defines adolescents and youth as those up to 24 years old, recognizing the gradual transition into adult roles. This shift demonstrates a contemporary understanding of the delayed onset of traditional markers of adulthood, such as achieving financial independence, forming stable relationships, and starting a family (Sawyer et al., 2018).

The American Psychological Association also notes that young adulthood can extend from the early 20 s to the mid-30 s, emphasizing that the process of adult development is often prolonged in modern societies (APA, 2025).

During this extended developmental stage, many processes that begin in adolescence, such as brain maturation, identity exploration, and the establishment of intimate relationships, remain ongoing (Institute of Medicine & National Research Council, 2015). While young adulthood is marked by increasing autonomy and cognitive maturity, it is also a period of instability and vulnerability, potentially heightening the risk for conditions such as IGD, as individuals seek coping mechanisms during transitions in education, work, and social life (Kinghorn et al., 2018).

IGD shares similarities with other behavioral and substance-related addictive disorders among young adults. One of these similarities is the loss of control over gaming behavior, which is comparable to issues found in disorders such as gambling disorder, compulsive buying disorder, and obsessive–compulsive disorder (Stevens et al., 2021). However, the DSM-5-TR notes that the diagnostic criteria for IGD are specifically applicable to gaming behaviors (APA, 2022). Prevalence estimates for these disorders among young adults or the general adult population also seem to vary significantly. The overall prevalence of gambling disorder in adults is estimated to be 2.8 % (95 % CI: 1.9 % to 3.9 %; Tran et al., 2024). The prevalence of compulsive buying in the adult population is estimated at 4.9 % (95 % CI: 3.4 % to 6.9 %; Maraz et al., 2015). For any type of obsessive–compulsive disorder in adults, the estimated prevalence is 17.5 % (95 % CI: 5.7 % to 33.9 %; Sharma et al., 2021), although this estimate decreases when focusing on specific obsessive–compulsive disorders. Even behavioral disorders with online components show markedly different prevalence estimates among emerging adults,

suggesting that these conditions represent distinct forms of concern (mild-problematic internet use: 12.1 %; online gambling disorder: 5.1 %; Díaz-López et al., 2024).

Regarding IGD comorbidity, a comprehensive review found an association between IGD and various conditions, including depression, anxiety, ADHD, and other psychiatric symptoms (González-Bueso et al., 2018). Furthermore, IGD seems to be associated with pathological gambling (Ayala-Rojas et al., 2021) and alcohol use disorder in adults (Na et al., 2017). Individuals with both IGD and alcohol use disorder tend to display more severe clinical features, such as impulsiveness, impaired self-control, and mood symptoms like depression, compared to those affected by only one of these conditions. These findings suggest not only a general comorbidity with certain disorders but also a potential for more specific or intensified comorbidities in adulthood.

Aim of the study

The differences in prevalence and specific characteristics highlight the necessity to investigate the overall prevalence of IGD among young adults. Therefore, the main objective of this study is to provide a comprehensive meta-analytic synthesis of the prevalence of IGD in young adults, while also examining potential moderators that may account for the observed heterogeneity in prevalence rates. Understanding the extent of IGD in young adults will help practitioners develop targeted prevention strategies and interventions tailored to this specific age group and will contribute to the refinement of methodological approaches used in future IGD prevalence research.

Method

Study design

The present systematic review and meta-analysis were conducted following the Preferred Reporting Items for Systematic reviews and Meta-Analyses guidelines (PRISMA 2020; Page et al., 2021). The protocol for the present study was registered in PROSPERO (ID CRD420251068921). Supplementary materials (Table S1) include the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols guidelines (PRISMA 2020) and Guidelines for Reporting Systematic Reviews and Meta-Analyses (Rubio-Aparicio et al., 2018).

Search strategy

The study search was conducted between April and May 2025, using three electronic databases: Web of Science (Core Collection), Scopus and PsycInfo. The search strategy used was: (“internet gaming disorder” or “online games addiction” or “problematic gaming behav*” OR “pathologic video game use” OR “digital game addiction”) AND (“emerg* adult*” OR “young adult*” OR “university*” OR “college” OR “youth”). Further manual searches of reference lists from the retrieved studies and previous systematic reviews and meta-analyses (Darvesh et al., 2020, Kim et al., 2022, Stevens et al., 2021, Zhou et al., 2024) were conducted to identify additional studies that met the inclusion criteria. Duplicate and reference management was performed using Refworks (ProQuest, 2025).

Study selection criteria

Studies were included if they: (1) reported a prevalence figure of Internet gaming disorder in a general or gamer-specific sample; (2) provided original empirical data; (3) comprised

a sample of participants with ages between 18 and 35 years; and (4) were available in English or Spanish. Studies were excluded if they: (1) provided insufficient demographic or methodological data; (2) reported a prevalence that could not be calculated from the available data; (3) used clinical specific samples (e.g., ADHD or IGD samples); or (4) used the same participant sample as another included study. Two researchers screened study titles, abstracts, and full-text inclusion criteria independently. Disagreements were resolved through discussion, and, if necessary, a third researcher was consulted.

Study coding

In order to investigate the potential influence of study characteristics on effect sizes, two researchers coded the study, methodological and participant variables independently. Disagreements were resolved through discussion, and, if necessary, a third researcher was consulted. Study-coded variables were (1) publication year, (2) country or continent where the study was conducted, (3) sampling technique (e.g., probabilistic or non-probabilistic), (4) year of data collection, (5) sample size, (6) instrument used to measure IGD, (7) number of items in the IGD instrument, (8) diagnostic manual on which the instrument was based, (9) instrument language, (10) number of response anchors, and (11) criteria used to identify IGD participants.

Methodological moderator variables were (12) study design (cross-sectional or longitudinal), (13) instrument used to measure IGD, (14) number of items in the IGD instrument, (15) diagnostic manual on which the instrument was based, (16) instrument language, (17) number of response anchors, and (18) criteria used to identify IGD participants.

Participant moderator variables were (19) reference population (e.g., general young adults, university students), (20) type of university students when applicable, (21) gamer-only sample (yes/no), (22) sample mean age, (23) sample age standard deviation, (24) age range, (25) proportion of female participants, (26) mean scale score, (27) standard deviation of the scale score, and (28) number of IGD cases.

Study quality

The risk of bias for individual studies was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Studies Reporting Prevalence Data (Joanna Briggs Institute, 2018, Munn et al., 2015). Risk of bias (RoB) was categorized as high when fewer than 50 % of items received a “yes,” moderate when 50–69 % received a “yes,” and low when 70 % or more received a “yes” (Kim et al., 2022). The checklist includes 9 criteria: (1) appropriate sample to address the target population, (2) appropriate sampling, (3) adequate sample, (4) detailed descriptions of study subjects and setting, (5) analysis conducted with sufficient coverage of the identified sample, (6) valid identification methods, (7) standardized and reliable measurements, (8) appropriate statistical analyses, and (9) adequate response rate. Each item was evaluated using yes/no/unclear coding (Supplementary materials Table S2). Two researchers independently assessed the risk of bias of individual studies. Disagreements were resolved through discussion and, if necessary, consultation with a third researcher. Risk of bias classifications were subsequently used as a moderator in the meta-analytic models.

Effect size estimate

Data on effect size included the proportion of participants who fulfilled the diagnostic criteria for IGD. This proportion was computed by dividing the number of

participants who met the diagnostic criteria for IGD by the total number of participants in the sample. In line with standard meta-analytic procedures (Borenstein et al., 2021), the effect size from each study was converted to logits for all analyses. After performing the statistical analyses, the outcomes (in logits) were converted back to proportions along with their associated confidence intervals to facilitate interpretation. Only the baseline IGD data were considered in longitudinal study designs to ensure comparability across studies. Two researchers calculated proportions independently. Disagreements were resolved through discussion, and, if necessary, a third researcher was consulted.

Statistical analysis

Meta-analysis was conducted using generalized linear mixed models (GLMMs) with a logit link function to estimate the proportion of participants with IGD. GLMMs have been suggested for estimating non-normal distributions such as proportions, since they offer lower bias, lower mean squared errors, and higher coverage probabilities than two-step methods (Lin & Chu, 2020). This study reports prevalence estimates with 95 % confidence intervals (CIs) and 95 % prediction intervals (PIs). All parameters were estimated using the maximum-likelihood approach. For each meta-analysis, a forest plot was created, and both the average effect size and a 95 % confidence interval (95 % CI) were determined. Inter-study heterogeneity was analyzed with Higgins' inconsistency index (I^2) and tested using the likelihood ratio test. Possible sources of heterogeneity were explored using univariate GLMMs. Categorical moderators included risk of bias, reference population, sampling technique, age-group category, geographical provenance, study design, and diagnostic manual underlying the IGD instrument. Quantitative moderators included year of publication, year of data collection, risk-of-bias score, mean age, proportion of female participants, and sample size. Classical recommendations were

used to assess categorical moderators with at least three studies at each level, and continuous moderators with at least ten studies per covariate (Borenstein et al., 2021). For each categorical moderator, a log-likelihood ratio test (LRT) was used to compare the null model against a model including the moderator. Significant omnibus tests ($p < .05$) were followed by pairwise post-hoc comparisons between moderator levels using Tukey-adjusted contrasts to determine specific group differences. Outlier diagnostic procedures were conducted to assess the potential impact of outliers or influential cases on the meta-analytic estimates (Viechtbauer & Cheung, 2010). Standardized residuals and studentized deleted residuals were computed for each study; effect sizes with either residual exceeding ± 1.96 were considered potential outliers. Influence was assessed using case-deletion diagnostics, including Cook's distance, covariance ratios and leverage (hat) values. When potential outliers demonstrated an influential impact on the meta-analytic results, sensitivity analyses were performed using a leave-one-out method, comparing the overall pooled estimate after excluding each study to assess whether its inclusion substantially affected the meta-analytic results. To assess potential publication bias, the DOI plot (Difference of Means–Oriented Index plot) symmetry and *LFK* index (Luis Furuya-Kanamori) were analyzed, as they are considered more sensitive techniques in prevalence meta-analysis than the funnel plot (Furuya-Kanamori et al., 2018). *LFK* index values between -1 and $+1$ indicate no asymmetry (no publication bias), values between ± 1 and ± 2 indicate minor asymmetry (possible bias), and values beyond ± 2 indicate major asymmetry (substantial publication bias). A $< 0.05p$ -value was considered statistically significant. Meta-analysis was performed using the *metafor* R package in R (version 4.4.0; Viechtbauer, 2010).

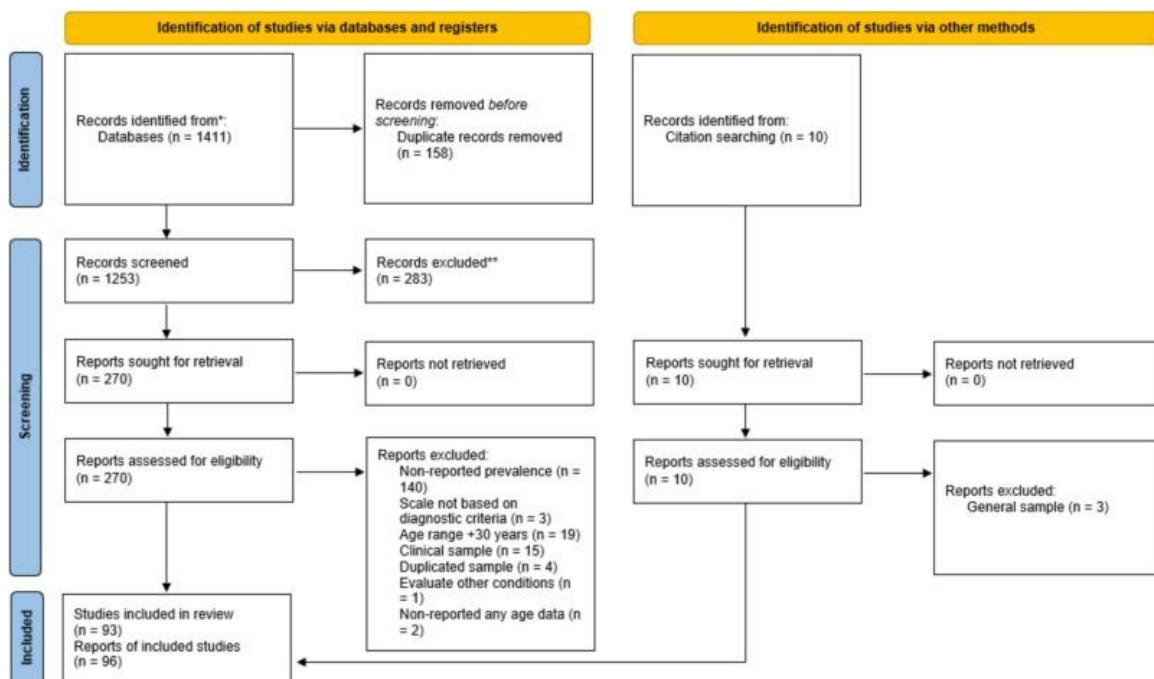
Results

Study selection

The search identified 1411 articles. After removing duplicates, 1,253 articles were screened based on title and abstract, of which 270 were identified as potentially eligible. After screening the full text of the 270 articles, 86 articles finally met the inclusion criteria. An additional manual search of reference lists from screened articles and previous systematic reviews identified 10 further records, of which 7 met the eligibility criteria. In total, 93 articles were included, contributing 96 analytical samples to the meta-analysis (Figure 1). The complete list of included studies is provided in the Supplementary Materials.

Figure 1

PRISMA flowchart



Study characteristics

Supplementary materials (Table S3) included study characteristics of the meta-analyzed studies. All the studies included in the meta-analysis are empirical articles published in scientific journals. Of the 2-year periods considered, the one with the highest number of articles was 2023–2024 ($n = 31$; 33.3 %), followed by 2021–2022 ($n = 17$; 18.3 %), 2019–2020 ($n = 14$; 15 %), 2017–2018 ($n = 10$; 10.7 %), and 2015–2016 ($n = 5$; 5.3 %). The year 2025 had $n = 8$ (8.6 %). Most articles used a cross-sectional design ($k = 87$; 90.6 %) rather than a longitudinal design ($k = 9$; 9.4 %).

Of the analytic samples, the majority were Asian ($k = 38$; 39.6 %), followed by European ($k = 20$; 20.8 %), North American ($k = 17$; 17.7 %), African ($k = 6$; 6.3 %), and Oceanic ($k = 5$; 5.2 %). Additionally, 11 samples included participants from intercontinental backgrounds (11.5 %). The samples primarily came from university settings ($k = 70$; 73 %), followed by general samples ($k = 25$; 26 %), and vocational settings ($k = 1$; 1.0 %). Most of the samples were general, including gamers and non-gamers ($k = 69$; 71.9 %), compared to samples of gamers only ($k = 27$; 28.1 %). A total of 149,601 participants were involved in the analytical samples (51.22 % female). Most of the studies reported complete information on the age of the participants ($k = 56$; 58.3 %) or were missing data on one age variable extracted ($k = 30$; 31.3 %).

Regarding the instrument used to diagnose IGD, the main instruments were: IGDS9-SF ($k = 32$; 33.3 %), DSM-5 Criteria ($k = 14$; 14.6 %), IGDS ($k = 15$; 15.56 %), IGD-20 ($k = 10$; 10.4 %), GAS and derivatives ($k = 6$; 6.3 %), IGDT-10 ($k = 5$; 5.2 %), GSMQ-9 ($k = 2$; 2.1 %), and POGQ-SF ($k = 2$; 2.1 %). The remaining instruments (C-VAT 2.0, PVGU, CSAS, and others) were applied in a single sample each ($k = 1$; 1.0 %).

Quality assessment in studies

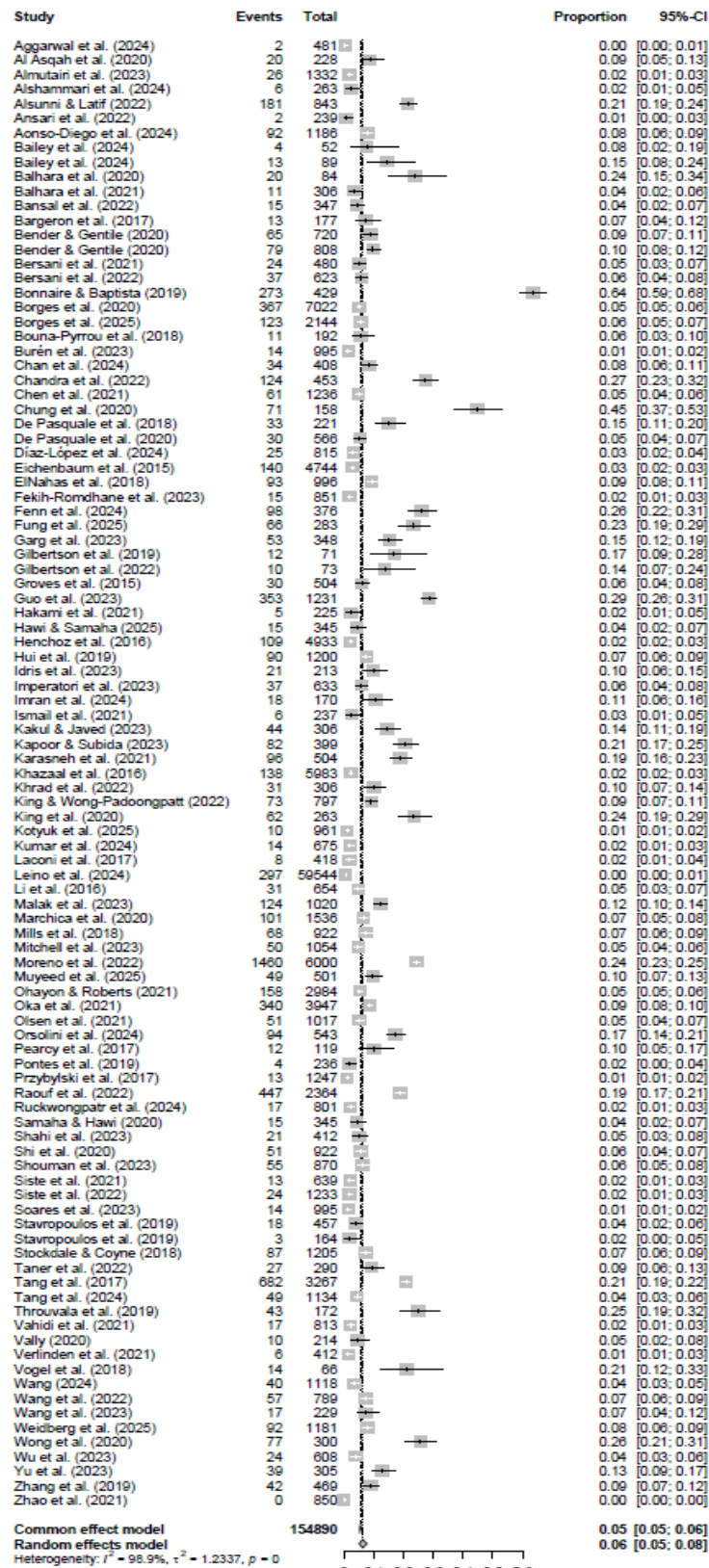
Table S2 included the quality assessment of the meta-analyzed studies. Of the 96 analytic samples, 38 were rated as low ($k = 39.6\%$), 49 as moderate ($k = 51\%$), and 9 as high ($k = 9.4\%$).

Meta-analytical results

Figure 2 shows the forest plot of the global IGD prevalence in young adults ($k = 96$). The prevalence rate in primary studies ranged from 0 % to 63 %, with a mean prevalence of 6.1 % (95 % CI: 5.03 %, 7.4 %; 95 % PI: 0.9–31.87 %) in young adult samples. This pooled estimate provides an approximation of IGD prevalence among young adults. Substantial between-study heterogeneity was observed (LRT: $\chi^2[95] = 10,849.87$, $p < .001$, $I^2 = 98.8\%$).

Figure 2

Forest plot of observed prevalences and global mean estimate of IGD



Sensitivity analyses

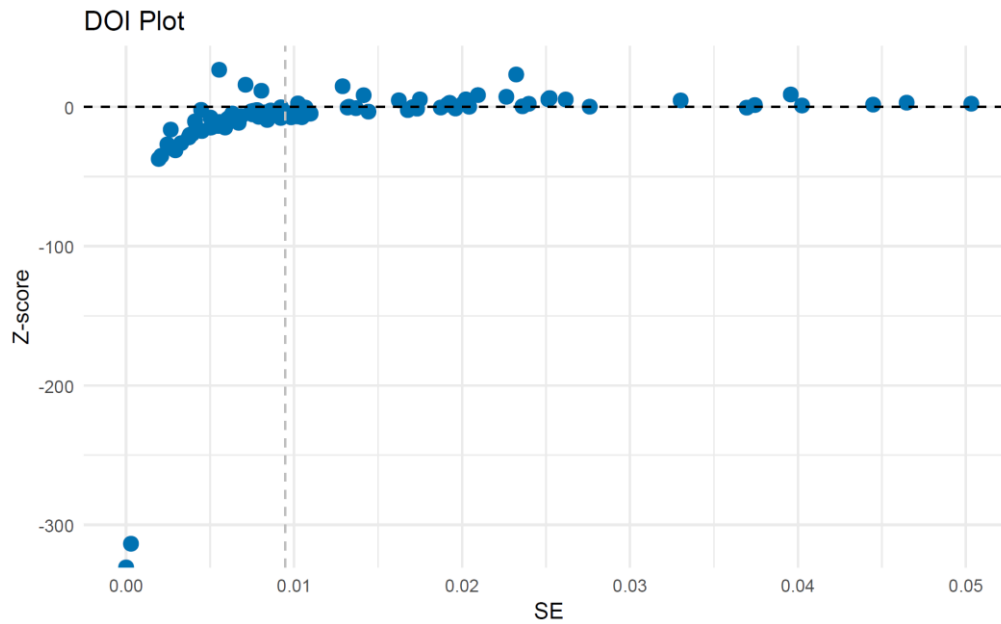
Three studies (Aggarwal et al., 2024; Chung et al., 2019; Leino et al., 2024) were identified as potential outliers and influential studies. Sensitivity analyses were conducted by refitting the random-effects model after excluding the three influential studies. Changes in confidence and prediction intervals were minimal (range: 6.12 %–6.45 %), supporting the robustness of the findings. In the mixed-sample subgroup (including both gamers and non-gamers), the same three studies were identified as influential outliers, but their exclusion did not materially affect the pooled prevalence (range: 5.42–5.84 %). In the gamer-only subgroup, no statistical outliers were detected. The leave-one-out analysis indicated that the prevalence estimate ranged from 5.97 % to 6.28 % when excluding individual studies, with confidence intervals consistent with the overall estimate. Heterogeneity and between-study variability remained stable, suggesting that the results are robust and not affected by outliers and influential studies.

Publication bias

Publication bias detection was conducted using the DOI plot (Difference of Means–Oriented Index plot) and the *LFK* index (Luis Furuya-Kanamori). Figure 3 reveals a pronounced leftward asymmetry in the DOI plot, confirmed by an *LFK* index of -3.8 , which exceeds the established ± 2 threshold, indicating significant asymmetry. This finding suggests the likely presence of publication bias among the studies included in this meta-analysis.

Figure 3

Results of DOI plot



Moderator analyses

Moderator analyses were conducted on the overall sample to investigate potential sources of heterogeneity in the prevalence estimates of IGD. Furthermore, statistically significant differences were observed between samples of exclusive gamers and mixed samples (comprising gamers and non-gamers). Further analyses within each subgroup helped clarify the effects on these estimates. Table 1 and Table 2 include the categorical and quantitative moderator analyses, respectively.

Table 1

Results of categorical moderator variables on the prevalence of IGD in young adults

	Global prevalence			Mixed samples			Gamer samples		
	<i>k</i>	eff (95% CI)	<i>p</i>	<i>k</i>	eff (95% CI)	<i>p</i>	<i>k</i>	eff (95% CI)	<i>p</i>
Risk of bias	101		.156	72		.864	29		.023
Low	41	5.63% (3.98%, 7.89%)		33	5.03% (3.38%, 7.44%)		8	8.72% (4.76%, 15.46%)	
Medium	50	5.95% (4.65%; 7.58%)		5	7.14% (1.79%, 24.46%)		16	7.12% (4.60%, 10.86%)	
High	10	13.26% (5.84%, 27.37%)		34	5.47% (4.08%, 7.30%)		5	22.56% (11.16%, 40.31%)	
Reference population	100		.559	72		.398	28		.821
General	27	7.02% (4.46%, 10.89%)		19	5.04% (3.81%, 6.65%)		8	9.61% (6.71%, 13.58%)	
University students	73	6.04% (4.78%, 7.61%)		53	6.44% (3.91%, 10.44%)		20	8.5% (3.26%, 20.67%)	
Sampling technique	101		.799	72		.691	29		<.001
Non-probabilistic	88	5.28% (5.16%, 5.40%)		62	5.49% (4.22%, 7.11%)		26	8.36% (5.70%, 12.09%)	
Probabilistic	13	6.37% (6.01%, 6.75%)		10	4.71% (2.27%, 9.5%)		3	21.55% (15.69%, 28.86%)	
Age range	74		.327	53		.393	21		.269
Late adolescence (18-24)	19	8.61% (5.6%, 12.89%)		15	12.05% (11.68, 12.44)		4	12.67% (7.41%, 20.82%)	

Emerging adulthood (18-29)	36	6.85% (4.60%, 10.07%)	25	5.04% (4.59%, 5.53%)	11	13.88% (4.65%, 34.78%)
Young adulthood (18-35)	19	5.63% (3.86%, 8.14%)	15	9.05% (8.56%, 9.58%)	6	6.31% (2.94%, 13%)
Geographical procedence	98	.825	69	.185	29	.458
Asia	49	5.77% (4.15%, 7.98%)	35	4.72% (3.17%, 6.97%)	14	13.89% (5.04%, 32.88%)
Europe	21	5.75 (3.42%, 9.51%)	15	3.94% (2.45%, 6.28%)	6	9.41% (5.60%, 15.39%)
America	21	7.39% (5.95%, 9.93%)	15	7.39% (4.92%, 10.96%)	6	7.26% (5.54%, 9.45%)
Oceania	3	5.95% (2.77%, 12.31%)	-	-	3	5.95% (2.77%, 12.31%)
Africa	4	6.93% (2.93%, 15.54%)	4	6.93% (2.93%, 15.54%)	-	-
IGD instrument	82	.002	59	<.001	24	.001
IGDS9-SF	32	4.98% (3.52%, 7.00%)	25	4.82% (3.20%, 7.21%)	7	5.58% (2.99%, 10.18%)
IGD-20	10	6.21% (3.50%, 10.76%)	7	5.10% (2.50%, 10.09%)	3	9.88% (4.78%, 19.32%)
DSM-5 Criteria	14	8.94% (5.59%, 13.99%)	9	8.30% (4.13%, 15.98%)	5	9.85% (6.63%, 14.40%)
IGDS	15	8.83% (6.90%, 11.24%)	12	8.81% (6.53%, 11.80%)	3	7.95% (6.94%, 9.09%)

GAS	6	7.44% (1.99%, 24.12%)	4	1.88% (0.83%, 4.22%)	3	35.18% (17.31%, 58.45%)
IGDT-10	5	3% (1.77%, 5.05%)	-	-	3	3.19% (1.39%, 7.14%)
Scale diagnostic manual based on	94		.741	68	.193	26
DSM-5	83	6.23% (5.11%, 7.58%)	60	5.84% (4.55%, 7.46%)	23	7.37% (5.46%, 9.87%)
DSM-4	11	7.23% (3.00%, 16.39%)	8	3.58% (1.76%, 7.14%)	3	35.18% (17.31%, 58.45%)

Note. *k*: number of studies included, eff: effect size (mean prevalence), 95% CI: 95% confidence interval.

Table 2

Results of quantitative moderator variables on the prevalence of IGD

	Global prevalence				Mixed samples				Gamer samples			
	<i>k</i>	Coeff	(95% CI)	<i>p</i>	<i>k</i>	Coeff	(95% CI)	<i>p</i>	<i>k</i>	Coeff	(95% CI)	<i>p</i>
Year of publication	101	-.015	(-0.102, 0.073)	.747	72	-.043	(-0.142, 0.056)	.397	29	.054	(-0.110; 0.219)	.515
Year of data collection	78	.054	(-0.037, 0.145)	.247	58	.008	(-0.093, 0.111)	.867	20	.213	(0.024, 0.402)	.027
Risk of bias of studies	100	.319	(0.065, -0.02)	.065	72	.143	(-0.279, 0.566)	.506	28	.455	(0.107, -0.09)	.107
Mean age sample	95	-.083	(-0.196, 0.028)	.141	67	-.076	(-0.198, 0.045)	.216	28	-.029	(-0.287, 0.229)	.825
Proportion of females	96	-.012	(-0.024, 0.000)	.052	67	-.01	(-0.022, 0.006)	.276	29	-.017	(-0.039, 0.0005)	.134
Sample size	101	-.00	(-0.001, -0.000)	.010	72	-.00	(-0.001, -0.000)	.019	29	-.00	(-0.001, 0.000)	.201

Note. *k*: number of studies included; 95% CI: 95% confidence interval.

Global prevalence moderators

The prevalence of IGD among samples of gamers only was 8.1 % (95 % CI: 5.91 %, 11.01 %; 95 % PI: 1.53–33.3 %; $I^2 = 95.3$ %), which differed significantly from samples comprising both gamers and non-gamers (5.47 %; 95 % CI: 4.33 %, 6.90 %; 95 % PI: 0.7–30.3 %; $I^2 = 99.1$ %; $p = .049$). The prevalence of IGD among university samples was 6.02 (95 % CI: 4.83 %, 7.49 %; $I^2 = 98.6$), which did not differ from that of general young adults (6.29 %; 95 % CI: 4.16 %, 9.39 %; $I^2 = 99$ %; $p = .854$). Prevalence estimates could not be calculated for vocational students because of an insufficient number of studies ($k = 1$).

Regarding age groups (including studies that reported sample age range, $k = 70$), the prevalence of IGD did not differ between late adolescents (18–24 years; 8.02 %, CI 95 %: 5.26 %, 12.03 %, $I^2 = 97.2$ %), emerging adults (18–29 years; 6.78 %, CI 95 %: 4.95 %, 9.23 %, $I^2 = 98.3$ %) and young adults (18–35 years; 5.63 %, CI 95 %: 3.86 %, 8.14 %, $I^2 = 94.3$ %; $p = .458$).

The pooled prevalence estimates varied significantly depending on the instrument applied across the included studies ($k = 82$; $p = .002$; Table 1). Only those instruments used in at least three samples were included. Post-hoc pairwise comparisons, adjusted using the Holm method to control multiple testing, revealed that studies using the IGDS reported significantly higher IGD prevalence estimates than those using the IGDT-10 ($\Delta = 1.14$, $p_{adj} = 0.003$). Similarly, studies based on DSM-5 criteria yielded higher prevalence estimates than those based on the IGDT-10 ($\Delta = 1.15$, $p_{adj} = 0.031$). No statistically significant subgroup differences were found among the other categorical moderators (risk of bias, reference population, sampling technique, different age range samples, geographical precedence, and diagnostic manual). Meta-regression results with

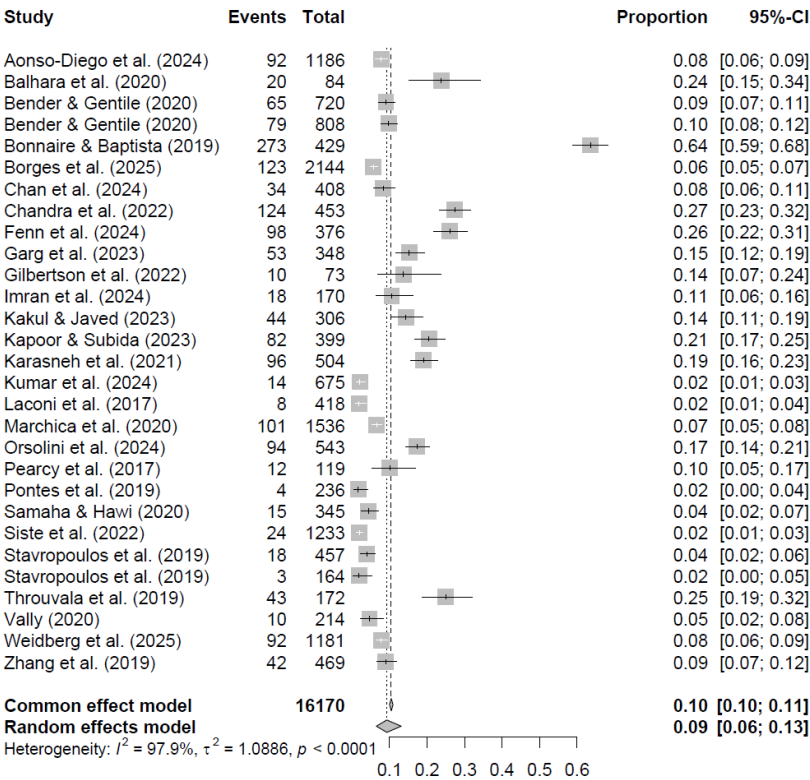
all samples indicated a marginally significant trend that samples with higher proportions of females were associated with lower IGD prevalence (coefficient = -0.011 , CI 95 %: $-0.022, 0.003$; $p = .056$). Likewise, larger sample sizes were also statistically significantly linked to lower prevalence estimates (coefficient = -0.000 , CI 95 %: $-0.001, -0.000$; $p = .004$).

Gamer prevalence moderators

Figure 4 illustrates the observed prevalence and mean estimate in gamer-only samples. Statistically significant subgroup differences were found regarding studies' risk of bias ($k = 29, p = .023$). Post-hoc comparisons indicated that studies with a high risk of bias yielded significantly higher prevalence estimates of IGD compared to those with a moderate ($\Delta = 0.96, p_{adj} = 0.001$) or low risk of bias ($\Delta = 0.94, p_{adj} = 0.012$). No statistically significant subgroup differences were found among the other categorical moderators in gamer samples. Meta-regression results indicated that the estimated prevalence in the gamer sample increased over the years (coefficient = 0.21 , 95 % CI: $0.036, 0.397$; $p = .018$).

Figure 4

Forest plot of observed prevalences and global mean estimate of IGD in gamer-only samples

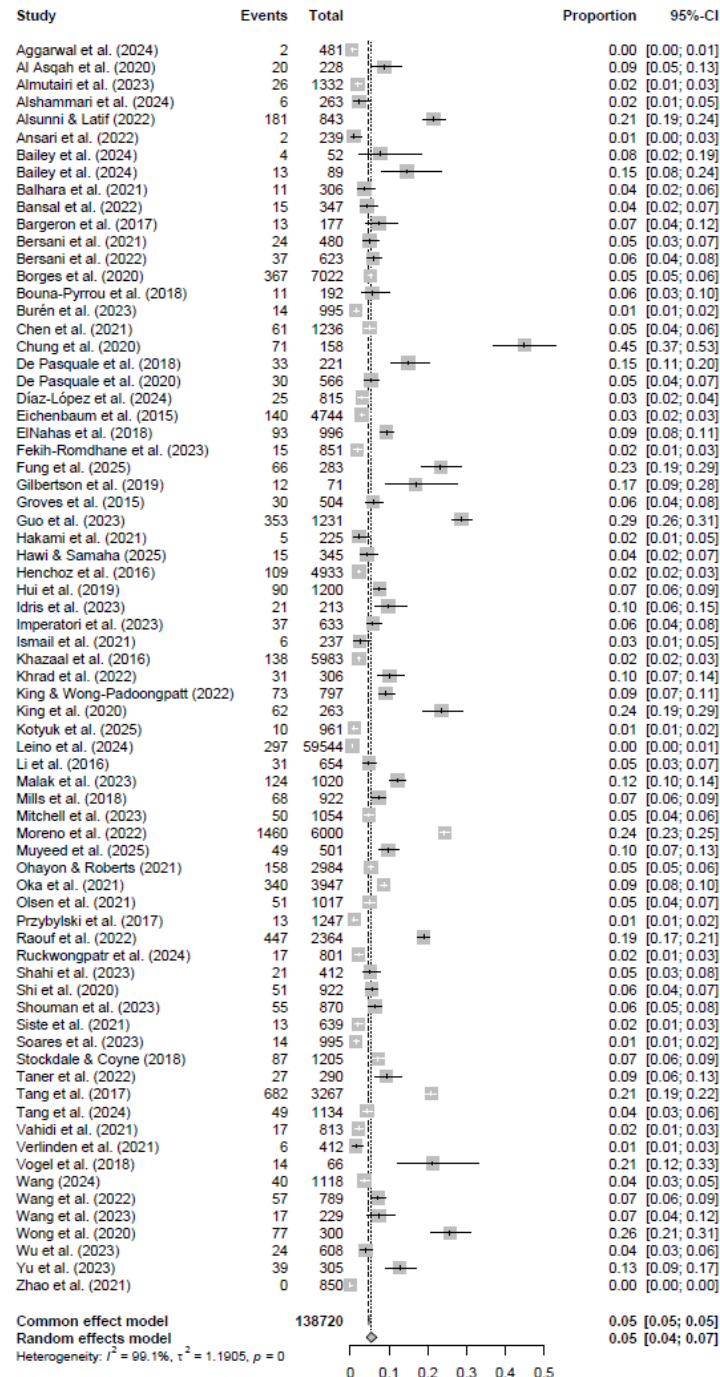


Mixed samples prevalence moderators

Figure 5 illustrates the observed prevalence and global mean estimate in mixed samples (including gamers and non-gamers). Pooled prevalence estimates for IGD varied significantly by the instrument used in mixed samples ($k = 57$; $p = .002$). Post-hoc pairwise comparisons with Holm-adjusted p-values revealed that studies using the GAS showed lower prevalence than those using the IGDS ($\Delta = -1.62$, $p_{adj} = 0.05$). Larger sample sizes were also statistically significantly linked to lower prevalence estimates in mixed samples ($p = .009$). No statistically significant subgroup differences were found among the other categorical and quantitative moderators in mixed samples.

Figure 5

Forest plot of observed prevalences and global mean estimate of IGD in mixed samples (gamers and non-gamers)



Discussion

This study provides a systematic review and meta-analysis of the estimated prevalence of IGD in young adults, considering differences between gamers-only and mixed samples. A previous study by Gao et al. (2022) estimated IGD prevalence, and given the rise in gaming after COVID-19 and the increase in video game use beyond adolescence, updated data are required.

The results showed that the overall prevalence of IGD in young adult samples ranged from 5.03 % to 7.4 %, lower than that found by Gao et al. (2022; 10.4 %). These figures are higher than those observed in meta-analyses concerning the general population, which reported prevalence estimates between 3.05 % and 6.7 % (Kim et al., 2022, Stevens et al., 2021, Zhou et al., 2024). The 95 % prediction interval ranged from 0.9 % to 31.87 %, indicating the range within which the true prevalence of IGD could be expected to fall in future studies. In this meta-analysis, prediction intervals were notably wider than the confidence intervals, reflecting the high degree of between-study heterogeneity and the variability of IGD prevalence across populations and study designs. Consequently, this variability suggests that while the pooled prevalence provides a useful overall estimate of IGD, the prevalence observed in future studies may vary substantially depending on contextual or methodological characteristics. This underscores the importance of interpreting pooled results with caution due to the observed heterogeneity.

Due to the high heterogeneity observed between studies, a meta-regression was conducted to determine if prevalence estimates differed significantly between studies that included only gamers and those that included mixed samples (both gamers and non-gamers). The results showed that the estimated prevalence among samples of gamers only

was 8.1 % (95 % CI: 5.91 %, 11.01 %; 95 % PI: 1.53–33.3 %), which was significantly different from the prevalence in mixed samples that had a rate of 5.47 % (95 % CI: 4.33 %, 6.90 %; 95 % PI: 0.7–30.3 %). Previous literature (Fam, 2018, Macur and Pontes, 2021) emphasized the importance of considering this distinction to avoid overestimating prevalence rates. In line with previous findings, the wide prediction intervals in both subgroups highlight significant variability within these categories, reflecting the impact of different contexts and methods used across studies. Thus, these findings emphasize the importance of investigating additional moderators that could explain this heterogeneity.

Considering the 96 reports included in the meta-analysis, 38 showed a low risk of bias, 49 showed a medium risk of bias, and 9 showed a high risk of bias. Statistically significant differences were observed primarily within the group of gamers, where studies with a high risk of bias reported a much higher prevalence estimate than the studies with moderate and low risk. These differences in study quality were mainly due to inadequate reporting of response rates, unclear standards and conditions for reliable measurements, insufficient coverage of the identified sampling, and inadequate sample sizes. Non-statistically significant differences in prevalence estimation were observed in overall and mixed samples.

Given that gaming habits vary across different age groups, meta-regressions were conducted to identify variables that might explain the high heterogeneity observed. Non-statistically significant differences were found among the age groups (categorized as early adulthood, which included late adolescence, emerging adulthood, and general young adulthood) in the three groups. However, the estimated prevalence of IGD seemed higher among late adolescents in the three samples (general, only gamers and mixed), followed by emerging adults. These findings align with those reported by Gao et al. (2022), which

indicated that young adults aged 18 to 28 years have a higher prevalence of IGD compared to adolescents aged 8 to 18 years. Thus, it appears that the early stages of young adulthood represent a key group at risk for developing IGD.

Furthermore, the geographical provenance of the samples did not result in significant differences in IGD prevalence. Although some numerical variability was detected — with slightly higher prevalence estimates in American samples for the overall and mixed groups, and in European samples for gamer-only groups — these differences did not reach statistical significance. Although systematic reviews and meta-analyses on IGD prevalence among the general population have found regional differences (Fam, 2018), no such differences were found in the systematic review and meta-analysis by Gao et al. (2022) with adolescents and young adults. These results may be due to an insufficient number and balance of studies per region or the high heterogeneity between studies found, limiting the power to detect true cross-regional effects (Darvesh et al., 2020). Moreover, grouping countries into broad regions (e.g., “Europe”, “Asia”) may be too coarse to capture country-level variation, particularly within a young adult population (Gao et al., 2022). This age group has grown up with the global normalization of video gaming, potentially leading to more uniform gaming behaviors across regions. Thus, widespread access to global gaming platforms and cross-cultural gaming communities may reduce the regional distinctions observed in IGD across broader age groups.

IGD prevalence estimates in the general and mixed samples varied significantly, consistent with previous findings (King et al., 2020). In the general sample, studies using the IGDS and DSM-5 criteria reported higher prevalence rates than those using the IGDT-10. These differences may be due to the use of adapted diagnostic criteria or differences in response scales. In the observed differences between the IGDS and GAS ($\Delta = -$

1.62, $p_{adj} = 0.05$) in mixed samples, it is important to note that these instruments are based on different diagnostic manuals, the DSM-V and DSM-IV, respectively. Therefore, instruments based on older diagnostic manuals may be less capable of accurately screening for IGD prevalence. These methodological discrepancies highlight the need for standardized, up-to-date diagnostic instruments aligned with current classification manuals (King et al., 2020).

Non-statistically significant differences were found in prevalence estimates based on publication year or sampling year, except for the sampling year in the gamer-only subgroup, which showed significantly higher prevalence estimates in more recent studies ($p = .018$). This trend could be influenced by several factors, such as the inclusion of reward systems in popular video games (Przybylski et al., 2016), the rise of competitive gaming platforms (Király et al., 2023), or the incorporation of microtransactions and loot boxes in contemporary video games (King et al., 2019), all of which may contribute to a higher risk of IGD.

Significant effects of sample size were observed in the global and mixed samples, where larger samples were associated with lower prevalence estimates of IGD. This discrepancy may arise from the inclusion of studies with varying sample sizes, as smaller sample sizes are more prone to random errors and systematic biases that could lead to an overestimation of prevalence (Schmidt & Hunter, 2015), particularly in atypical conditions like IGD. Regarding other quantitative moderators, neither mean age, risk of bias nor proportion of women in the samples consistently predicted IGD prevalence across groups, although a trend toward lower prevalence with higher proportions of women was nearly significant in the global sample ($p = .056$). This is consistent with prior evidence indicating that women are generally less likely to engage in problematic

gaming behaviors than men, which may contribute to lower IGD prevalence in samples with greater female representation (Stevens et al., 2021). All these findings highlight the importance of careful study design and reporting, as they can significantly impact IGD prevalence estimates.

Limitations and future directions

This study has several limitations. Firstly, the search strategy, which included terms related to the target age group, may not have identified some studies that only reported age in numerical terms. However, to retrieve studies that had not been identified in the systematic search, manual searches were conducted. Secondly, it should be noted that the studies used instruments based on diagnostic manuals or established criteria (e.g., WHO) rather than clinical interviews. Therefore, the prevalence estimates should be interpreted with caution. Thirdly, the LFK index indicates significant asymmetry and potential publication bias, suggesting that studies with less significant results are less likely to be published. This could distort estimates of the prevalence of IGD. Fourthly, substantial between-study variability was observed, which was partly explained by certain moderator variables. This may be due to differences in research objectives, methodologies, sample sizes, demographics, and measures used. Fifthly, the use of different cut-off values in some studies may lead to biased prevalence estimates that do not accurately reflect true rates. Lastly, the small number of studies prevented a thorough examination of specific categorical moderators in mixed and gamer-only samples. Given these limitations, caution should be exercised when generalizing the meta-analytical results.

Future directions should include the application of bias correction methods tailored to the specific nature of the data used in prevalence meta-analyses. Additionally,

employing standardized clinical cut-off points for IGD is essential. To ensure comparability and diagnostic accuracy, it is crucial to utilize validated assessment tools that align with official diagnostic manuals, such as the DSM-5-TR or ICD-11. Similarly, analyzing the prevalence of IGD in samples presenting with clinical conditions comorbid with IGD (such as ADHD) may provide new insights into its prevalence in specific groups. Furthermore, incorporating studies from diverse cultures and geographic regions would provide more globally representative estimates and enhance our understanding of cross-cultural variations in the prevalence of IGD.

Practical implications

This meta-analysis provides an estimate of the prevalence of IGD among young adults. Traditionally, this developmental stage has not been the primary focus of studies related to gaming-related issues. This overall prevalence estimate highlights an emerging problem, emphasizing the need for policies or strategies aimed at prevention, as well as public and mental health interventions tailored to this age group. Furthermore, the specific findings related to young adults enable institutions, such as higher education establishments, to create digital education campaigns or workshops that promote responsible gaming. The results also underline the importance of training personnel in higher education and healthcare to identify IGD within this demographic.

Conclusions

This meta-analysis offers an estimate of the prevalence of IGD among young adults, a demographic that has often been overlooked in gaming research. The findings indicate that the prevalence of IGD in this age group is higher than in the general population, with statistically significant variations depending on the type of sample, the assessment tools used, the quality of the studies, and other studies' characteristics such as the female proportion, sample size and year of data collection. These results emphasize the importance of using standardized diagnostic tools based on official manuals and clinically validated cut-off points. Overall, this study provides valuable data to inform public health policies, clinical screening practices, and targeted educational programs for young adults at risk of developing IGD.

Study 2. Emotional intelligence and gaming disorder symptomatology: A systematic review and meta-analysis⁴

Gisbert-Pérez, J., Badenes-Ribera, L. & Martí-Vilar, M. (2024). Emotional Intelligence and Gaming Disorder Symptomatology: A Systematic Review and Meta-Analysis. *Adolescent Research Review*, 9(4), 621–646. <https://doi.org/10.1007/s40894-024-00233-3>

Abstract

The increasing prevalence of Internet gaming disorder has created an interest in identifying the factors associated with its development, including emotional intelligence, which has been negatively associated with many addictions. This work aimed to provide a narrative and quantitative synthesis of the association between emotional intelligence and Internet gaming disorder symptomatology. An online search of four electronic databases and an additional manual search identified 49 studies that met the inclusion criteria provided 54 independent samples ($N=43,289$) and a total of 166 correlation coefficients. The selected studies used different definitions of emotional intelligence (i.e., *emotional regulation, social-emotional competence, ability and trait*). Random-effect models were used to estimate the pooled correlation coefficient between emotional intelligence and Internet gaming disorder symptomatology. The results revealed a small-to-moderate negative association between any measure of emotional intelligence and Internet gaming disorder symptomatology. However, the various characteristics involved in its study, such as methodological quality, research design, geographical location and the means of assessing emotional intelligence, could modify the association between both

⁴ All references of the studies included in the review and meta-analysis are listed in the Supplementary Material.

variables. In short, any deficits in emotional regulation or social competence could be a risk factor for developing Internet gaming disorder.

Keywords: Emotional Intelligence, Emotional Regulation, Social Competence, Gaming Disorder, Meta-analysis

Introduction

This study investigates the link between emotional intelligence and Internet gaming disorder. The growing prevalence of this disorder emphasizes the need to identify the possible factors associated with its development. This problem is especially significant among adolescents and young adults, who are more vulnerable to developing gaming disorder (Wang et al., 2021). This study proposes a meta-analysis to explore the relationship between gaming disorder and emotional intelligence, as it is believed to have a protective role in preventing other addictions. Emotional intelligence continues to develop throughout adolescence and early adulthood, making this study relevant for both theoretical and practical implications in preventing the onset of gaming disorder.

Internet Gaming Disorder Conceptualization

Internet gaming disorder is becoming an increasingly common problem among the adolescent population (García-García et al., 2021; Wang et al., 2021). It usually begins in early adolescence, in the form of higher rates of gaming-related problems than in older age groups (general population: 3.05%; adolescents: 4.6%; Fam, 2018; Lemmens et al., 2015; Paulus et al., 2018; Stevens et al., 2021; Wang & Cheng, 2021), with higher rates in men (6.8%) than women (1.3%).

Internet gaming disorder was included in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) under the name “Internet gaming disorder” (IGD) (APA, 2013), and later included in the International Classification of Diseases, Eleventh Revision (ICD-11) as “Gaming Disorder” (WHO, 2018). According to the DSM-5, the diagnosis of this requires meeting five or more of the following criteria: (1) high preoccupation with gaming, (2) withdrawal symptoms, (3) increased tolerance, (4)

unsuccessful attempts to quit or reduce gaming, (5) loss of interest in other hobbies or activities, (6) excessive gaming despite its negative consequences, (7) deceiving others about gaming activities, (8) using it as an escape or to avoid other hobbies or activities, (9) excessive gaming despite negative consequences (APA, 2013; Petry et al., 2014). For its part, ICD-11 considers it as due to addictive behavior, i.e. “a pattern of persistent or recurrent gambling behavior that is not primarily conducted over the internet and is manifested by: (1) impaired control over gambling (e.g. onset, frequency, intensity, duration, termination, context); (2) increasing the priority given to gambling to the extent that gambling takes precedence over other life interests and daily activities; and 3) continuation or escalation of gambling despite experiencing negative consequences” (WHO, 2018, p. 166). Its diagnosis requires a pattern of behavior severe enough to cause significant impairment in core areas of functioning. Gaming behavior patterns may be continuous or episodic but must be recurrent and evident for at least 12 months before diagnosis, although meeting all the criteria and having severe symptoms may reduce this requirement (Saunders et al., 2017; WHO, 2018).

Emotional Intelligence Conceptualization

Emotional intelligence is a broad and plural construct due to being widely studied and the absence of a consensus on its definition. Salovey and Mayer (1990) first defined it as an ability-based construct similar to general intelligence. They defined emotional intelligence as “the ability to carry out accurate reasoning about emotions and the ability to use emotions and emotional knowledge to enhance thinking” (Mayer et al., 2008, p. 511), suggesting a multidimensional approach to this construct. Different conceptualizations of emotional intelligence have emerged in the last three decades and can be grouped into three models (Miao et al., 2017): ability, trait, and mixed.

According to the ability models, emotional intelligence is a cognitive ability with emotions that process emotional information (MacCann et al., 2014, 2020; Mayer et al., 2008). The chief ability model is Mayer and Salovey's (1997) *four-branch hierarchical model*, based on Gross' model of emotion regulation (Gross, 1998), which focuses on the four components of emotional ability: (1) emotion perception, (2) emotion facilitation of thought, (3) emotion understanding, and (4) emotion management. The emotional intelligence level ranges in complexity from information processing to the deliberate use of emotions to achieve objectives (MacCann et al., 2020). Emotional intelligence ability can be assessed by performance-based measures in the tradition of measures of intellectual intelligence, where there are right or wrong answers based on the predetermined criteria and by rating-scales (self-report measures). From the performance-based measures framework, the ability-based Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT, Mayer et al., 2002, 2003) is the one most frequently used to assess emotional intelligence. Of the rating-scales used to assess emotional intelligence, the Wong & Law Emotional Intelligence Scale (WLEIS, Wong & Law, 2002) is frequently applied to measure a set of basic emotional abilities consisting of a 16-item scale divided into four subscales: (1) self-emotion appraisal; (2) other's emotion appraisal; (3) use of emotion, and (4) regulation of emotion. The trait model developed by Petrides and Furnham (2001) defines emotional intelligence as a trait, i.e. as persistent behavior over time, and is associated with dispositional tendencies, personality traits and self-efficacy beliefs. Emotional intelligence is thus considered as a constellation of self-perceived abilities and behavioral dispositions assessed by rating-scales (Petrides & Furnham, 2001, 2003) as the Trait Emotional Questionnaire (TEIQue; Petrides & Furnham, 2003) or its short version (TEIQue-SF, Petrides, 2009). This model comprises

fifteen emotional intelligence domain personality grouped into four dimensions: (1) well-being, (2) self-control, (3) emotionality and (4) sociability (Petrides, 2009).

The mixed model considered emotional intelligence as a mixture of personality-type items and behavioral preferences and is assessed by rating-scales. According to the mixed model, emotional intelligence is the sum of emotional skills, personality traits and motivational factors that lead to emotionally intelligent behavior (Bar-On, 2006; MacCann et al., 2020; Petrides et al., 2007). These models include Goleman's *emotional competence* (1998), Bar-On's *social-emotional competence* (1997, 2006) and Rindermann's *emotional competence* (2009). Goleman's (1998) model defines emotional intelligence according to four main competencies: (1) self-awareness of one's emotions, (2) self-control, (3) social awareness of other's emotions and (4) social skills. This model thus differentiates between awareness (emotion detection) and management (regulation) of one's own and others' emotions and is measured by Goleman's Emotional Competency Index (ECI; Sala, 2002). Bar-On's (1997, 2006) model focuses on fifteen dimensions of social and emotional competence, which can be grouped into five scales: (1) inter- and (2) intrapersonal competence, (3) stress management, (4) adaptability, and (5) general mood or self-motivation. All of these are considered "key components of effective emotional and social functioning leading to psychological well-being" (Bar-On, 2000, p. 364). The Bar-On model is operationalized by the Emotional Intelligence Inventory (EQ-I, Bar-On, 1997), which is "a self-report measure of emotionally and socially intelligent behavior that provides an estimate of emotional-social intelligence" (Bar-On, 2009, p. 15). Rindermann's *emotional competence* (2009) includes emotional abilities and behavioral tendencies, which can be grouped into four dimensions of perceived abilities: the multidimensional construct of emotional competence consists of the perceived

abilities to (1) recognize and understand one's own emotions, (2) recognize and understand other's emotions, (3) regulate and control one's own emotions, and (4) emotional expressiveness. The emotional competence questionnaire (EKF; German designation: Emotionale-Kompetenz-Fragebogen, Rindermann, 2009), a self-reported measure, was developed to assess Rindermann's *emotional competence* (2009).

The Role of Emotional Intelligence in Addictions

Emotional intelligence relates to well-being or self-control (Petrides et al., 2007). Having emotional self-awareness and cognitive control over one's emotions is an important preventive factor against involvement in problematic behaviors (Kircaburun et al., 2020). Individuals with lower levels of trait emotional intelligence are at a higher risk of facing heightened psychological and interpersonal challenges, which may facilitate potential problematic behavior such as internet or gaming disorder (Kun & Demetrovics, 2010; Leite et al., 2019).

Many studies have found a negative association between emotional intelligence and addictions in adolescents, thereby reinforcing the potentially protective role of emotional intelligence against them (Aslanidou et al., 2019; Henning et al., 2021; Leite et al., 2019). Ranjbar and Bakhshi's (2018) meta-analysis of the association between emotional intelligence and Internet addiction found a moderate and inverse association (pooled correlation = -0.393 ; 95% CI: $-0.564, -0.190$). Several empirical studies reported a negative correlation between various behavioral addictions and emotional intelligence. The study by Parker et al. (2008) focused on the relationship between different adolescent behavioral addictions (e.g. gaming, gambling and internet) and their results indicated moderate-to-strong negative correlations between emotional intelligence

and behavioral addictions. The results of Hamissi et al. (2013), in a study on a sample of 201 students, indicated small-to-moderate negative correlations between internet disorder and emotional intelligence, in line with others carried out on the general population (Saraiva et al., 2018). Emotional intelligence is also negatively correlated to mobile phone addiction (Arrivillaga et al., 2020; Beranuy et al., 2009), pathological gambling (Parker et al., 2008, 2013), and addiction to video games (Kircaburun et al., 2019; Parker et al., 2008, 2013; Bender et al., 2020). All these findings suggest that lower emotional intelligence scores may represent vulnerability or a risk factor for developing behavioral addictions, especially in adolescence (Henning et al., 2021).

A previous systematic review of the relationship between emotional regulation and Internet gaming disorder (Marchica et al., 2019) found inconsistent results: 90% of the reviewed studies showed a negative and statistically significant relationship between emotional regulation and video gaming disorder symptomology (the higher the emotional regulation, the lower the gaming disorder symptomology), although 10% of the studies did not detect this association between both variables. There are also two previous meta-analyses on risk and protective factors for Internet gaming disorder limited to the Chinese (Ji et al., 2022) and Korean (Koo & Kwon, 2014) contexts. However, the relationship between emotional intelligence and Internet gaming disorder symptomatology across different social contexts (e.g. nationalities) has not been systematically examined to date by a meta-analysis technique.

It is important to note that the examination of emotional intelligence and internet gaming disorder is particularly relevant during stages such as adolescence, considered as a period of heightened vulnerability, impacting both the overall development and susceptibility to addiction (Krishnamoorthy, 2021). Consistent with the findings in the

general population, lower scores in emotional intelligence seem to be associated with gaming disorder symptomatology (Aksoy & Erol, 2021; Amendola et al., 2019). In the comparative study between age groups by Kircaburun et al. (2020), the results indicated that the effect of emotional intelligence was stronger in adolescent players than in adult players.

Current Study

Emotional intelligence has been negatively associated with acquiring different addictions, but its specific relationship with internet gaming disorder has not yet been explored. This article describes a meta-analytic study to quantitatively synthesize the relationship between emotional intelligence and Internet gaming symptomatology and to determine the pooled effect of this association (Research Question 1). Its secondary aim was identify the different study characteristics (e.g., geographic location, age, gender, etc.) that could influence the resulting heterogeneous results (Research Question 2).

Methods

A meta-analysis of the relationship between emotional intelligence and Internet gaming disorder was conducted in line with the PRISMA guidelines (Page et al., 2021, see Supplementary Table 1). A previous search in the PROSPERO and Cochrane databases had confirmed that there were no previous SR or meta-analysis that had already investigated this relationship. A protocol was registered in PROSPERO (Registration Number: CRD42023400540), including the review question, type of review, searches, study conditions, population of interest, types of studies included, the expected results, data extraction, risk of bias, data synthesis strategy and the language of the study.

Study Selection Criteria

The inclusion criteria were as follows: (1) original, quantitative investigation; (2) publication in peer-reviewed journal; (3) included a measure of Internet gaming disorder (e.g. using an instrument that assessed Internet gaming disorder symptoms or its diagnostic criteria, etc.); (4) contained a measure of emotional intelligence in some way (e.g. emotion intelligence, emotion competence, emotion perception, emotion management, etc.); examined the relationship between emotional intelligence and Internet gaming disorder; (6) reported a correlation coefficient or the required statistical data; (7) written in English or Spanish. There were no limits as to date of publication, geographical location or the participants' ages.

All qualitative studies, reviews, meta-analyses, commentaries, editorials and studies that did not explore the relationship between emotional intelligence and Internet gaming disorder were excluded. Those reporting multivariate results (e.g., regression analysis) were also excluded for not being comparable with others (Lipsey & Wilson, 2001).

Search Strategy

The online searches were conducted on September 20th, 2023 in the Scopus, Pubmed, Web of Science and PsycInfo databases using the following search strategy: (emotion* intelligence OR emotion* competence OR socioemotion* competence OR emotion* perception OR emotion* understanding OR emotion* management OR emotion* regulation OR emotion* expression OR emotion* facilitation OR self-awareness OR self-management OR social awareness OR social skills OR intrapersonal competence OR interpersonal competence OR stress management OR adaptability OR self-motivation)

AND (gaming disorder OR video game disorder OR videogame disorder). This search resulted in 3639 eligible studies.

A manual search in the reference lists of the retrieved studies was also carried out and yielded 6 additional studies. Finally, references from previous reviews and meta-analyses were examined (e.g., Bäcklund et al., 2022; Bender et al., 2020; Gao et al., 2022; Ji et al., 2022; Koo & Kwon, 2014; Marchica et al., 2019; Pan et al., 2020) but no further eligible studies were found.

Coding of the Studies

A protocol was systematically applied by two independent coders to extract the studies' characteristics as follows: authors, year of publication, country of origin, search design (cross-sectional vs longitudinal), sampling method (probabilistic vs non-probabilistic), sample size, participant's mean age, gender (percentage of males), sexual orientation, ethnicity (percentage of Caucasians), marital status, educational qualifications, conceptualization of emotional intelligence and Internet gaming disorder, percentage of Internet gaming disorder in the sample, hours of play, video game studied, and correlation coefficients or reported statistics to calculate the effect size.

Study Quality

The methodological quality of the primary studies was individually assessed by two researchers, who applied the 10-item checklist previously used by Badenes-Ribera et al. (2019) to examine the relationship between muscle dysmorphia and eating disorders. Each of the 10 checklisted items was given a score of 1 when the study met the criteria and 0 when it did not (see Supplementary Table 2). Their total quality score (range: 0–

10) was calculated by adding the corresponding quality item scores, with a higher score indicating a higher methodological quality and lower risk bias.

Effect Size

The effect size index was a correlation coefficient (e.g., Pearson's correlation coefficient, Spearman's correlation coefficient, etc.) computed between measures of emotional intelligence and Internet gaming disorder (Borenstein et al., 2009, 2021), which was then coded and translated into a Fisher's Z score to normalize their distributions and stabilize their variance by applying the following formula (Cooper et al., 2019, pp. 220–221): $Z_r = \frac{1}{2} \log_e \left(\frac{1+r}{1-r} \right)$, with sampling variance: $V(Z_r) = \frac{e^{2Z_r} - 1}{e^{2Z_r} + 1}$, with e being the base of natural logarithms. The Fisher's Z for the individual effect sizes, as well as those for the pooled effect sizes and their confidence limits, were back translated into the correlation coefficient metric to simplify their interpretation. Following criteria Cohen's guidelines (1988), correlation coefficients of about 0.10, 0.30, and 0.50 (in absolute values) are indicative of low, moderate and large relationships between the variables, respectively.

To handle the statistical dependence among correlation coefficients from the same study, in which multiple correlation coefficients were reported for the relationship between emotional intelligence and internet gaming disorder (Aksoy & Erol, 2021; Che et al., 2017; Fumero et al., 2020; Hollett & Harris, 2020; Kim et al., 2023; King et al., 2013; Kökönyei et al., 2019), their average was calculated to obtain a synthetic correlation coefficient for each study instead of treating each correlation coefficient as an independent unit in the analysis. This synthetic correlation coefficient was used as the unit analysis (Borenstein et al., 2021; Hedges, 2019). When the studies did not report an emotional intelligence/Internet gaming disorder correlation coefficient, the appropriate

statistical data were extracted (e.g., mean and standard deviation) to calculate the effect size and apply translations between them (Dieter et al., 2017; Gentile et al., 2011; Hong et al., 2022; Marchica et al., 2020; Müller & Bonnaire, 2021; Paulus et al., 2021; Uçur & Dönmez, 2021; Yen et al., 2018). For instance, standardized mean differences (d) were computed, after which the d were translated into r ; with $r = \frac{d}{\sqrt{d^2 + a}}$, where a was estimated by $a = \frac{(n_1 + n_2)^2}{n_1 * n_2}$, and n_1 , n_2 were the sample sizes in both conditions (Borenstein et al., 2009, 2021). In addition, in the studies with only one control group and two pathological video gaming groups (e.g., King et al., 2013; Müller & Bonnaire, 2021), the sample size of the control group was divided by two to enable two comparisons and avoid statistical dependence. For the longitudinal studies, the data from the first data point (i.e., Time 1) were recorded. Finally, to code the correlation coefficient between any measure of Emotional Regulation and Internet gaming disorder, the effect size was reverse-scored when the emotional regulation was measured by negative indicators (e.g., Difficulties Emotional Regulation Scale). The coded positive effect sizes (r) thus represented an association between Emotional Regulation and a higher degree of Internet gaming disorder.

Statistical Analysis

Separate meta-analyses were conducted to examine the relationships between emotional intelligence and Internet gaming disorder symptomatology, assuming random-effects models. The correlations coefficients were then weighted by inverse variance (Borenstein et al., 2021; Cooper et al., 2019) and a restricted maximum likelihood was used to estimate inter-study variance (τ^2). Pooled correlation coefficients, with their 95% confidence interval (CIs) and credibility interval (CRs), were calculated applying the

method recommended by Hartung and Knapp (2001). The statistical significance of the pooled correlation coefficients was assessed by the t test. Forest plots were drawn up to visually examine effect size heterogeneity. Cochran's Q -statistic and the I^2 index were also calculated. A Q -statistic with $p < 0.05$ and $I^2 > 25\%$ indicated effect size heterogeneity (Higgins et al., 2003; Huedo-Medina et al., 2006).

Moderator analyses using a mixed-effects model were carried out (Borenstein et al., 2009, 2021; Knapp & Hartung, 2003; López-López et al., 2014) to identify the study characteristics statistically related to effect sizes for meta-analyses with at least 20 correlation coefficients (López-López et al., 2014). Weighted ANOVAs were applied for the categorical variables and for the continuous variables simple meta-regression were performed. Q_W and Q_E statistics were used to evaluate model misspecification for categorical and continuous variables, respectively. Q_B and Q_R statistics were applied to evaluate the statistical significance of categorical and continuous variables, respectively, while the proportion of variance accounted for by the moderator variable was also estimated (López-López et al., 2014; Raudenbush, 2009).

Funnel plots with Duval and Tweedie's trim-and-fill method for imputing missing data (Duval & Tweedie, 2000) and Egger's test (Sterne & Egger, 2005) were used to examine publication bias. When the meta-analysis only included two studies, the funnel plot and Egger's test could not be applied, given the small number of studies (Sterne & Egger, 2005; Sterne et al., 2000; Thornton & Lee, 2000). Finally, sensitivity analyses were performed to examine the robustness of the meta-analytic results and the impact of including or excluding one-to-one correlation coefficients. All the statistical tests were conducted on the *Metafor* Package in R (Version 3.0.2) and interpreted assuming a significance level of 5% ($p < .05$) using two-tailed tests.

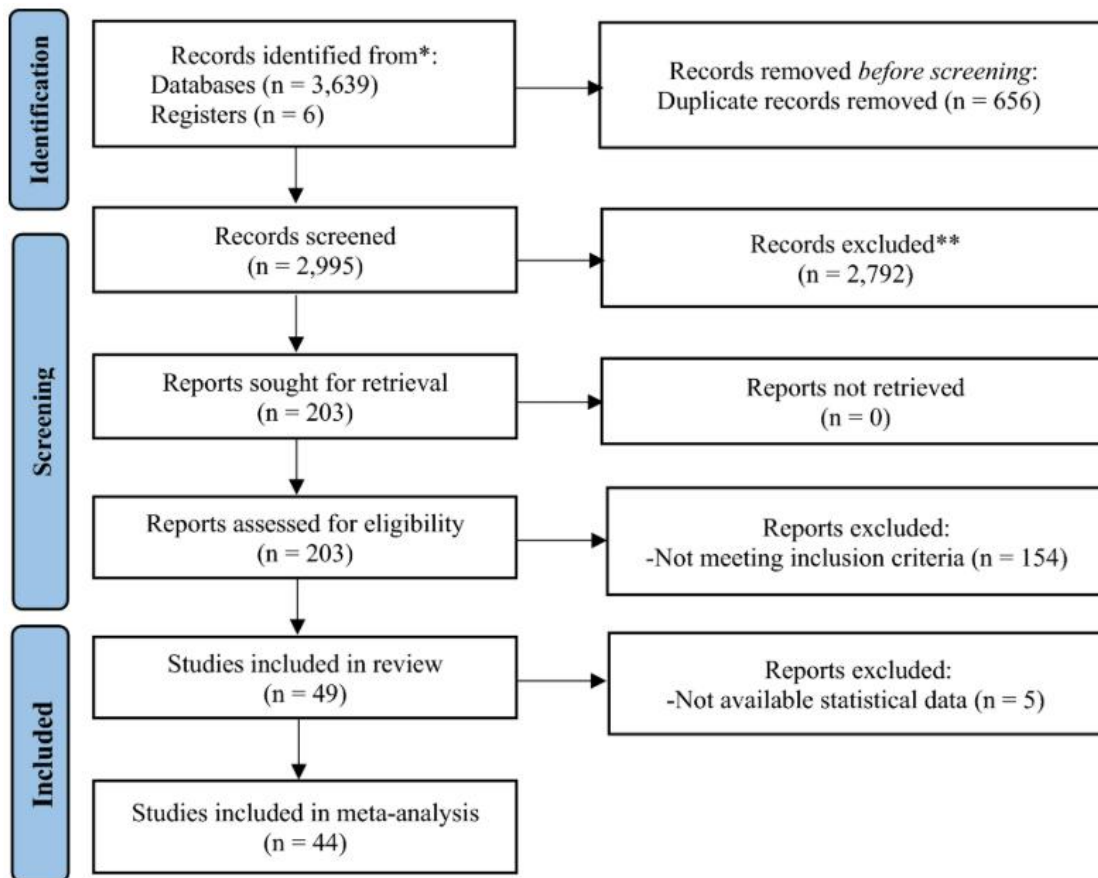
Results

Study Selection Process

Figure 1 includes a flowchart of the screening and selection process used in this work. As can be seen, the search strategies identified a total of 3645 references. After removing duplicate references ($n = 656$), a total of 2995 articles remained. The titles and abstracts of these references were screened, and 203 potential articles were pre-selected and examined on the basis of their full text, by which 151 studies were excluded for not meeting the inclusion criteria. The search strategy thus identified 49 published articles for systematic review and meta-analysis, all published in peer-reviewed journals between 2008 and 2023, of which 7 did not include emotional intelligence/Internet gaming disorder correlation coefficients or the statistical data required to calculate them (Efrati & Spada, 2023; Liao et al., 2015; Nugraha et al., 2021; Schettler et al., 2023; Torres-Rodriguez et al., 2018; Wichstrøm et al., 2019; Wang et al., 2022b). The authors were contacted by email to request these data, only one of which complied, so that five studies were excluded from the meta-analytic synthesis. Several studies reported on the correlation coefficients from different independent samples (Dieter et al., 2017; Kim et al., 2023; King et al., 2013; Müller & Bonnaire, 2021; Parker et al., 2013, Parker et al., 2008; Soares et al., 2023; van Den Eijnden et al., 2018; Wang et al., 2022b; Wichstrøm et al., 2019), so that the database of the present meta-analysis included a total of 54 independent samples, which provided a total of 166 correlation coefficients.

Figure 1

Flowchart of the screening and selection process following PRISMA guidelines



Study Characteristics

Appendix A includes the descriptive characteristics of the articles included in the systematic review meta-analysis ($n = 49$). Most of these used convenience sampling (e.g., community, university or schools, forums or websites, clinical settings) and a cross-sectional design. Three used stratified random sampling (Kököneyi et al., 2019; She et al., 2021; Wichstrøm et al., 2019) and random sampling (Paschke et al., 2020, 2021; Schettler et al., 2023), two used a crowdsourcing technique from Qualtrics and Prolific (Giordano et al., 2022; Kim et al., 2023) and cluster random sampling (Wu et al., 2022). Eight studies applied a longitudinal research design (Dang et al., 2019; Liao et al., 2015;

Van Den Eijnden et al., 2018; Gentile et al., 2011; Mun & Lee, 2022; Paulus et al., 2021; Wichstrøm et al., 2019; Efrati & Spada, 2023), and one study had both a cross-sectional and longitudinal design (Schettler et al., 2023). Ten studies were conducted in China, six in Canada, five in Spain, Germany and Turkey, four in Italy, two in the USA and South Korea, and only one in Hungary, Singapore, The Netherlands, Australia, France, Iran, Indonesia, Norway, Israel, Sweden and Pakistan. Most of the studies ($n = 30$) were conducted on adolescent and young adult samples, fifteen used mixed samples, four used child samples and one included both an adult and a child dyad sample.

The total number of participants in the samples was $N = 43,289$, with a mean age of 15.75 years old, ranging from 4 to 75. Two studies did not report any data on the age of the sample participants. Most did not report the participants' ethnicity ($n = 40$) or marital status ($n = 44$), while none reported sexual orientation data.

As can be seen in comthe 49 studies examined different types of emotional intelligence and used different instruments to assess Internet gaming disorder and emotional intelligence. Most focused on specific constructs that included emotional intelligence, and only nine addressed this factor emotional intelligence itself. Its most frequently studied emotional intelligence component was emotional regulation ($n = 37$), focusing mainly on difficulties in emotional regulation ($n = 20$). In its turn, the instrument most frequently used to measure emotional intelligence was also specific to emotional regulation difficulties: the Difficulties in Emotional Regulation Scale or its reduced variants (DERS, Gratz & Roemer, 2004; Kaufman et al., 2016) ($n = 19$), following either the Cognitive Emotion Regulation Questionnaire or its short version (CERQ, Garnefski & Kraaij, 2006; Garnefski et al., 2001) ($n = 4$), and the Emotional Regulation Questionnaire (ERQ, Gross et al., 2003) ($n = 3$). The Difficulties in Emotional Regulation

Scale assesses clinically relevant difficulties in emotional functioning, including lack of emotional awareness, nonacceptance of one's emotions, lack of ability to engage in goal-directed cognition and behavior, lack of ability to manage one's impulses, lack of emotional clarity, and lack of access to effective strategies for feeling better when distressed. Higher scores in this scale reflect greater difficulties in regulating emotions. The Cognitive Emotion Regulation Questionnaire measures nine cognitive strategies that individuals use in response to stressful life events, which can be grouped into maladaptive (rumination, self-blame, other-blame, and catastrophizing) or adaptive emotional regulation strategies (acceptance, positive refocusing, putting into perspective, positive reappraisal, and planning). Higher scores indicate greater usage of the specific strategy. The Emotional Regulation Questionnaire measures an individual's tendency to regulate his emotions in two ways, according to Gross's (1998) process-oriented approach: cognitive reappraisal and expressive suppression. Higher scores indicate greater usage of the specific strategy.

The Wong and Law Emotional Intelligence Scale (WLEIS, Wong & Lang, 2002) ($n = 3$) was the one most often used in the nine comprehensive studies on emotional intelligence, followed by the Emotional Quotient Inventory: Young Version, (EQ-i:YV, Bar-On & Parker, 2000) ($n = 2$), and the Trait Emotional Intelligence Questionnaire-Short Form (TEIQue-SF, Petrides, 2009) ($n = 2$). The Wong and Law Emotional Intelligence Scale is a 16-item self-report emotional intelligence ability scale based on Mayer and Salovey's theoretical framework (1997). The Emotional Quotient Inventory: Young Version is a 60-item self-reporting emotional intelligence measure for use with children and adolescents between 7 and 18 years of age, which assesses the way individuals' feel, think or act in most situations. This scale measures total emotional intelligence and four

dimensions (intrapersonal, interpersonal, stress management, and adaptability) and provides a total score. Higher scores reflect a higher level of social and emotional competency. The Trait Emotional Intelligence Questionnaire-Short Form contains 20 items divided into four emotional intelligence dimensions, such as well-being, self-control, emotionality and sociability. The emotional intelligence global trait score is obtained via combination of these dimensions. The higher the score, the higher the level of emotional intelligence.

Twenty-eight different instruments were used to measure Internet gaming disorder, the most frequently used being the Internet Gaming Disorder Scale (IGDS), based on DSM-V diagnostic criteria ($n = 13$), followed by the Gaming Disorder Scale for Adolescents (GADIS-A; $n = 5$), the Gaming Addiction Scale (GAS; $n = 4$), and the MULTICAGE CAD-4, and Pathological Video-Game Use (PVU; $n = 3$). The remaining instruments were used in two studies (Ten-Item Internet Gaming Disorder Test (IGDT-10), Problematic Video Game Playing scale (PVP), Pathological Video Gaming Scale (PVGS), Internet Addiction Test – World of Warcraft version (IAT-WoW), Screener for Substance and Behavioral Addictions – Gaming (SSBA Gaming)) or in only one (Questionnaire of Smoking Urges adapted to Gaming (QSU-Brief Gaming), Problematic Online Gaming Questionnaire Short-Form (POGQ-SF), Video Gaming Dependency Scale or “Computerspielabhängigkeitsskala” (CSAS), Game Addiction Inventory for adults (GAIA), 10-item scale DSM-IV, GUP addiction scale, Internet Gaming Disorder Questionnaire (IGDQ), Pathological Video Game Use Questionnaire, Scale for the Assessment of Internet and Computer game Addiction (AICA-30), Problematic Technology Use Checklist, Gaming Disorder Scale for Parents (GADIS-P), Parental version of the Internet Gaming Disorder Scale (P-IGDS), Chen Internet Addiction Scale

(CIAS), Korea Agency for Digital Opportunity scale (KADO), Gaming and Social Media Questionnaire (GSMQ).

Assessment of Methodological Quality

Supplementary Table 3 gives the details of the studies' methodological quality assessment. A TQS was also obtained by adding the 1 s and 0 s for the items of the checklist (range: 0–10). The studies obtained an average methodological quality score of 4.83 ($SD = 1.33$, $Min. = 1$, $Max. = 8$). The quality criteria most often used were item 7 (*Absence of reporting bias*, $n = 49$), followed by item 4 (*The measurement instrument used to assess emotional intelligence shows good psychometric properties*, $n = 40$) and item 5 (*The measurement instrument used to assess gaming disorder shows good psychometric properties*, $n = 38$). The least met criteria were item 10 (*Statistical Power*, $n = 2$) and item 3 (*Dropouts were similar in socio-demographic characteristics to those of the final sample*, $n = 4$).

Quantitative synthesis: Meta-analysis

The final dataset of the meta-analysis consisted of 44 studies published between 2008 and 2023 (Median = 2020), which provided 54 independent samples and 166 correlation coefficients. All of these were written in English. Sample size ranged from 48 to 3136 participants (Median = 412 participants) with an average participants' mean age of 18.21 years old (Median = 16.27, $SD = 6.18$, $Min. = 9.18$, $Max. = 41.80$) and the average percentage of males in all the studies was 56.3% (Median = 54.8).

To quantitatively synthesize the relationship between emotional intelligence and Internet gaming disorder symptomatology, several independent meta-analyses were conducted by type of emotional intelligence examined (i.e., Emotional Regulation,

Social-Emotional Competence, Intelligence as ability and Intelligence as trait) and by measurement instrument used for assessing emotional intelligence.

Relationships Between Emotional Intelligence Measured as Emotional Regulation and Internet Gaming Disorder Symptomatology

The 36 correlation coefficients reported for the relationship between Emotional Regulation and Internet Gambling disorder symptomatology ranged from -0.52 to 0.25 , with a pooled correlation coefficient of -0.237 (95% CI: $-0.287, -0.186$, $p < .001$) (see Table 1 and Fig. 2), indicating that the higher the emotional regulation, the lower the Internet Gambling disorder symptomatology. According to Cohen's (1988) criteria, a pooled correlation coefficient of -0.223 can be considered as reflecting a low-to-medium relationship. The heterogeneity analysis showed that there was a large degree of heterogeneity among the correlation coefficients reported ($Q(35) = 614.156$, $p < .0001$, $I^2 = 93.7\%$).

Table 1

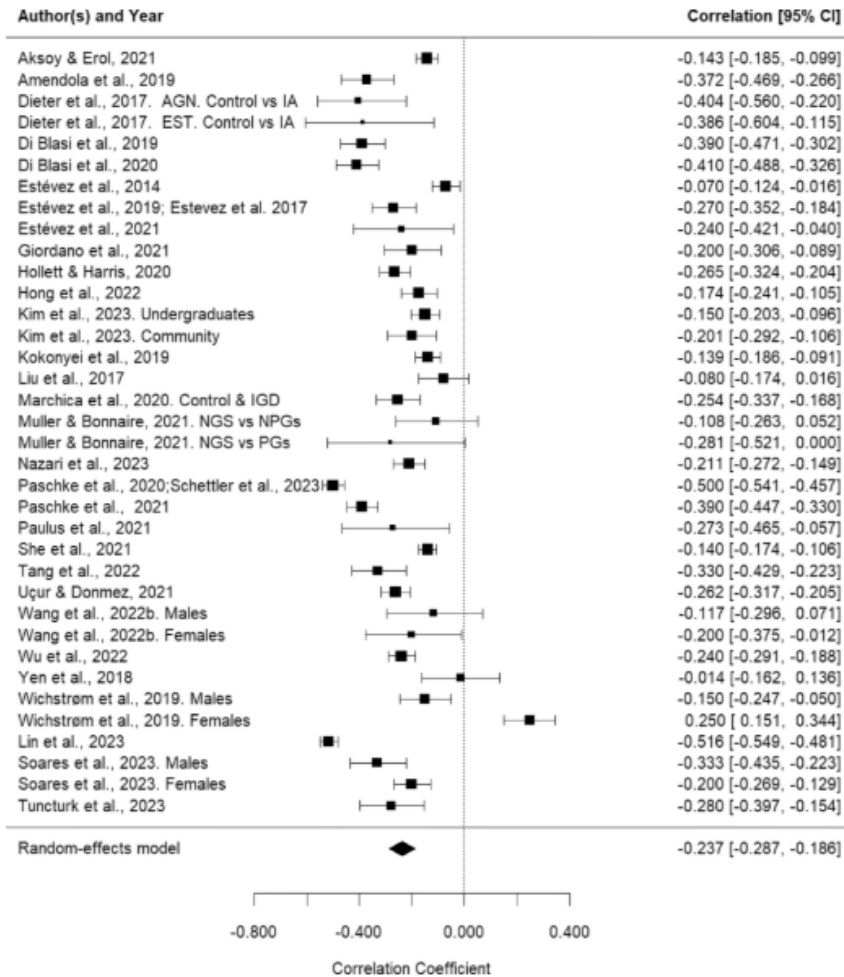
Pooled correlation Coefficients, 95% confidence intervals, 95% prediction intervals, and heterogeneity statistics for the relationship between emotional regulation and internet gaming disorder symptomatology

Outcome		<i>k</i>	<i>N</i>	<i>r</i> ₊	95% CI		95% PI		<i>Q</i>	<i>I</i> ²	<i>τ</i>
					LL	UL	LL	UL			
	Any measure	36	24450	.237	.287	.186	-.502	.068	614.156***	93.7	.023
DERS	Total score	18	13113	.299	.236	.359	.020	.535	350.147***	92.6	.018
	Nonacceptance	13	9467	.237	.189	.283	-.076	.435	182.678***	93.7	.015
	(lack of) Goals	12	9245	.192	.121	.260	-.058	.419	171.039***	89.9	.012
	Impulse	10	7202	.296	.227	.360	.020	.520	142.127***	91.2	.019
	(lack of) Awareness	13	7678	.077	.037	.117	-.026	.179	25.218*	51.7	.002
	(lack of) Strategies	10	7584	.289	.207	.367	.020	.519	142.187***	90.7	.014
	(lack of) Clarity	15	9668	.194	.131	.256	-.039	.407	147.438***	87.2	.011
CERI	Negative Impact	2	995	.258	-.551	.817	-.812	.930	3.835*	73.9	.007
CERQ	Maladaptive cognitive strategies	5	6282	.196	.109	.279	.028	.353	16.820**	73.4	.003
	Adaptive cognitive strategies	3	1866	-.049	-.365	.278	-.585	.517	9.078*	74.4	.005
ERQ	Cognitive Reapprais	3	375	-.162	-.322	.006	-.322	.006	1.140	0.0	.000
	Expressive Suppress	3	375	.256	.083	.541	-.322	.695	4.951	58.3	.013
ERQ-Sort	Sort Total score	2	740	.052	-.987	.990	-1.00	1.00	30.307***	96.7	.080

Note. DERS = Difficulties Emotional Regulation Scale. CERI = Comprehensive Emotion Regulation Inventory. CERQ = Cognitive Emotion Regulation Questionnaire. ERQ = Emotional Regulation Questionnaire. *k* = number of independent samples. *N* = total sample size. *r*₊ = pooled correlation coefficient. CI: Confidence interval for *r*₊. PI: prediction interval for *r*₊. LL and UL = lower and upper limits of the 95% confidence and prediction intervals for *r*₊. *Q* = Cochran's heterogeneity *Q* statistic; *Q* statistic has *k* - 1 degrees of freedom. *I*² = heterogeneity index. *τ* = between-studies standard deviation estimated using restricted maximum likelihood. **p* ≤ .050, ***p* < .010, ****p* < .0001

Figure 2

Forest plot of the association between any measured of emotional intelligence as emotional regulation and internet gaming disorder symptomatology



Gauged by measurement instrument (see Table 1), the relationship between the Difficulties Emotional Regulation Scale (DERS) total score and the Internet gaming disorder symptomatology was 0.299 (95% CI: 0.236, 0.359, $p < .0001$, $k = 18$), ranging from 0.07 to 0.52, indicating that the greater the difficulties emotional regulation, the greater the Internet gaming disorder symptomatology. According to Cohen's (1988) criteria, a correlation coefficient of 0.299 can be considered as reflecting a medium relationship. For the Difficulties Emotional Regulation Scale (DERS) subscales, the

pooled correlation coefficient for the nonacceptance subscale was 0.201 (95% CI: 0.130, 0.271, $p < .0001$, $k = 13$), ranging from 0.03 to 0.42; for the lack of goals subscale was 0.192 (95% CI: 0.121, 0.260, $p < .0001$, $k = 12$), ranging from 0.03 to 0.42; for the impulse subscale was 0.296 (95% CI: 0.227, 0.362, $p < .0001$, $k = 10$), ranging from 0.16 to 0.47; for the lack of awareness was 0.077 (95% CI: 0.037, 0.118 $p = .001$, $k = 13$), ranging from 0.03 to 0.29; for the lack of strategies subscale was 0.289 (95% CI: 0.207, 0.367 $p < .001$, $k = 10$), ranging from 0.13 to 0.48; and for the lack of clarity subscale was 0.194 (95% CI: 0.131, 0.256 $p < .0001$, $k = 15$), ranging from 0.01 to 0.39.

Concerning the Cognitive Emotion Regulation Questionnaire (CERQ), the 5 correlation coefficients reported on the association between the maladaptive cognitive emotion regulation strategies and Internet gaming disorder symptomatology ranged from 0.059 to .29, with a pooled correlation coefficient of 0.196 (95% CI: 0.109, 0.279, $p = .003$), indicating that the higher the maladaptive cognitive emotion regulation, the higher the Internet gaming disorder symptomatology. According to Cohen's (1988) criteria, a pooled correlation coefficient of 0.196 can be considered as reflecting a low-to-moderate relationship. Moderate to large heterogeneity was noted among the correlation coefficients reported ($Q(4) = 16.820$, $p = .002$, $I^2 = 73.4.0\%$), although the adaptive cognitive emotion regulation strategies were not related with Internet gaming disorder symptomatology ($p = .593$).

In the Emotional Regulation Questionnaire (ERQ), the 3 correlation coefficients reported for the relationships between Cognitive reappraisal subscale and Internet gaming disorder symptomatology ranged from -0.24 to -0.10 , with a pooled correlation coefficient of -0.162 (95% CI: -0.322 , 0.006 , $p = .053$, $k = 3$), indicating that both variables were not associated. For the expressive suppression subscale, the 3 correlation

coefficients reported ranged from 0.12 to 0.35, with a pooled correlation coefficient of 0.256 (95% CI: $-0.083, 0.541$, $p = .083$, $k = 3$), indicating no relationship between both variables. However, following Cohen's (1988) criteria, a pooled correlation coefficient of 0.162 and 0.256 can be considered as reflecting low-to-medium relationships.

Relationships Between Emotional Intelligence Measured as Social-Emotional Competence and Internet Gaming Disorder Symptomatology

The 13 correlation coefficients reported for the relationships between Social-Emotional Competence and Internet gaming disorder symptomatology ranged from -0.570 to 0.034 , with a pooled correlation coefficient of -0.230 (95% CI: $-0.333, -0.121$, $p < .001$) (see Table 2 and Fig. 3), indicating that higher social competence, lower Internet gaming disorder symptomatology. According to Cohen's (1988) criteria, a pooled correlation coefficient of -0.160 can be considered as reflecting a low-to-moderate relationship. Again, a large degree of heterogeneity was noted among the correlation coefficients reported ($Q(12) = 107.338$, $p < .0001$, $I^2 = 92.9\%$).

Table 2

Pooled correlation Coefficients, 95% confidence intervals, 95% prediction intervals, and heterogeneity statistics for the relationship between emotional intelligence measured as social-emotional competence, trait or ability with Internet gaming disorder symptomatology

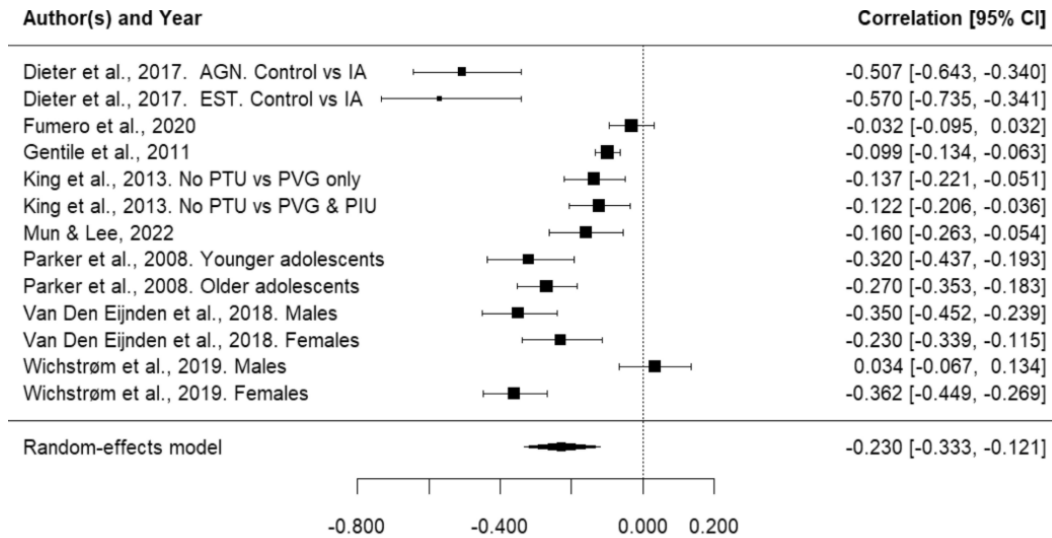
Outcome		<i>k</i>	<i>N</i>	<i>r</i> ⁺	95% CI		95% PI		<i>Q</i>	<i>I</i> ²	<i>τ</i>
					LL	UL	LL	UL			
	Any measure	13	7394	-.223	-.333	-.121	-.544	.141	107.338***	92.9	.027
EQ-i:YV	Total score	4	1193	-.249	-.386	-.101	-.485	.021	7.221	59.7	.005
	Intrapers	4	1193	-.160	-.308	-.004	-.423	.128	7.815*	65.6	.006
	Interpers	4	1193	-.291	-.408	-.163	-.493	-.059	6.401	52.8	.004
	Adaptability	4	1193	-.059	-.123	.005	-.123	.005	1.436	0.0	.00
	Stress management	4	1193	-.208	-.329	-.080	-.409	.013	5.759	48.1	.003
EKF	Total score	2	143	-.528	-.807	-.056	-.807	-.056	0.240	0.0	.00
	EE	2	143	-.461	-.677	-.172	-.677	-.172	0.090	0.0	.00
	EA	2	143	-.268	-.793	.486	-.793	.486	0.551	0.0	.00
	RE	2	143	-.233	-.368	-.090	-.482	.050	8.814	44.7	.009
	EX	2	143	-.419	-.681	-.061	-.681	-.061	0.126	0.0	.00

Outcome		k	N	r^+	95% CI		95% PI		Q	I^2	τ
					LL	UL	LL	UL			
TISS	Total score	2	1026	-.129	-.220	-.036	-.220	-.036	0.056	0.0	.00
	Positive Skills	2	1026	.039	-.936	.945	-.994	.995	19.264***	94.8	.036
	Negative Skills	2	1026	.110	-.895	.931	-.987	.992	15.344***	93.4	.028
HSPPA	Total score	2	538	-.291	-.812	.489	-.908	.724	2.290	56.6	.005
WLEIS	Total score	2	597	-.249	-.386	-.101	-.485	.021	0.000	0.0	.00
TEIQue-SF	Total score	2	948	-.276	-.977	.929	-.998	.995	21.887***	95.4	.044

Note. EQ-i:YV = Emotional Quotient Inventory: Young Version. EKF = Emotional competence questionnaire. EKF-EE = Recognizing and understanding the own emotions. EKF-EA = Recognizing and understanding others' emotions. EKF-RE = Regulation and control of the own emotions. EKF-EX = Emotional expressiveness. TISS = Teenage Inventory of Social Skills. HSPPA = Harters' Self Perception Profile of Adolescents. TEIQue-SF = Trait Emotional Intelligence Questionnaire-Short Form. WLEIS = Wong and Law's Emotional Intelligence Scale. *k* = number of independent samples. *N* = total sample size. *r*₊ = pooled correlation coefficient. CI: Confidence interval for *r*₊. PI: prediction interval for *r*₊. LL and UL = lower and upper limits of the 95% confidence and prediction intervals for *r*₊. *Q* = Cochran's heterogeneity *Q* statistic; *Q* statistic has *k* – 1 degrees of freedom. *I*² = heterogeneity index. τ = between-studies standard deviation estimated using restricted maximum likelihood. **p* ≤ .050, ****p* ≤ .0001

Figure 3

Forest plot of the association between any measured of emotional intelligence as social-emotional competence and internet gaming disorder symptomatology



The relationship between the Teenage Inventory of Social Skills (TISS) total score and Internet gaming disorder symptomatology by measurement instrument was -0.129 (95% CI: $-0.220, -0.036, p = .036, k = 2$), ranging from -0.12 to -0.14 , indicating that the higher the Social Skills, the lower the Internet gaming disorder symptomatology. However, the TISS positive and negative social skills subscales did not show a relationship with Internet gaming disorder symptomatology ($p = 0.824, p = 0.899$, respectively). Finally, for Harters' Self Perception Profile of Adolescents total score, the pooled correlation did not reach statistical significance -0.291 (95% CI: $-0.812, 0.489, p = .138, k = 2$).

Relationships Between Emotional Intelligence as Ability and Internet Gaming

Disorder Symptomatology

The 2 correlation coefficients reported for the relationships between Wong and Law's Emotional Intelligence Scale (WLEIS) total score and Internet gaming disorder symptomatology ranged from -0.23 to -0.23 , with a pooled correlation coefficient of -0.249 (95% CI: $-0.386, -0.101, p < .001$), indicating that the higher the Emotional Intelligence, the lower the Internet gaming disorder symptomatology (see Table 2). According to Cohen's (1988) criteria, a pooled correlation coefficient of -0.249 can be considered as reflecting a low-to-medium relationship.

Relationships Between Emotional Intelligence as Trait and Internet Gaming

Disorder Symptomatology

The pooled correlation of the Trait Emotional Intelligence Questionnaire-Short Form (TEIQue-SF) total score with Internet gaming disorder symptomatology (see Table 2) did not reach statistical significance ($r_+ = -0.276$, 95% CI: $-0.977, 0.929, p = .314, k = 2$).

Moderator Analyses

Moderator analyses were performed on the relationship between any measure of Emotional regulation and Internet gaming disorder symptomatology, since this was the one outcome that presented more than 20 correlation estimates. To facilitate the interpretation of meta-regression analyses, the correlation coefficients representing the relationships between any emotional regulation and internet gaming disorder symptomatology were adjusted so that all of them were positive. Simple meta-regression analyses revealed that the methodological quality of primary studies exhibited a positive and statistically significant association with the correlation coefficients, accounted for 12.7% of the variance (see Table 3).

Table 3

Results of the simple meta-regressions applied on correlation coefficients for the relationships between any emotional regulation and internet gaming disorder symptomatology, taking continuous moderator variables as predictors

Predictor variable	<i>k</i>	<i>b_j</i>	95% CI		<i>F</i>	<i>Q_E</i>	<i>R</i> ²
			LL	UL			
N	36	0.000	− 0.0001	0.0001	0.009	601.017***	.000
Gender	35	0.002	0.005	0.004	2.513	565.807***	.057
Age Mean	36	0.006	− 0.003	0.014	1.940	596.097***	.029
Age SD	34	0.012	− 0.005	0.029	2.234	492.748***	.034
Year	36	0.015	− 0.011	0.040	1.378	549.830***	.025
MQ total score	36	0.052	0.008	0.097	5.769*	550.891***	.127

Note. *N* = sample size. Gender = percentage of males in the sample. Age Mean = average age (years) of the sample. Age *SD* = standard deviation of the age (years). Year = publication year of the study. MQ = Methodological quality of primary studies. *k* = number of independent samples. *b_j* = regression coefficient of each predictor. LL and UL = lower and upper limits of the 95% confidence interval for *b_j*. *F* = Knapp-Hartung's statistic for testing the significance of the predictor (the degrees of freedom for this statistic are 1 for the numerator and *k* − 2 for the denominator). *Q_E* = statistic for testing the model misspecification. *R*² = proportion of variance accounted for by the predictor. **p* ≤ .050, ****p* < .001

The weighted ANOVAs applied to correlation coefficients found that three categorical moderator variables showed an association with correlation estimates (see Table 4): the research design (*p* = .020), measurement instrument applied for assessing emotional regulation (*p* = .022) and country in which the study was conducted (*p* = .014). The research design, classified as cross-sectional versus longitudinal, accounted for 14.8% of the variance. Stronger emotional regulation-Internet gaming disorder associations were found in cross-sectional ($r_+ = -0.244, p < .001$) than in longitudinal studies ($r_+ = -0.033, p = .715$). The measurement instrument applied to assess emotional regulation explained 30.9% of the variance. The ERQ-Sort instrument was the least sensitive to capturing the relationship between the emotional regulation-Internet gaming

disorder relationships found ($r_+ = 0.051, p = .608$), in comparison with the other instruments used ($r_+ = -0.254, p < .001$). The country in which the research was carried out explained 36% of the variance.

Table 4

Results of the weighted ANOVAs applied on correlation coefficients for the relationships between any measure of Emotional Regulation (ER) and IGD, taking categorical moderator variables as independent variables

Variable	<i>k</i>	<i>N</i>	r_+	95% CI		ANOVA results
				LL	LU	
Research design						$F(1,34) = 5.956, p = .020$
Cross-sectional	33	23,630	-.254	-.302	-.204	$R^2 = .148$
Longitudinal	3	820	-.033	-.211	.147	$Q_w(34) = 559.491, p < .001$
Sampling method						$F(1,34) = 0.024, p = .877$
Convenience	33	18,868	-.239	-.292	-.184	$R^2 = .00$
Random	3	5582	-.225	-.386	-.051	$Q_w(34) = 587.791, p < .001$
Target population						$F(6,29) = 0.804, p = .575$
Clinical	3	397	-.265	-.447	-.063	$R^2 = .00$
Community	13	8835	-.243	-.324	-.158	$Q_w(29) = 485.599, p < .001$
Gamers	2	2154	-.365	-.540	-.160	
Mixed (Clinical & Community)	2	143	-.396	-.604	-.138	
Mixed (Gamers & Community)	4	421	-.168	-.341	.016	
School students	8	10,302	-.205	-.309	-.096	
University students	4	2198	-.193	-.343	-.032	
Measurement Instrument for ER						$F(8,27) = 2.891, p = .018$
ALPS	1	2001	-.143	-.375	.107	$R^2 = .310$
CBCL	1	80	-.273	-.547	.054	$Q_w(27) = 398.717, p < .001$
CERI	2	995	-.263	-.428	-.082	
CERQ	5	6282	-.169	-.283	-.049	
DERS	18	13,113	-.299	-.345	-.241	

Variable	<i>k</i>	<i>N</i>	<i>r</i> ₊	95% CI		ANOVA results
				LL	LU	
EKF	2	143	−.397	−.583	−.171	
ERQ-Sort	2	740	.051	−.137	.236	
ERICA	1	301	−.200	−.442	.069	
ERQ	4	594	−.101	−.248	.048	
Measurement Instrument for ER (II)						$F(1,34) = 9.271, p = .005$ $R^2 = .200$ $Q_w(34) = 552.123, p < .001$
ERQ-Sort	2	740	.051	−.149	.248	
Other	34	23,710	−.254	−.300	−.207	
Country						$F(8,24) = 3.161, p = .014$ $R^2 = .360$ $Q_w(24) = 338.282, p < .001$
Canada	5	3364	−.239	−.346	−.125	
China	8	7778	−.202	−.292	−.108	
France	2	201	−.174	−.389	.058	
Germany	5	2244	−.406	−.512	−.289	
Italy	3	1075	−.391	−.515	−.252	
Italy & Sweden	2	995	−.264	−.429	−.081	
Norway	2	740	.051	−.138	.237	
Spain	3	1883	−.186	−.334	−.028	
Turkey	3	3290	−.225	−.363	−.077	
Continent						$F(2,33) = 0.453, p = .640$ $R^2 = .000$ $Q_w(33) = 610.409, p < .001$
Asia	12	12001	−.207	−.294	−.116	
Europe	18	8784	−.261	−.333	−.185	
North America	6	3665	−.233	−.352	−.107	

Note. ALPS = Adolescent Lifestyle Profile Scale. CBCL = Child Behavior Checklist. CERQ = Cognitive Emotion Regulation Questionnaire. DERS = Difficulties Emotional Regulation Scale. EKF = Emotional competence questionnaire. ERQ-Sort = Emotion Regulation Q-Sort. ERICA = Emotion Regulation Index for Children and Adolescents. ERQ = Emotional Regulation Questionnaire. *k* = number of independent samples. *N* = total sample size. *r*₊ = pooled correlation coefficient. LL and LU = lower and upper 95% confidence limits for *r*₊. *F* = Knapp-Hartung's statistic for testing the significance of the moderator variable. *Q*_w = statistic for testing the model misspecification. *R*² = proportion of variance accounted for by the moderator

Analysis of Publication Bias

The funnel plot with the trim-and-fill method and Egger's test were applied for each meta-analysis to examine publication bias. The Egger's tests applied did not reach statistical significance for any the meta-analysis of the relationships between any measure of Social Emotional competence and Internet gaming disorder symptoms (see Appendix B). In addition, the trim-and-fill method required the imputation of correlation coefficients to achieve symmetry in twelve other funnel plots, in eleven of which the adjusted pooled correlation coefficient displayed a negligible difference from the original pooled correlation coefficient (see Table 5). The adjusted pooled correlation coefficient showed a slight difference from the original only for the meta-analysis on the adaptive cognitive strategies as measure of emotional regulation outcome ($r_+ = -0.049$, $r_{adj+} = 0.072$, difference = 0.121) but was not relevant. In both cases, the relationships between the adaptive cognitive strategies as measure of emotional regulation outcome and Internet gaming disorder was not statistically significant so that publication bias can be safely discarded as a threat to the meta-analytic results.

Table 5

Publication bias analysis: Results of the Trim- and-Fill method

Outcome	k	k_{imp}	k_{TaF}	r_{adj+}	95% CI		95% PI		Difference (r_+ and r_{adj+})
					LL	UL	LL	UL	
DERS									
Total scores	18	2	20	.323	.261	.382	.037	.560	− 0.024
Nonacceptance	13	2	15	.227	.161	.292	− .028	.455	− 0.026
(Lack of) Goals	12	2	14	.219	.153	.283	− .027	.440	− 0.027
Impulse	10	2	12	.325	.262	.385	.103	.517	− 0.029
(Lack of) Awareness	13	3	16	.061	.023	.099	− .053	.174	0.016
(Lack of) Strategies	10	1	11	.307	.234	.377	.056	.522	0.018
CERQ									
Adaptative cognitive strategies	3	2	5	.072	− .110	.250	− .331	.453	0.121
ERQ									
Cognitive Reappraisal	3	1	4	− .151	− .244	− .056	− .244	− .056	0.011
Any measure of SEC	13	1	14	− .211	− .305	.111	− .525	.155	0.012
EQ-i:YV									
Total Scores	4	1	5	− .228	− .307	− .146	− .382	− .062	0.021
Adaptability	4	1	5	− .070	− .121	− .018	− .121	− .018	0.011
Stress management	4	1	5	− .180	− .262	− .097	− .341	− .009	0.028

Note. DERS=Difficulties Emotional Regulation Scale. CERQ=Cognitive Emotion Regulation Questionnaire. ERQ=Emotional Regulation Questionnaire. SEC=Social Emotional Competence. EQ-i:YV=Emotional Quotient Inventory: Young Version. k =number of original independent samples. k_{imp} =Number of imputed independent sample by the Trim- and-Fill method. k_{TaF} =number of independent samples from the Trim- and-Fill method. r_{adj+} =adjusted pooled correlation coefficient from the Trim- and-Fill method. CI: Confidence interval for r_+ . PI: prediction interval for r_+ . LL and UL = lower and upper limits of the 95% confidence and prediction intervals for r

Analyses of Sensitivity

Sensitivity analyses were performed to examine the robustness of the results and the impact of including or excluding one-to-one correlation coefficients. By deleting each study one by one and performing the analyses again each time, the pooled correlation

coefficient for the relationships between emotional intelligence measured as emotional regulation and Internet gaming disorder symptomatology ($k = 35$) ranged from -0.227 (95% CI: $-0.178, -0.275$) to -0.251 (95% CI: $-0.207, -0.294$), and for the relationship between emotional intelligence measured as social-emotional competence and Internet gaming disorder symptomatology ($k = 12$), the pooled correlation coefficient ranged from -0.206 (95% CI: $-0.102, -0.305$) to -0.249 (95% CI: $-0.144, -0.349$), indicating that the pooled correlation coefficients were robust. Supplementary Material 2 provides the results of the sensitivity analysis for each measurement instrument and shows that all the meta-analytic results were significantly robust.

Discussion

The prevalence of Internet gaming disorder has increased, and there is interest in identifying protective factors against its development. This study examined the association between Internet gaming disorder and a variable that is protective against other types of addiction: emotional intelligence. This study provides a meta-analytic synthesis of the existing research on the association between emotional intelligence and Internet gaming disorder symptomatology. Previous meta-analyses (Ji et al., 2022; Koo & Kwon, 2014) focused on specific social contexts (i.e., China and Korea), without considering potential differences across countries. Separate meta-analyses were performed to examine the relation between emotional intelligence and Internet gaming disorder symptomatology across different social contexts.

The results showed a negative and statistically significant relationship between emotional intelligence measured as emotional regulation and Internet gaming disorder symptomatology, indicating that the higher levels of emotional regulation were related to

lower levels of Internet gaming disorder symptomatology. According to Cohen's (1988) criteria, a pooled correlation coefficient of $r_+ = -0.237$ can be considered as reflecting a low-to-medium association. Higher Internet gaming disorder scores are associated with lower emotional regulation scores, suggesting two possible implications. On one hand, deficits in emotional regulation or maladaptive regulation strategies may be a risk factor in Internet gaming disorder development and gaming may provide an escape from emotional distress. On the other hand, emotional regulation deficits have also been linked to impulsivity (or deficits in self-control), another risk factor for multiple addictions (Estévez et al., 2019, 2021). In this case, emotional regulation could play a mediating role between impulsivity and Internet gaming disorder.

A negative and statistically significant relationship was found between emotional intelligence measured as social-emotional competence and Internet gaming disorder symptomatology, indicating that higher levels of social-emotional competence are related to lower levels of Internet gaming disorder symptomatology. According to Cohen's (1988) criteria, a pooled correlation coefficient of $r_+ = -0.230$ can be considered as reflecting a relevant low-medium association. These results indicate that there is not only a negative correlation between Internet gaming disorder and emotional intelligence, but also a correlation with one of the key emotional intelligence components: social-emotional competence. As in the case of emotional regulation, this correlation may have different implications, e.g., deficits in social competence may favor dysfunctional gaming. Although video games do have a social character, they do not necessarily require direct interaction with other players, which may be an aspect sought by people with little social competence. On the other hand, excessive gaming patterns may be linked to less time spent on other social activities and could impair social performance.

The results also showed the existence of a negative and statistically significant relationship between emotional intelligence measured as an ability and Internet gaming disorder symptomatology, indicating that the higher levels of emotional intelligence were related to lower higher levels of this symptomatology. According to Cohen's criteria (1988), a pooled correlation coefficient of $r_+ = -0.249$ can be considered as reflecting a low-to-medium association, in line with previous studies focusing on the association between Internet gaming disorder and emotional intelligence as ability (Dang et al., 2019; Fatima & Zulfqar, 2023). These findings may suggest that emotional intelligence acts as a protective factor, and therefore working on emotional awareness and management in prevention programs may reduce the likelihood of developing online gaming problems (Henning et al., 2021).

A negative and statistically significant relationship was detected between emotional intelligence measured as a trait and Internet gaming disorder symptomatology was found, indicating that the higher levels of emotional intelligence are related to lower higher levels of Internet gaming disorder symptomatology. According to Cohen's (1988) criteria, a pooled correlation coefficient of $r_+ = -0.276$ can be interpreted as reflecting a low-to-medium association, in line with previous studies on the association between emotional intelligence and Internet gaming disorder (Hamissi et al., 2013; Parker et al., 2008; Ranjbar & Bakhshi, 2018; Saraiva et al., 2018). Higher Internet gaming disorder scores are associated with lower emotional intelligence scores, suggesting that emotional intelligence may mediate the users' level of addiction. The results suggest that trait emotional intelligence, which is a stable personality trait, may be inversely related to internet gaming disorder symptomatology. One implication is that people with higher levels of trait emotional intelligence may be less likely to develop Internet gambling

problems. Previous evidence suggests that this relationship is stronger in adolescents than in adults (Kircaburun et al., 2020).

Overall, as the size of the relationships between any emotional intelligence and Internet gaming disorder symptomatology presented a large variability across studies, moderator analyses (e.g., ANOVAs and meta-regressions) were conducted to identify the study features that could explain at least part of the correlation coefficient variability. However, they could only be performed on the relationship between emotional intelligence measured as emotional regulation and Internet gaming disorder symptomatology due to the small number of studies that examined the other relationships (e.g., trait emotional intelligence and social competence with Internet gaming disorder symptomatology). Several characteristics of the studies were statistically associated with correlation coefficients, such as the methodological quality of primary studies, the research design, the measurement instrument for assessing emotional regulation, and the country in which the study took place. The studies with a higher methodological quality score were more sensitive in identifying the relationships between emotional regulation and Internet gaming disorder symptomatology. In other words, those with higher methodological quality scores showed a stronger relationship between emotional regulation and Internet gaming disorder than those with a lower score, exemplifying the benefits of rigorous methodologies in achieving more robust and trustworthy findings. The commitment to higher methodological standards not only enhances the precision of estimations but also facilitates a more accurate identification of the relationships of interest (Cohen, 1988). Also, stronger emotional regulation-Internet gaming disorder associations were found in cross-sectional than in longitudinal studies, suggesting that the studies' methodological characteristics could explain differences in the magnitude of the

relationship between emotional intelligence and Internet gaming disorder symptoms found in the literature.

The findings revealed that of all the emotional regulation measurement instruments, the ERQ-Short (Shields & Cicchetti, 1997) was the least sensitive tool in identifying relationships with Internet gaming disorder symptomatology. Based on this result, the ERQ-Short should be the last choice for assessing emotional regulation when it wants to examine the co-occurrence of internet gaming disorder symptomatology and difficulties emotional regulation. In addition, the country in which the study was conducted was also statistically related to correlation coefficients, which suggests that the strength of this relationship could vary across different social contexts. These findings support the view that emotional intelligence is culturally specific, reflecting differences in the cultural and individual dimensions of understanding, regulating, and managing emotions (Pathak & Muralidharan, 2020). Previous research has shown that individualistic-collectivist orientations in society tend to shape and influence psychological processes, with a stronger relationship found between collectivist cultures and emotional intelligence (Bhullar et al., 2012; Margavio et al., 2012). Similarly, the prevalence of gaming disorder differs across countries, particularly in Asia and North America, which the highest rates of video game consumption are found (Warman, 2018).

On the other hand, the participant's age, gender distribution, and the target population (e.g., clinical, community, gamers, mixed, school students or university students), did not show a statistically significant association with the correlation coefficients, which suggests that age, gender, and the target population does not affect the strength of the relationship, which therefore does not systematically vary across age, genders, and the target population. The size of the relationship between emotional

intelligence measured as emotional regulation and Internet gaming disorder symptomatology are thus equally regardless of age, gender, and target population.

The present meta-analysis has limitations in terms of sample size and characteristics of the sample studies. One of the limitations is associated with the small number of studies included in certain analyses ($k = 2$). This limitation could affect the precision of the estimation, potentially failing to accurately reflect the true relationship between emotional intelligence and the symptoms of internet gaming disorder. The results of these analyses should therefore be interpreted with caution. Additionally, the present meta-analysis is limited by the following points: most of the included studies used a non-probabilistic sampling method (i.e., convenience sample, non-representative sample), which makes it difficult to generalize the meta-analytic results. Most also used a cross-sectional research design, which cannot draw causal inferences on the association between emotional intelligence and Internet gaming disorder symptomatology. Longitudinal studies might help to understand this association in chronological terms to determine whether emotional intelligence precedes Internet gaming disorder symptomatology (or vice versa). In addition, four studies which examined the relationship between emotional intelligence and Internet gaming disorder symptomatology could not be included in the meta-analyses as they did not provide statistical data to compute the effect sizes and their authors did not reply to the request for data. There was also great heterogeneity among the correlation coefficients, so that there are possibly other moderator variables which could not be considered in the present analysis because they did not report on the original studies (i.e., hours playing or percentage of Internet gaming disorder in the sample) and could be relevant in explaining this variability. It would be interesting in future primary studies to analyze the emotional intelligence-Internet gaming disorder relationship to include other variables that could be used as moderators, such as

participant variables (i.e., personality traits), consumption habits (i.e., hours of playing, game genre, game mode) and study methodology (i.e., study design, sampling method, risk of bias). Future research could focus on analyzing the components of emotional intelligence that have a greater protective effect on the development of Internet gaming disorder, and whether they are differential in the development of other types of addiction. Also, a study could explore whether the size of the correlation between emotional intelligence and Internet gaming disorder symptomatology found is stable across different age groups, or whether there is an age group in which the correlation becomes stronger. Practical implications for the practical field can also be drawn from the results, especially in preventing Internet gaming disorder prevention and in its treatment programs.

Conclusion

The increasing incidence of Internet gaming disorder highlights the need to investigate factors associated with its onset. This study examined emotional intelligence as a study variable in relation to Internet gaming disorder, due to its relevance to the development of other addictive behaviors. The results suggest a significant negative association between Internet gaming disorder and emotional intelligence. A low-to-medium association was found between Internet gaming disorder and overall emotional intelligence, emotional regulation, and social competence. Given the protective role of emotional intelligence in substance and behavioral addictions, a similar role can be expected for gaming disorder. The authors consider that these results could make a valuable contribution to the improvement of research in this area, especially as regards understanding the development of gaming addiction in adolescence and early adulthood.

Study 3. Reliability Generalization Meta-Analysis of Internet Gaming Disorder Scale⁵

Gisbert-Pérez, J., Martí-Vilar, M., Merino-Soto, C., & Vallejos-Flores, M. (2022). Reliability Generalization Meta-Analysis of Internet Gaming Disorder Scale. *Healthcare, 10*(10), 1992. <https://doi.org/10.3390/healthcare10101992>

Abstract

The objective of this study was to carry out a reliability generalization meta-analysis of the Internet Gaming Disorder Scale (IGDS) to find out if it presents adequate values that justify its application in its four versions: original and abbreviated with dichotomous or ordinal response. A systematic review including 26 studies that apply this instrument from 2015 to June 2022 was conducted. For each version, a reliability generalization meta-analysis was performed with the random coefficients (RC) and varying coefficients (VC) model. Results showed reliability levels > 0.80 in the ordinal versions (IGDS9P and IGDS27P) and in the dichotomous 27-item version (IGDS27D), while the dichotomous 9-item version (IGDS9D) produced levels > 0.70 . High heterogeneity was found in all versions ($I^2 > 95\%$; $R_b > 90\%$). Cronbach's α means with both models (RC-VC) did not differ significantly except for the IGDS9D version. It is concluded that, considering the dependence of the results on sample size, abbreviated versions do not guarantee that reliability remains acceptable, and dichotomous versions may provide limited but acceptable reliability. Finally, IGDS27P version is recommended in contexts where high precision is required.

Keywords: IGDS, internet gaming disorder, meta-analysis, reliability

⁵ All references of the studies included in the review and meta-analysis are listed in the Supplementary Material.

Introduction

Since the inclusion of Internet gaming disorder (IGD) in the DSM-5 (APA, 2013), a set of controversies and opportunities arose for mental health professionals regarding the evaluation and intervention of IGD (Carbonell et al., 2020; Montag et al., 2019). This incorporation reinforced the development and adaptations of psychometric instruments that evaluate the IGD, presenting a set of proposals based on DSM-5 diagnostic criteria (Beranuy et al., 2020).

According to DSM-5, IGD is characterized by a pattern of persistent and recurrent gaming behavior that leads to clinically significant impairment or discomfort over 12 months, in which five or more symptoms are present such as preoccupation with gaming, withdrawal symptoms when not gaming (sadness, anxiety, and irritability), tolerance, inability to reduce or stop gaming, giving up other pleasurable activities, continuing to game despite problems, misleading family or others about the amount gaming time, using gaming to relieve negative moods, and risking or losing a job or relationship over gaming (APA, 2013). Although this disorder is labeled “online” due to its association with specific online games, it can also develop with offline games (APA, 2013; p. 796). It is also included in the ICD-11 as a “gaming disorder” (WHO, 2019).

In a systematic review and meta-analysis of IGD prevalence in 17 countries (Stevens et al., 2021), the worldwide prevalence was estimated to be 3.05%. These rates exceed the prevalence of problem gaming, and are similar to those of some substance use disorders and obsessive-compulsive disorder.

IGD usually begins in early adolescence (García-García et al., 2021). During adolescence, there are higher rates of gaming-related problems compared to older age groups (Lemmens et al., 2015; Paulus et al., 2018; Wang & Cheng, 2021). Thus, the

pooled prevalence of IGD is 4.6% in adolescent samples (Fam, 2018), with higher rates in men (6.8%) than in women (1.3%). Regarding the geographical context, Asia and North America report a higher prevalence of IGD in adolescents (9.9% and 9.4%, respectively), who also present the highest rates of video game use (Warman, 2018).

However, the prevalence of problematic video game use among adults should be considered. In an intergenerational prevalence study (Wang & Cheng, 2021), IGD rates were compared among 847 Millennials, Generation X'ers, and Baby Boomers from Hong Kong. The prevalence of IGD increased in the younger generations, being a worrying phenomenon both in Millennials (7.4% of the general sample) and in Generation X (1.3% of the general sample).

With the COVID-19 pandemic, there has been an increase in the number of video game users and related phenomena, such as video game streaming (Cabeza-Ramírez et al., 2021). However, cases of Internet gaming disorders have also increased by between 1–2.5% (Oka et al., 2021). This highlights the current importance of the comprehensive and intergenerational study of this phenomenon and the development of reliable diagnostic instruments for IGD.

Since the introduction of IGD in the DSM-5, different instruments have been developed for its diagnosis, such as the Internet Gaming Disorder Test-IGD-20 (Pontes et al., 2016), the Questionnaire of Experiences Related to Video Games (CERV; Chamarro et al., 2014), or the Internet Gaming Disorder Scale (IGDS; Lemmens et al., 2015), among others. This study focuses on the IGDS of Lemmens et al. (2015) as it provides greater possibilities in terms of response format (dichotomous and polytomous version), extension (27 or 9 items), and multiple adaptations to other languages (Lei et al., 2020; Evren et al., 2017; Baiumy et al., 2018).

The IGDS is an instrument based on the nine DSM-5 IGD diagnostic criteria: preoccupation, tolerance, withdrawal, persistence, escape, problems, deception, displacement, and conflict (APA, 2013). Since the initial proposal, four variants have been presented: a 27-item scale with a polytomous response or IGDS27P (Likert 0–6), a 27-item scale with dichotomous responses or IGDS27D, a 9-item scale with a polytomous response or IGDS9P (Likert 0–6) and a 9-item scale with a dichotomous response or IGDS9D [9]. The psychometric properties found for all the scales were evaluated in samples of adolescents and young adults, finding high internal consistency in all of them (coefficient α): IGDS27P (>0.94), IGDS27D (>0.93), IGDS9P (>0.95), and IGDS9D (>0.83 ; Lemmens et al., 2015). The evidence for validity was acceptable, as well as evidence for content validity (Lei et al., 2020), internal structure, and validity in relation to other variables (Allen & Anderson, 2018; Evren et al., 2017; Lei et al., 2020; Lemmens et al., 2015; Paschke et al., 2021).

Regarding its structure, the unidimensionality of the scale has been reported in some studies (Lei et al., 2020; Lemmens et al., 2015; Paschke et al., 2021) and multidimensional in others (Evren et al., 2017). For the diagnosis of gaming disorder, the cut-off point recommended and established by researchers is to present five or more criteria during 12 months, based on the recommendation of the DSM-5 (Lemmens et al., 2015). This criterion, assumed from the DSM-5 (>5), showed high specificity and adequate sensitivity (Bernaldo-de-Quirós et al., 2020). These authors, assuming this cut-off point, identified three types of players: normal, risk, and disordered (Lemmens et al., 2015; Paschke et al., 2021).

However, despite its frequent use, no study reports its average reliability across multiple application studies. The need for a study of these characteristics adds to the fact that some studies report low-reliability values (Baiumy et al., 2018; Bernaldo-de-Quirós

et al., 2020; Wartberg et al., 2019), and therefore, the reliability scores of the instrument may not justify its use. Reliability generalization meta-analyses are used to statistically integrate reliability estimates calculated in different applications of an instrument. In addition, they provide information on how different sample characteristics affect the variation in an instrument's reliability indices (Badenes-Ribera et al., 2020). It should be considered that some aspects can increase the variance error, affecting reliability. Some authors highlight the fatigue in the participants (Santos, 2017), the lack of monitoring in massive applications, or the induction of the validity of the instrument (Merino-Soto et al., 2020; 2021), among others. Quality controls and specifying the conditions of application contribute to the reliability of the instrument scores (Reidl-Martínez, 2013).

Having a meta-analysis of an instrument that presents good reliability is useful both for a good diagnosis and for providing adequate care to users who require it (Sánchez-Meca et al., 2009). After a previous search, no examples of this type of meta-analysis have been found for the IGDS. However, while it was being carried out, a study was detected that included a reliability generalization meta-analysis of the IGDS (Yoon et al., 2021), with which there are substantial differences in the included versions of the IGDS, the meta-analytic models employed, the sample size, and the sample size, and the assessment of heterogeneity. Therefore, this study includes the four main versions of the IGDS, as well as more models and reliability and heterogeneity estimators, and discusses which of the four versions may be more reliable. A more comprehensive differentiation between the two studies is included in Appendix A.

Given that IGD usually begins and develops during adolescence, such a study could benefit clinical practice by providing evidence of the reliability of a diagnostic tool for IGD, as well as promoting the prevention and early treatment of IGD.

Aim of the study

To carry out this study, a main research question was posed: does the IGDS in its four versions present adequate reliability values to justify its application? Consequently, the main objective of this study is to carry out a reliability generalization meta-analysis to estimate the internal consistency of the IGDS in order to know whether it presents adequate values that justify its application in all its versions. Likewise, it is intended to analyze whether the reliability indices are affected by the characteristics of the studies. It was hypothesized that the IGDS, in its four versions, would continue to be an instrument with good internal consistency reliability.

Materials and Methods

Information Sources

After not identifying a systematic review or meta-analysis similar to the one proposed, a systematic review was carried out following the PRISMA 2020 method (Page et al., 2021) in the Web of Science (WoS, Main Collection), PsycInfo, Scopus, and Dialnet databases.

Eligibility Criteria

A protocol was registered in PROSPERO, with the identification code CRD42022330840. For screening, the following inclusion criteria were proposed: (a) original empirical studies that apply the IGDS, (b) include the IGDS in the original or translated language, (c) include the IGDS in the original or reduced version, (d) validations and adaptations of the IGDS, and (e) report the reliability of the instrument using Cronbach's α or another indicator. It was not considered to limit the search to the type of sample, since the instrument has been adapted to different populations. Likewise,

those studies that met any of the following exclusion criteria were discarded: (a) not using the IGDS and (b) book chapters or books.

Search Strategy

First, manuscripts using IGDS were identified in three iterations. The search was carried out in July 2021 and was updated in June 2022. This process was carried out by one of the authors and corroborated by another through the Covidence tool.

First Iteration. The first search was performed on the Web of Science (WoS Main Collection), PsycInfo, Scopus, and Dialnet databases. On all bases, the term “Internet Gaming Disorder Scale” was introduced to include all those works that contained said instrument. Given the generality of the search profile, the results were refined by including only the works between 2015 and June 2022, both inclusive, and written in English and Spanish.

The search was limited to the field of psychology. In the WoS database, the search was limited to the categories “social sciences”, “psychology”, “applied psychology”, “clinical psychology”, “developmental psychology”, “experimental psychology”, “multidisciplinary psychology”, and “psychology Social”. In Scopus, the fields of study “psychology” and “social sciences” were selected. In Dialnet, it was not limited by the field of study. At PsycInfo, the field of study was also not limited by being a psychology database.

Second Iteration. The second search was manual, reviewing the references of the studies found in the first search.

Third Iteration. A second manual search was performed in Google Scholar to expand the sample.

Selection of Studies

Once duplicates were eliminated with RefWorks bibliographic manager, the Covidence Software was used to carry out a blind peer review by title and abstract, and full text, following the eligibility criteria. In longitudinal studies or those that included more than one measurement performed on the same subjects, the first study was selected, or in its exception, the first that reported a reliability coefficient. In contrast, studies using more than one sample and their reliability values were considered independent samples.

Data Extraction

The reliability coefficient of the selected studies (α , McDonald's omega (ω), or test-retest) was manually extracted. Both reported (i.e., the study's coefficient) and induced reliability values were considered. In this scale, the use of the single score or total α (although there are several specific dimensions) is indicated and was used for the correlations of the original study. Therefore, no study reports the reliability of the 9 dimensions of the scale.

Regarding the induced reliability, it was subdivided into three categories: omitted, vague, and precise (Rubio-Aparicio et al., 2020). It was considered omitted when no reliability coefficient was reported in the study, vague when "good" reliability was expressed by citing other previous studies, and precise when the exact value of a previous study was reported.

From the studies with reported reliability values, information was extracted regarding the year of publication, version of the IGDS, the language of the IGDS, country of application, application method, sample size, general characteristics of the sample, and classification of the gamers in the sample (include only players or players and non-players), mean age, mean IGDS scores and standard deviation, percentage of women in

the sample, mean weekly gaming hours, data collection method, adjustment indices, use of test-retest, presence of statistical validation of the IGDS, and percentage IGD+ in the sample. Data extraction was performed with Covidence and Microsoft Excel.

Analysis

After obtaining the sample, a reliability generalization meta-analysis was performed for each version of the IGDS following the recommendations of the REGEMA checklist (Appendix B).

Description and Evaluation of α Coefficients

The adequacy of the reliability in each study, and the mean α coefficient, were evaluated by comparing their confidence intervals (95%) obtained against a null value (Bonett & Wright, 2015). This null value was established in two values of the coefficient α : 0.70 and 0.80. These values were chosen because they are usually minimum criteria to generically determine the appropriateness of a reliability coefficient (Savalei, 2019).

Modeling

Due to the characteristics of the study that could influence the conclusions (i.e., inter-study and intra-study heterogeneity, and the size of the selected studies), the modeling decision was oriented towards two approaches: random coefficients (RC model; Hedges, 1983) and variant coefficients (VC model; Bonett, 2010).

Random coefficients model. There are several contextual factors (e.g., a large number of measures applied to an examinee, evaluation monitored by an examiner or without monitoring, etc.), individual variables (e.g., mood, motivation, effort, personality attributes, etc.), data quality (e.g., multivariate outliers, response trends, etc.), and the interaction between them, which can produce variability in the estimation of the reliability

of the obtained score (Huang et al., 2014; 2015). Thus, the first model for meta-analyzing the α coefficients of the IGDS was random effects (RC; Hedges, 1983). RC has several underlying assumptions: first, the estimates obtained vary from study to study, due to actual differences between studies, and due to sampling variation. Second, the study sample came from a random selection from a normally distributed population of α coefficients, which implies that this is an overpopulation. Third, to generalize the results to future studies not similar to this study, the RC model is generally accepted as the recommended option, and is one of the preferred goals of research (Schmidt et al., 2009).

For the estimation of the amount of variance between studies (τ^2 ; Veroniki et al., 2019), the restricted maximum likelihood (REML) method was implemented (Raudenbush, 2009), with the Knapp–Hartung modification (Knapp & Hartung, 2003) was applied to the statistical test of variability (Q ; Cochran, 1954), τ^2 , and confidence intervals. This method is based on the Student's t -distribution and tends to provide more robust estimates under various data conditions (IntHout et al., 2014). The measures of heterogeneity of the selected studies were: (a) the statistical test Q (Cochran, 1954), with the significance level set at 0.10 (Fletcher, 2007), and (b) estimators of the size of heterogeneity: I^2 (Higgins et al., 2022), R_b , and CV_b and CV_w as measures of between-study and intra-study variability, respectively (Crippa et al., 2016).

Due to the potential bias produced in the estimation of I^2 in meta-analyses with a small number of studies (von Hippel, 2015), its interpretation mainly used its confidence intervals. Two qualitative criteria used to interpret I^2 were: The first, by Deeks et al. (2008) and Higgins et al. (2022): $<I^2 = 40\%$ (“could be small”), $I^2 = 30–60\%$ (“could be moderate”), $I^2 = 50–90\%$ (“could be moderate”), and $I^2 = 75–100\%$ (“could be substantial”). The second, by Higgins et al. (2003): $I^2 < 25\%$ (trivial), $I^2 \geq 25\%$ (minor), $I^2 \geq 50\%$ (moderate), and $I^2 \geq 75\%$ (substantial).

According to the recommendation of Sánchez-Meca et al. (2013) and Romano et al. (2010), under the RC model, the α coefficients were transformed with the Bonett method [54], $L_i = \ln(1 - \alpha)$, and their sampling variance (Bonett, 2002) was obtained with: $V_i = 2/J(J-1)*(n_i-2)$, in which J: number of items and n_i : sample size of the study. On the other hand, the weighting of the studies to obtain the α_{mean} was conducted with the general approach of creating weights based on the inverse of the variance (Whitehead, 1991). To assess the independence between the size (i.e., number of participants) and the α coefficient of the studies (Bonett, 2010; Shuster, 2010), both parameters were correlated. Respectively, for IGDS9D, IGDS9P, IGDS27D, and IGDS27P, the following was obtained: $r = 0.149$ ($p = .53$), $r = -0.213$ ($p = .78$), $r = 0.382$ ($p = .61$), and $r = -0.793$ ($p = .108$). According to the lack of statistical significance, the weights could be applied with little apparent risk of bias in the estimation of the α_{mean} in the IGDS9D, IGDS9P, and IGDS27D, but the interpretation of the results requires caution in IGDS27P due to the size of the correlation.

Varying coefficients model. Although meta-analytic research usually uses the RC model, the analysis was also conducted with the varying coefficients (VC) model (Bonett, 2010). This model was chosen due to: (a) the unlikely fulfillment of the assumption of normality of the hypothetical population of α coefficients, (b) the actual absence of random selection of manuscripts, and (c) the small number of selected studies (i.e., less than 6 in IGDS9P, IGDS27D, and IGDS27P). These are conditions that make it difficult to justify the RC model, particularly when the identification of a well-defined population of studies is problematic (Bonett, 2010). Specifically, in our study, variability is observed in multiple factors of the sample. Firstly, there are differences in gamer conceptualization. On the one hand, some studies define a gamer according to a minimum game frequency (e.g., playing at least once a month; Allen & Anderson, 2018; Brooks & Clark, 2019;

Buiza-Aguado et al., 2018; Lemmens et al., 2015; Sioni et al., 2017; Stockdale & Coyne, 2019; Wartberg et al., 2019), while others only consider as gamers those who currently play (Baiumy et al., 2018; Booth, 2020; Dedeaux, 2019; Evren et al., 2017; Grajewski & Dragan, 2020; Lei et al., 2020; Liu et al., 2021; Mills & Allen, 2020; Wartberg et al., 2019; Zemestani et al., 2021). On the other hand, some studies did not specify what they considered as a gamer, since in most of these cases the diagnosis of IGD was not their main objective (Baiumy et al., 2018; Bonett, 2008; Cabeza-Ramírez et al., 2021; Dedeaux, 2019; Gibbons & Bouldin, 2019; Koning et al., 2018; Reyes et al., 2019; Van den Eijnden et al., 2018; Zendle, 2020).

Differences are also observed in terms of the characteristics of the samples, sometimes including players and non-players or exclusively gamers. In some studies, game intensity (hours and days of game), gamer profiles (players for fun, amateur, professionals, etc.), and video game genre (e.g., MMORPG) were considered. Methodological variability was also observed. Finally, both the size and age groups of the study samples are variable, ranging from 204 to 2078 participants, including adolescents, young adults, adults, and the general community. Consequently, heterogeneity is present in different combinations of the aforementioned variables.

VC model is an appropriate approach when the number of meta-analyzed studies is small (<30; Sánchez-Meca et al., 2013), when strong heterogeneity is present (in the Results section, this is observed), and when there was no randomized extraction of studies (Bonett, 2008). In contrast to the RC model, the generalizability of the VC results is oriented to a population of studies similar to those that were selected (Sánchez-Meca et al., 2013). VC does not assume compliance with the common assumptions of fixed effects and random coefficient methods (Krizan, 2010). In the VC method, the log-

transformation is applied to α_{mean} ($\ln [1 - \alpha_{\text{mean}}]$; Bonett, 2010) to stabilize the variance (Bonett, 2002), and the studies are not weighted to obtain the mean meta-analytics.

Sources of Heterogeneity

Due to the small number of studies analyzed (<25), the identification of sources of heterogeneity in the IGDS with the largest number of meta-analyzed studies (i.e., IGDS9D, $n_{\text{studies}} = 20$) was explored with *K*-means cluster analysis, within a dependency *cluster-covariate analysis* (Mikolajewicz & Kamarova, 2019). Accordingly, (a) strictly exploratory clusters were identified with the *K*-means procedure, and (b) these clusters were compared with the existing natural clusters in the studies. This comparison was made using the χ^2 independence test, and the Cramer-V effect size estimator. The similarity found in this comparison would suggest the substantive interpretation of these new groupings and avoid random capitalizing. The descriptive variables were: the language of the scale (original and English dichotomous classification), mode of application, age characteristics of the sample (adolescents, young people, adults, or general community), and the condition of gamers in the sample (only gamers or mixed samples with gamers and non-gamers) (Appendix B). Differences in mean alpha estimates for each group of studies were estimated using Bonnet's method (2010), based on the confidence interval of the differences ($\text{CI } \Delta_{\text{diff}}$).

In the versions with smaller number of meta-analyzed studies (i.e., IGDS9P, IGDS27D, and IGDS27P; in all $n \leq 5$), subgroup identification was performed on a quantitative–qualitative basis, and within *qualitative evidence synthesis* (QES) framework (Schulz et al., 2021). This was conducted to identify the distinguishing characteristic of the studies that could be associated with the variability of the α_{mean} coefficient. The procedure followed was: (a) quantitative identification of homogeneous groups with *K*-means cluster analysis, (b) content exploration of the identified groups by

K-means analysis (i.e., qualitative examination of the characteristics of their studies from their descriptive variables: instrument language, etc.), (c) assignment of apparent quality that distinguishes these identified groups, and (d) reproducibility evaluation of the three previous steps (independently by one of the authors).

Outliers and Robust Estimation

As part of the heterogeneity assessment, outliers were detected for each study, and the mean α was robustly reestimated excluding them. For each study, its impact on τ^2 was also estimated, using the V_{RATIO} and TAU_{RATIO} statistics (Noma, 2022); the cut-off point Q (Q_{vratio} and Q_{tauratio}) to identify the strength of the impact of each study ($V_{\text{RATIO}} > Q_{\text{vratio}}$; $TAU_{\text{RATIO}} > Q_{\text{tauratio}}$) was established with 1000 bootstrap samples.

Regarding the software used, the following R programs were used: RC modeling with *metafor* (Viechtbauer, 2010), VC modeling with *vcmeta* (Bonett, 2022), the impact assessment of each study on variability was conducted with *boutliers* (Noma, 2022), outlier detection and robust estimation were conducted with the *dmetar* (Harrer et al., 2019), alternative measures of heterogeneity (R_b , CV_b , CV_w) were obtained with the *hetmeta* (Crippa et al., 2016), and K-means cluster analysis with *R stats* (R Core Team, 2021).

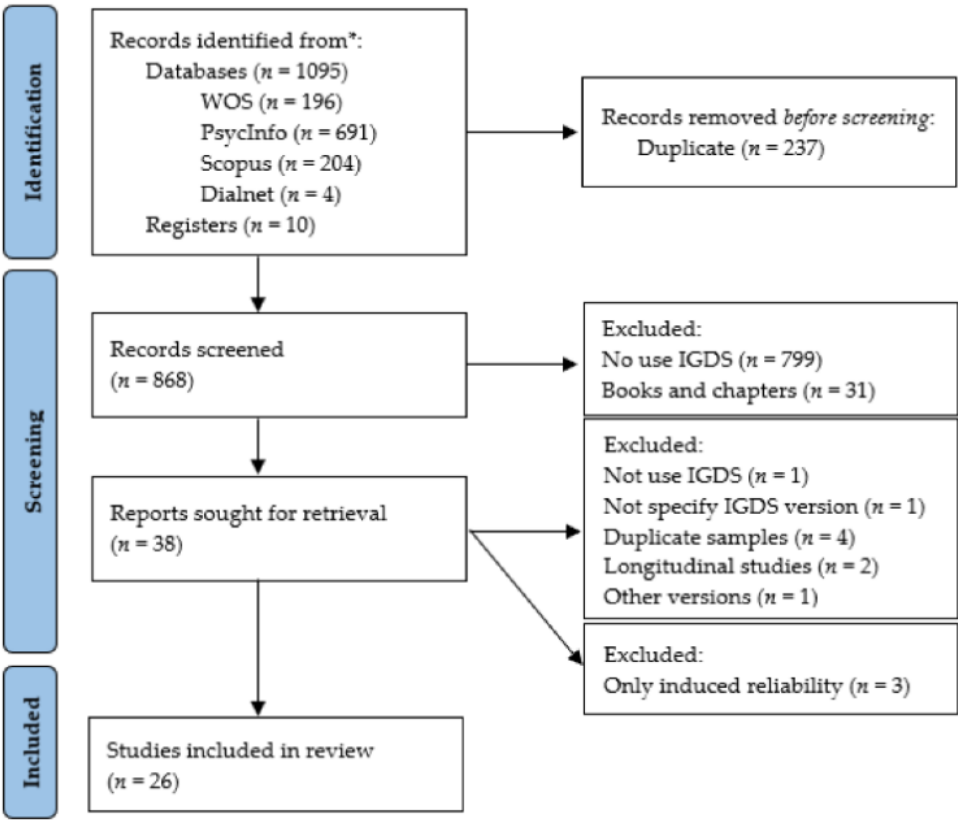
Results

Results of the Study Selection Process

The identification, screening, and selection process carried out according to PRISMA 2020 is detailed in Figure 1.

Figure 1

Flowchart of the selection and screening process of the systematic review articles according to the PRISMA 2020 statement



First, using the database tools, a total of 1095 articles were identified, including 204 from Scopus, 196 from WoS, 691 from PsycInfo, and 4 from Dialnet. Additionally, 10 articles were identified in a second ($n = 3$) and third ($n = 7$) iteration. After removing duplicates ($n = 237$), the remaining 868 articles were screened for eligibility criteria. In

total, 38 articles were selected to read the full text. Nine articles were excluded: for not administering the instrument ($n = 1$), for not specifying IGDS version ($n = 1$), for administering a version whose answers are provided by third parties ($n = 1$), second measures from longitudinal studies ($n = 2$), and by using repeated samples ($n = 4$). Of the 29 studies, 3 studies only include induced reliability values (omitted ($n = 2$) and precise ($n = 1$)). Only articles that reported reliability ($n = 26$) were included for the meta-analysis. These studies were divided according to the version of the IGDS administered. As mentioned, the studies that presented several independent samples that reported the reliability values and the N of each one of them were coded as independent samples. The distribution was as follows: IGDS27P ($n = 5$), IGDS27D ($n = 4$), IGDS9P ($n = 4$), and IGDS9D ($n = 20$; Appendix B).

Description and Evaluation of the Level

Results are presented in Table 1. Regarding IGDS9D, 60% ($n = 12$) of the studies produced an alpha coefficient > 0.70 , while the rest were below this level (20%, $n = 4$) or had an inconclusive result (20%, $n = 4$), because the confidence interval of the difference includes zero. Meanwhile, less than half of the studies produced coefficients > 0.80 . Regarding IGDS9P and IGDS27P, all random-effects coefficients > 0.80 . Finally, IGDS27D was predominantly > 0.80 .

Table 1

Characteristics of the reliability levels of the articles included in the meta-analysis

Study	<i>n</i>	α	<i>se</i>	95% CI α (LL–UL)	>0.70	>0.80	V_{RATIO}	Q_{vratio}	TAU_{RATIO}	$Q_{tauratio}$
1	989	0.830	0.00	0.814–0.845	Y	Y	10.07 *	0.87	10.02 *	0.82
2	394	0.850	0.00	0.826–0.871	Y	Y	10.04 *	0.88	0.99 *	0.83
3	1020	0.820	0.01	0.803–0.836	Y	Y	10.08 *	0.89	10.03 *	0.84
4	204	0.610	0.00	0.523–0.684	N	N	0.92	0.92	0.88	0.88
5	708	0.810	0.04	0.788–0.830	Y	NC	1.09 *	0.88	1.04 *	0.83
6	354	0.740	0.01	0.697–0.778	NC	N	1.10 *	0.88	1.05 *	0.83
7	538	0.730	0.02	0.694–0.763	NC	N	1.09 *	0.89	1.04 *	0.84
8	257	0.820	0.01	0.784–0.851	Y	NC	1.08 *	0.88	1.03 *	0.83
IGDS9D	18,828									
9	310	0.840	0.01	0.811–0.865	Y	Y	1.06 *	0.89	1.00 *	0.84
10	855	0.810	0.01	0.790–0.828	Y	NC	1.09 *	0.89	1.04 *	0.83
11	1306	0.690	0.01	0.664–0.714	NC	N	1.04 *	0.89	0.99 *	0.84
12	351	0.810	0.01	0.778–0.838	Y	NC	1.09 *	0.90	1.04 *	0.84
13	1001	0.660	0.01	0.627–0.691	N	N	0.98 *	0.90	0.93 *	0.84
14	1081	0.790	0.01	0.771–0.808	Y	NC	1.11 *	0.86	1.05 *	0.81
15	2078	0.740	0.01	0.723–0.756	N	N	1.10 *	0.88	1.05 *	0.83
16	1121	0.830	0.00	0.815–0.844	Y	Y	1.07 *	0.86	1.02 *	0.81
17	3938	0.840	0.00	0.832–0.847	Y	Y	1.06 *	0.88	1.00 *	0.82
18	762	0.780	0.00	0.756–0.803	Y	N	1.11 *	0.87	1.06 *	0.81
19	777	0.720	0.01	0.689–0.748	NC	N	1.09 *	0.88	1.03 *	0.83
20	784	0.560	0.01	0.512–0.604	N	N	0.68	0.90	0.63	0.85
IGDS9P	2787									
1	923	0.95	0.002	0.945–0.955	Y	Y	1.09 *	0.26	0.81	0.26
2	457	0.93	0.005	0.920–0.939	Y	Y	1.73 *	0.21	0.45	0.21
9	1029	0.85	0.007	0.836–0.863 *	Y	Y	0.61 *	0.25	1.30	0.25
18	378	0.89	0.009	0.872–0.906	Y	Y	1.87 *	0.21	1.42	0.21
IGDS27D	2919									
1	989	0.93	0.003	0.9234–0.936	Y	Y	1.64 **	0.27	1.23 *	0.17
14	1026	0.90	0.004	0.8908–0.908	Y	Y	2.02 *	0.17	1.52 *	0.11
16	423	0.93	0.004	0.9198–0.939	Y	Y	1.64 *	0.18	1.23 *	0.10
26	481	0.81	0.012	0.7842–0.833 *	Y	NC	0.12	0.22	0.09	0.15
IGDS27P	2454									
1	923	0.95	0.001	0.95–0.96	Y	Y	0.31	0.64	0.20	0.49
2	457	0.94	0.002	0.93–0.94	Y	Y	1.03 *	0.64	0.80 *	0.49
5	315	0.97	0.002	0.96–0.97	Y	Y	1.63 *	0.78	1.33 *	0.60
13	272	0.96	0.003	0.95–0.96	Y	Y	1.62 *	0.78	1.32 *	0.60
19	487	0.96	0.003	0.95–0.96	Y	Y	1.64 *	0.64	1.33 *	0.49

Note. α : Cronbach's α reliability; *n*: sample size; *se*: standard error; >.70, >.80: Levels for qualify α (Y = yes; N = no; NC = non conclusive); V_{RATIO} and TAU_{RATIO} : impact indexes of each study, on the variability of α_{mean} ; Q_{vratio} , $Q_{tauratio}$: cutoff points for V_{RATIO} and TAU_{RATIO} (1000 bootstrap samples). * $p < .05$. ** $p < .01$.

Random-Effects Model

Mean Reliability

The size distribution of each study ranged from 204 to 3938 ($M = 941.1$, $Md = 780$). Based on 20 studies ($n_{\text{total}} = 20$) for IGDS9D, the mean reliability was higher than 0.70. In contrast, the mean point estimates for the remaining versions IGDS9P ($n_{\text{total}} = 4$), IGDS27D ($n_{\text{total}} = 4$), and IGDS27P ($n_{\text{total}} = 5$) were found to be higher than 0.90. In the population variability range (95% CI), the coefficients varied between approximately 0.75 and 0.97, higher than 0.70. The prediction intervals for IGDS9D, IGDS9P, and IGDS27D, placed the mean reliability at low levels, except for the mean reliability of IGDS27P, in which the predictivity of the mean coefficient is above 0.90.

Robust Estimate

Outliers were only detected in the IGDS9D studies, specifically nine studies (Baiumy et al., 2018; Bernaldo-de-Quirós et al., 2020; Dedeaux, 2019; Grajewski & Dragan, 2020; Lemmens et al., 2015; Liu et al., 2021; Oka et al., 2021; Sioni et al., 2017; Wartberg et al., 2019). With the remaining 11 studies (Baiumy et al., 2018; Bonett, 2008; Brooks & Clark, 2019; Dedeaux, 2019; Grajewski & Dragan, 2020; Lei et al., 2020; Liu et al., 2021; Reyes et al., 2019; Zendle, 2020), the α mean was 0.781 ($SE = 0.05$), 95% CI = 0.758, 0.802 (95% PI: 695, 843). The heterogeneity of this robust estimate was statistically significant ($Q = 101.49$, $df = 11$, $p < .001$), and, also, had a high $I^2 = 89.9\%$ (95% CI = 78.8%, 96.8%), even with high intra-studies ($CV_w = 0.603$) compared with between-study variability ($CV_b = 0.106$, 95% CI = 0.106, 0.108).

Varying Coefficients Model

Heterogeneity Estimation

The smallest part of the heterogeneity came from random variation ($<0.10\%$), while the strong degree of between-study heterogeneity ($I^2 > 95\%$; $R_b > 90\%$) was predominant in the analysis of all IGDS versions. Between-study variability (CV_b) was trivial in the IGDS27P studies, and was similar in the rest of the IGDS versions (CV_b between 0.189 and 0.206), while the variability from intra-study differences was strong in the IGDS9D, compared to the rest (CV_w between 0.383 and 0.473; Table 2).

Exploratory Analysis

IGDS9D. In the cluster-covariate analysis, two exploratory solutions were identified in the IGDS9D (Table 3), one of three groups (three Clusters: group 1 = 6 studies, group 2 = 2 studies, group 3 = 12 studies), and another of two groups (two clusters: group 1 = 12 studies, group 2 = 8 studies). The X^2 independence test did not reject the null independence hypothesis between these two solutions and the existing groupings in the data (language of the scale, language, mode of application, sample, and gamer condition; see Table 4). These results suggest that the association found (Cramer- V) may be included in the sampling variation. Advancing in a qualitative evidence synthesis (QES) framework, regarding the solution of three groups: in cluster 1, 2 articles share samples of young people (under 20 years of age) in which only gamers are included, in cluster 2, all agree on the administration of the IGDS in European languages and online administration, and in cluster 3, no similarities are found. Between clusters, there are no clear differences in the variables studied.

Table 2

Meta-analytical estimates

Random coefficients model										
Measure	<i>K</i>	α_+	95% CI (Confidence) LL–UL	95% CI (Prediction) LL–UL	<i>Q</i> (df)	τ (τ^2)	<i>I</i> ² (CI 95%)	<i>R</i> _{β} (CI 95%)	<i>CV</i> _{β} (CI 95%)	<i>CV</i> _w
IGDS9D	20	0.775	0.74, 0.80	0.56, 0.88	726.40 ** (11)	0.307 (0.094)	97.43 (95.5, 98.8)	96.1 (96.2, 96.4)	0.206 (0.20, 0.20)	0.864
IGDS9P	4	0.912	0.81, 0.95	0.51, 0.98	279.53 ** (3)	0.488 (0.233)	98.55 (95.4, 99.8)	98.4 (98.3, 98.4)	0.198 (0.19, 0.20)	0.408
IGDS27D	4	0.908	0.79, 0.95	0.48, 0.98	174.98 ** (3)	0.465 (0.217)	98.63 (95.7, 99.9)	98.5 (98.3, 98.6)	0.201 (0.19, 0.20)	0.383
IGDS27P	5	0.958	0.943, 0.969	0.913, 0.980	79.41 ** (4)	0.244 (0.05)	92.99 (80.6, 99.1)	92.2 (93.1, 93.5)	0.07 (0.07, 0.07)	0.473
Varying coefficients model										
Measure	<i>K</i>	α_+	95% CI (Confidence) LL–UL							
IGDS9D	20	0.764	0.755, 0.775							
IGDS9P	4	0.905	0.889, 0.991							
IGDS27D	4	0.892	0.885, 0.899							
IGDS27P	5	0.958	0.955, 0.960							

Note. *k*: number of studies; GF: *k*–1 degrees of freedom; LL, UL: lower and upper limits; α_+ : mean coefficient α ; τ^2 : between-studies variance estimated using restricted maximum likelihood. ** $p < .01$.

Table 3

Exploratory analysis results

IGDS9D	Kmeans 1 (n _g = 3)	K-means 2 (n _g = 2)	IGDS9P	K-means 1 (n _g = 2)	IGDS27D	Kmeans 1 (n _g = 2)	IGDS27P	Kmeans 1 (n _g = 2)
Study 1	3	1	Study 1	1	Study 1	2	Study 1	1
Study 2	3	1	Study 2	2	Study 2	2	Study 2	2
Study 3	3	1	Study 3	1	Study 3	2	Study 3	1
Study 4	1	2	Study 4	1	Study 4	1	Study 4	1
Study 5	3	1		83.1%		93.8%		37.5%
Study 6	2	2						
Study 7	2	2						
Study 8	3	1						
Study 9	3	1						
Study 10	3	1						
Study 11	2	2						
Study 12	3	1						
Study 13	2	2						
Study 14	3	1						
Study 15	2	2						
Study 16	3	1						
Study 17	3	1						
Study 18	3	1						
Study 19	2	2						
Study 20	1	2						
Wc SSC	91.3%	71.8%						

Table 4

IGDS9D: dependence of cluster–covariable analysis

	2 Clusters		3 Clusters	
	χ^2 (df)	Cramer– V	χ^2 (df)	Cramer– V
Language	16.38 ^{Ns} (19)	0.373	4.97 ^{Ns} (19)	0.343
English language	2.78 ^{Ns} (19)	0.187	8.59 ^{Ns} (19)	0.296
Application mode	5.87 ^{Ns} (19)	0.308	9.28 ^{Ns} (19)	0.341
Sample	7.69 ^{Ns} (19)	0.334	6.26 ^{Ns} (19)	0.268
Gamer condition	4.97 ^{Ns} (19)	0.254	8.06 ^{Ns} (19)	0.291

IGDS9P. The minimum interpretable solution was two groups (see Table 3). Qualitative analysis of the similarity between this clustering and the study characteristics suggested that cluster 1 were similar in including general population, with similar mean ages, and gamer-only samples (although the report of the Lei et al. (2020) study is missing). The difference in α coefficient between the cluster 1 studies (study 1 and 2; α mean = 0.94), with the cluster 2 (study 9 and 18; α mean = 0.87) can be established as statistically significant, but also as small ($\Delta\alpha = 0.07$; 95% CI $\Delta_{\text{diff}} = 0.05, 0.08$), because the range of the difference (95% CI Δ_{diff}) was small and close to 0.0.

IGDS27D. The minimum interpretable solution was two unbalanced groups (see Table 3). Qualitative analysis of the similarity between this grouping and the characteristics of the studies suggested that the studies of cluster 1 only include gamers in their samples, compared to the study of cluster 2, which has a mixed sample. However, the difference in α coefficient between the study identified as cluster 2 (study 4, $\alpha = 0.81$) and the rest of the three studies (α mean = 0.92), can be established as trivial, ($\Delta\alpha = -0.11$, 95% CI $\Delta_{\text{diff}} = -0.13, -0.08$).

IGDS27P. The minimum interpretable solution was two unbalanced groups (see Table 3). Qualitative analysis suggested that the only difference between both groups was the presence of gamers and non-gamers in the sample of the second study. However, the

difference in the α coefficient between the study identified as the only member of its group (study 2, $\alpha = 0.97$), with the rest of the three studies (α mean = 0.95) can be established as trivial, ($\Delta\alpha = -0.01$, 95% CI $\Delta_{\text{diff}} = -0.01, -0.00$).

Discussion

The objective of this study is to perform a reliability generalization meta-analysis of the IGDS. For this purpose, the internal consistency values of the IGDS in different samples are analyzed, and possible causes of the observed variations are examined (Sánchez-Meca & López-Pina, 2008).

The appropriateness of the alpha coefficients of the retrieved studies depended on instrument length (number of items) and response scaling (i.e., dichotomous and polytomous); both structural characteristics had a clear influence, as all versions of the IGDS using ordinal scaling (IGDS9P and IGDS27P) or the long version with 27 dichotomous items (IGDS27D), almost entirely produced scores with reliabilities >0.80 . In contrast, the short version with dichotomous items (IGDS9D) produced levels <0.70 .

Two major issues to be elaborated in this discussion can be drawn. Ordinal scales and the larger number of items can be taken into account when choosing the IGDS version. In terms of brevity, the IGDS9P may be the recommended version. In a first look at the influence that each study had on the overall estimation of the degree of heterogeneity of the studies (with V_{RATIO} and $\text{TAU}_{\text{RATIO}}$; Noma, 2022), almost all individual studies potentially produced non-negligible changes in the α -mean heterogeneity of each version (Table 1). In the versions with few meta-analyzed studies (IGDS9P, IGDS27D, and IGDS27P), there was an apparent hypersensitivity and consequent Type I error. The studies detected as a source of statistically important impact subsequently showed trivial differences with the rest of the coefficients compared.

Regarding the α coefficient meta-analysis, the point estimates of the mean α produced by the VC and RC model were not substantially different, except for the IGDS9D version (α mean = 0.775; 95% CI = 0.74, 0.80). The rest of versions can achieve a level of accuracy of the scores that is usually considered optimal for group description purposes and basic research (Nunally, 1987; Savalei, 2019).

In both RC and VC models, IGDS27P was shown to be exceptionally high (lower CI limit > 0.93), while the most widely used version, IGDS9D, remained at an acceptable level (lower CI limit > 0.70), but not optimal compared to the rest of the IGDS versions. One implication of these specific results is that the IGDS27P may be the best option for using highly reliable scores, particularly when the context of IGDS use demands this level of precision, such as the classification of individuals, and the differentiation of individual gamer vs. non-gamer, etc. On the contrary, with both estimated models (i.e., CR and VC), IGDS9D showed acceptable levels of reliability, but they are likely to be unacceptable when high precision in the interpretation of its scores is required, as in clinical practice (Badenes-Ribera et al., 2020). Due to the number of meta-analyzed studies ($n_{\text{studies}} = 20$) in the IGDS9D version, this conclusion is relatively reliable and can be taken as a reference.

The prediction intervals (PI) did not set optimal minimum values in future studies using the IGDS9D, IGDS9P, and IGDS27D. Using the lower limit of the PI as a reference, the lowest estimates obtained (IGDS9D = 0.56, IGDS9P = 0.51, and IGDS27D = 0.48) showed that the scores may contain a high proportion of error variance, even at levels where no instrument would be eligible for research and applied use (<0.60). On the other hand, the upper limit of the PI indicated that the predicted levels can exceed the value 0.85. The best consistently achieved level on this was the IGDS27P, where the error variance was consistently very low. Three implications of these results are that: first, to

maintain high and optimal true variance in IGDS scores, the IGDS27P is the best option in the context of high intra-study variability; second, the abbreviated versions of the IGDS (IGDS9D and IGDS9P) do not guarantee that the reliability remains within a range of acceptable use; and third, the dichotomous versions of the IGDS may yield a limited minimum acceptable reliability. Therefore, it is apparent that IGDS27P is the recommended option in a wide range of applications, especially when high precision is required. As a further note here, the confidence intervals generated by RC tended to be wider compared to the CIs generated by VC, a problem intrinsic to the RC model when the number of studies is small (Bonett, 2010).

In the robust analysis, the re-estimation of α_{mean} could only be conducted in the IGDS9D, because in the rest of the versions no outliers were detected. The robust α_{mean} obtained was slightly higher ($\alpha_{\text{mean}} = 781$) than the non-robust estimate ($\alpha_{\text{mean}} = 0.775$), as well as the 95% CI was very similar, and therefore both parameters can be considered equivalent. This equivalence may be because the outliers were symmetrically distributed, producing little bias in the estimation (Zimmerman et al., 1993). In contrast, the PI was different in the robust analysis (95% PI: 0.695, 843), because the predicted level of the α coefficient indicates an acceptable level of reliability. An implication of this is that the user must consider that the internal consistency of the IGDS9D can be maintained at the level declared in previous paragraphs.

It should be mentioned that the detection of outliers by the method used (i.e., Harrer, et al., 2019) did not have an apparent sensitivity in the studies analyzed for IGDS9P, IGDS27D, and IGDS27P, as no outlier studies were detected. This suggested that the heterogeneity detected could not be explained by the presence of studies with extreme alpha coefficients (i.e., outlier studies). Given the strong heterogeneity found, it

is likely that the reason for this lack of sensitivity of the method used was the effect of the small number of these studies in each version ($n_{\text{studies}} \leq 5$; Harrer et al., 2019).

Usual (I^2) and new (R_b) indicators of heterogeneity converged in pointing out that the amount of variability was strong ($>90\%$), and that an important source seems to come from the intra-study variability (CV_w) compared with the inter-study variability (CV_b). The exploration of the heterogeneity between the studies gave an unclear clue as to the sources of the variability of the alpha coefficients. Qualitative inspection suggested that when the size of meta-analyzed studies is small only some studies were an apparent source of differentiation (Schulz et al., 2021; i.e., the study by Evren et al. (2017) on IGDS9P, Zemestani et al. (2021) in IGDS27D, and Evren et al. (2017) in IGDS27P; Table 3), but this was trivial because the differences produced in their α_{mean} coefficients without these studies were of trivial size.

The exploration of the heterogeneity carried out suggests that there are other possible and realistic explanations for the degree of heterogeneity found. These can be attributed to the characteristics of the individual studies, which may be causally linked to the distance of each alpha coefficient from its α_{mean} . Specifically, methodological or artificial heterogeneity may have played an important and not ignorant role in this heterogeneity (Langan et al., 2021). The methodological aspects are specifically focused on the quality of the data, and the calibration of the IGDS in each sample. In the first, possible response biases were not explicitly incorporated into the analytical procedures of the selected studies, which requires a set of a priori decisions about their detection or treatment. These have been termed random responses (Pinsoneault, 2007), item content-independent responses (Evans & Dinning, 1983), insufficient effort response (Huang et al., 2012), or careless response (Meade & Craig, 2012).

There is empirical literature that has shown its effects on a long chain of statistical estimates, such as the spurious variability of responses (Huang et al., 2014; 2015), the internal structure of the instrument (Huang et al., 2015; Merino-Soto et al., 2021), and in general, the prevalence of error Type I and Type II (Clark et al., 2023). In the study of behavioral addictions mediated by the web platform, this issue is no less critical compared to other areas of research. There is an explicit call to address it as well (Godinho et al., 2016), more so when a small prevalence of C/IE responses can produce non-ignorable changes in quantitative estimates (Arias et al., 2020), which are unrealistic for the measurement of the construct of interest (Merino-Soto et al., 2021).

Second, in the selected substantive studies, the internal structure of the IGDS was not explicitly verified, resorting to supporting the validity argument using previous results. This is a problem of inducing the validity of the instrument (specifically, its structure or the interpretation of its scores) from background evidence, but without corroborating it with the available data (Merino-Soto et al., 2020; 2021; Merino-Soto & Calderón-De la Cruz, 2018). Due to the natural variability of samples and application conditions, it does not seem reasonable to expect that the internal structure of an instrument will remain intact, even more so if the instrument contains several items that capitalize on sampling variability and methodological variability. These changes in the instrument may be expressed in different magnitudes of intra-study or between-study factor loadings on the set of items, the presence of correlated residuals between items, or the emergence of a general method factor. This means that even to obtain a valid measure of the reliability of the scores, this corroboration is required (Flora, 2020; Savalei, 2019), and as a general rule, it should be resolved even in non-psychometric studies. As part of good reporting practices, it is proposed to check the internal structure of the IGDS and to report the psychometric adjustment obtained.

Modern reliability estimates aim to calculate other coefficients that tend to better represent the structure of the items of a measure, such as the coefficient ω [98] for congeneric one-dimensional measures (McNeish, 2018), that is, with variability in factor loads of the items. This reliability measure was hardly calculated in the selected studies with the IGDS, and it is reasonable to conclude that the reliability estimates obtained with the alpha coefficient are the lower bound of the reliability of the scores obtained by omega (McDonald, 1999; McNeish, 2018). A practical implication is that the mean reliabilities of the IGDS versions may be higher than those obtained in the present study. How high? It is not possible to give an approximate or precise answer, due to the high prevalence of induced validity and the consequent lack of knowledge of factor loads. In practice, it may be advisable to report both coefficients, α and ω .

Finally, in comparison with another meta-analysis analyzing the reliability of various instruments (Yoon et al., 2021), the two polytomous versions of the IGDS (IGDS27P and IGDS9P) show higher reliability scores than those found on other similar instruments. This highlights that these versions may be more suitable for the assessment of the IGD.

Limitations

Firstly, the present study considered that the minimum reasonable evidence to quantitatively address the generalization of reliability was the number of studies included (20 in the IGDS9D; between 4 and 5 in the IGDS9P, IGDS27D, and IGDS27P). Although each contributed a substantial number of participants ($n_{\text{participants}} > 2000$), the accumulation of more studies may be required to reach more reliable conclusions about the α_{mean} and sources of heterogeneity. Secondly, the interpretation of the PI can be reliable in the IGDS9D, but with caution in the conclusions of the IGDS9P, IGDS27D, and IGDS27P, due to the small size of the studies included in these three versions. Thirdly,

the conclusions about the α mean in each version analyzed must be contextualized by the degree of heterogeneity found, especially in the versions where the number of studies was less than six (i.e., IGDS9P, IGDS27D, and IGDS27P). Adding to this general situation, in our analyzes the number of retrieved studies was small (particularly for the IGDS9P, IGDS27D, and IGDS27P versions), and few studies cannot serve to reliably identify sources of heterogeneity (Riley, 2011); for this reason, heterogeneity was conducted in an exploratory manner, combining quantitative and qualitative means to maximize the opportunity to recognize these sources. Fourthly, it is possible that, within a general framework of sensitivity, it is necessary to implement new estimators (Brannick et al., 2019), but it is adapted to the study of reliability generalization, or to take advantage of the Bayesian approach in the area of the generalization of the reliability of the IGDS (Gronau et al., 2021).

Practical Implications and Future Research

The continuous evolution of video game consumption, the increase in rates of problematic consumption, and the expansion of consumption beyond adolescence highlight the social relevance of the IGD study. Carrying out a reliability generalization meta-analysis of evaluation or diagnostic instruments guides professionals on which scales are more reliable to evaluate a certain construct, as well as in what circumstances (Badenes-Ribera et al., 2020). Given that psychological intervention in social settings covers all social sectors (children, adolescents, young adults, etc.), the availability of reliable instruments can be helpful in prevention, diagnosis, evaluation, and psychological intervention, as well as in choosing therapeutic strategies. Therefore, due to the onset and prevalence of IGD in adolescence, the results of this study have implications for clinical practice, confirming the accuracy of the instrument for the early detection and intervention of this

disorder. All of this has a direct positive impact on the promotion of well-being in this vital sector and beyond, as well as the promotion of prevention at earlier ages.

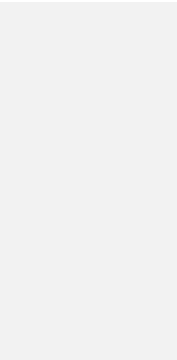
On a practical level, after the results are obtained, the IGDS27P is shown to be the most recommendable version for contexts where high reliability is required. However, despite the more frequent use of the IGDS9D, the use of its polytomous version is also recommended when the use of an abbreviated version is required.

For future research, it is proposed to continue with the study of the IGD in different countries with differential video game consumption or to analyze variables that could positively or negatively influence the development of IGD. Moreover, after the sample size is achieved, it would be important to re-perform a meta-analysis to generalize the reliability of the same instrument or even include more instruments measuring this construct, in order to corroborate the results found, as well as to study the psychometric properties of these instruments.

Conclusions

The present work carried out a reliability generalization meta-analysis of the IGDS from 2015 to June 2022, considering its four versions, original and abbreviated with dichotomous and polytomous responses. In the meta-analysis, it was observed that a large part of the sample of studies reviewed lacked some data and presented high heterogeneity, which made it difficult to correctly interpret the generalization of its reliability. The results of the study suggested that to achieve high-reliability scores it was advisable to use the IGDS with ordinal response, for both the 9-item and 27-item versions, the latter being the most appropriate when high precision is required. In contrast, the IGDS9D version had the lowest reliability and could compromise the interpretation of its scores, and was, therefore, the least recommended. These conclusions are dependent, however, on the size

of the meta-analyzed studies in each version, and considering that the version with nine dichotomous items was the one with the largest meta-analyzed studies, this conclusion may be more generalizable. Regarding the exploration of heterogeneity, high variability was found, and it was not possible to classify the studies based on the characteristics of the registered data (language of the scale, mode of application, age characteristics of the sample, and status of gamers in the sample). For this reason, a qualitative analysis was carried out that highlighted as a possible cause of variability the use of samples of only gamers in the original and abbreviated polytomous and original dichotomous versions, but this apparent source of differentiation was trivial. Regarding other sources of heterogeneity, the studies did not include information to identify methodological variability (e.g., response bias control, outliers, etc.), which could play an important role in the heterogeneity found. Finally, the need to strengthen adequate reliability reporting practices in primary studies to optimize their reporting is highlighted.



Characterization of gaming among university students in Spain, Italy, and Mexico

Study 4. Gender differences in internet gaming among university students: a discriminant analysis

Gisbert-Pérez, J., Martí-Vilar, M., Merino-Soto, C., Chans, G. M., & Badenes-Ribera, L. (2024). Gender differences in internet gaming among university students: a discriminant analysis. *Frontiers in Psychology, 15*, 1412739. <https://doi.org/10.3389/fpsyg.2024.1412739>

Abstract

Research on gaming and gaming habits has predominantly focused on younger populations, particularly males. The main objective of this study was to analyze gender-based differences in gamer profiles, considering variables related to gaming habits and the gaming community. A total of 180 Spanish university students currently engaged in video gaming ($M = 21.51$ years, $SD = 3.09$, 57.4% male) participated in the study by completing an online questionnaire addressing gaming characteristics such as the age of onset, gaming hours, motives of gaming, and perceived toxicity in the video gaming community. The results revealed statistically significant gender differences in the age of gaming initiation, weekly gaming hours, community toxicity, and several gaming motivations, including customization, cognitive challenge, violent gratification, and social interaction. Linear discriminant analysis identified that higher scores in the age of initiation and customization, along with lower scores in violent gratification and community toxicity, formed the combination of predictor variables that most strongly distinguished between genders. Understanding these gender differences is essential for capturing current gaming trends and addressing the needs of diverse gamers. Finally, the potential clinical implications of these findings are discussed.

Keywords: educational innovation, gaming, gaming motivations, gender differences, higher education, toxicity.

Introduction

Historically, video gaming and males have been closely associated. Video games are interactive digital experiences that immerse players in virtual environments through gameplay mechanics, often centered around challenges, goals, and competition (Jenkins, 2009). These games are available on various platforms, including consoles, computers, and mobile devices, and span a wide range of genres, from action and adventure to simulation and role-playing. Despite this diversity, video gaming has traditionally been male-dominated. Professional esports players are overwhelmingly male (Paaßen et al., 2017), and the video game industry comprises mainly male developers (Kuss and Griffiths, 2012). In the early days of gaming, men created many games for a predominantly male audience (Lopez-Fernandez et al., 2019), which fostered a male-centric gaming culture. This culture has often overshadowed the presence of female gamers, even though women now represent 45% of gamers in Western markets (Entertainment Software Association, 2018).

Despite significant progress in promoting inclusivity and diversity within video games, persistent stereotypes and gender-related perceptions continue to affect the gaming community. Female gamers are often influenced by gaming-related stigmas that shape their self-perception. Some video game content still features the excessive sexualization and objectification of female characters, which can contribute to a hostile environment for women (Lopez-Fernandez et al., 2019; Lynch et al., 2016). As a result, female gamers frequently experience sexism, harassment, gender-based violence, and objectification (Belskie et al., 2023; Kuss et al., 2022). This stereotypical culture impedes the recognition of women as legitimate and skilled gamers (Vermeulen et al., 2017), limiting their ability to identify fully with the gaming community (Vermeulen et al., 2017; Lopez-Fernandez et al., 2019). Consequently, many women struggle to see themselves as

gamers. Only 35% of women identify as gamers, compared to 51% of men (Le Ngoc, 2022).

Given video games' male-centric design and the persistence of gender stigma, gender-related differences in gaming patterns are to be expected. This situation raises important questions about how gender influences game selection, the gaming experience, and the potential psychological effects of these differences.

Several studies have investigated the variables related to gaming preferences among male and female gamers. Research consistently shows that males tend to exhibit higher levels of engagement, resulting in differences in gaming frequency between genders. For example, Miezah et al. (2020) reported that males averaged 14.18 h of gaming per week, compared to 8.88 h for females. Similarly, van Rooij et al. (2014) found that males spent 15 h per week playing online video games, while females averaged 7 h. Homer et al. (2012) reported even more significant disparities, with males gaming for 43 h per week compared to 30 h for females and daily gaming durations of 6 versus 4 h, respectively. Although higher video game consumption is often linked to earlier initiation of gaming (Nakayama et al., 2020), studies specifically examining gender-based differences in this area remain limited.

Similarly, prevalence rates of Internet gaming disorder (IGD) differ by gender (Kuss et al., 2022). Stevens et al. (2021) conducted a meta-analysis of 53 studies published between 2009 and 2019. Their analysis revealed significant gender differences, with a male-to-female ratio 2.5:1 across 31 studies. Only 3 of these 31 studies (9.6%) reported a higher prevalence of IGD among females.

Research on gender preferences in video game genres (Wohn et al., 2020) has shown that female gamers participate in various genres (Lopez-Fernandez et al., 2019;

Hassan et al., 2019; Lewis and Griffiths, 2011). However, the findings are mixed, with some studies suggesting that women tend to gravitate toward less aggressive or competitive games than men (Lange et al., 2021; López-Fernández et al., 2020; Phan et al., 2012). This discrepancy may stem from the addictive nature of competitive games and the sometimes toxic behavior within their communities. In competitive gaming, the use of verbal communication can expose players, especially women, to harassment and toxicity (Belskie et al., 2023; Bopp et al., 2022). As a result, many women choose not to identify as gamers, conceal their gender while playing, or avoid social and online games altogether, potentially missing out on the social and psychological benefits that gaming can offer (Kuss et al., 2022).

Players' motivations for gaming differ by gender, as highlighted in a systematic review by Martucci et al. (2023). The review found that male players are more likely to engage in gaming for competitive reasons, while female players tend to use games for social and relational purposes. Interestingly, these motivations also vary by region. In Europe, women are more inclined to play for competition and to showcase their skills (Lewis and Griffiths, 2011; Laconi et al., 2017), whereas men often turn to gaming as a coping mechanism or to achieve success. In contrast, studies involving Spanish participants suggest that women's primary motivation is to have fun (Labrador et al., 2022). In Asia, research indicates that women are more drawn to gaming for social interactions, while men play to pass the time. Meanwhile, in the United States, women are more likely to game for achievement, empowerment, fun, or to strengthen social relationships (Lopez-Fernandez et al., 2019).

In conclusion, few studies have thoroughly analyzed female gaming behavior, leading to mixed findings (Lopez-Fernandez et al., 2019; Kuss et al., 2022; Vermeulen et al., 2017; Lopez-Fernandez et al., 2019; Labrador et al., 2022; McLean and Griffiths,

2019). Given the disparities observed in recent research, a more comprehensive investigation into gender differences among gamers is essential.

The discrepancies identified in previous research may result from various methodological factors, such as using different instruments to measure study variables, sometimes without sufficient validation of their reliability and accuracy (Hassan et al., 2019; Lange et al., 2021; Labrador et al., 2022). Additionally, many studies have included samples with a broad age range, from preadolescents to adults or the general population, which can introduce further variation (Lange et al., 2021; Labrador et al., 2022). To address these issues, our study adopts a two-pronged approach: (1) focusing on a population with specific age and characteristics and (2) utilizing an instrument with well-established reliability and internal consistency. This approach ensures that our findings are more accurate and reliable for the target population.

Understanding these gender differences is crucial for grasping current gaming trends, reducing stereotypes, and fostering healthier gaming communities. Additionally, this insight can inspire more diverse and inclusive game design ideas, enabling the creation of gaming experiences that cater to the preferences and needs of all players, regardless of gender. This study is particularly relevant at the etic and emic levels, as variables like gaming motivations have been explored across cultures (Bäcklund et al., 2022). Applying an etic/emic approach in gender studies within gaming allows for the identification of universal patterns while also acknowledging the specific gender-related experiences that shape players' preferences and behaviors.

Aims of the study

Given the mixed results regarding gaming preferences and motivations, the main objective of this study is to analyze the differences in gamer profiles based on gender,

focusing on gaming habits and community-related variables. Additionally, the research seeks to determine whether trends observed in larger populations hold within a university demographic. Specifically, we propose the following hypotheses:

Hypothesis 1 (H1): A higher proportion of males engage in video gaming compared to females. This hypothesis is based on the observed discrepancy in statistical data regarding the number of male and female gamers (Kuss and Griffiths, 2012) and the tendency for video games to be designed with predominantly male-oriented content (Lopez-Fernandez et al., 2019).

Hypothesis 2 (H2): Significant differences exist between male and female players regarding age of gaming initiation, weekly gaming hours, and experiences of community toxicity. Due to the gender-biased content of video games (Lopez-Fernandez et al., 2019), disparities in gaming habits are expected among college students, similar to those found in younger populations (Miezah et al., 2020; Homer et al., 2012; Phan et al., 2012). Specifically, we anticipate the following:

- a. Females will report a later age of gaming initiation.
- b. Males will report more hours of gaming per week.
- c. Males will report higher levels of perceived toxicity within gaming communities.

Hypothesis 3 (H3): There are notable differences in the gaming motivations of male and female players. Given the gendered nature of video game content (Lopez-Fernandez et al., 2019), it is expected that motivations for gaming will vary by gender, although existing literature presents mixed findings (Lewis and Griffiths, 2011; Laconi et al., 2017; Labrador et al., 2022).

Hypothesis 4 (H4): Gaming motives are critical factors in distinguishing male and female gamer profiles.

Materials and Methods

Research design and procedure

A cross-sectional research design was employed using an online survey distributed through social media platforms. The study adhered to the ethical principles outlined in the 1964 Declaration of Helsinki and its subsequent amendments or comparable ethical standards. Approval was obtained from the Institutional Review Board of the University of Valencia (2023-MAG- 2988759).

The target population for this study consisted of university students, specifically active video game players. The inclusion criteria required participants to be Spanish-speaking university students, at least 18 years old, and actively engaged in playing video games during the study.

Participants

The convenience sample consisted of 180 Spanish students, primarily from higher education, actively engaged in video gaming. The participants had an average age of 21.52 years ($SD = 3.08$, range: 18–33). The sample had a male representation of 58.3% (see Table 1). There was no statistically significant age difference between genders [$t(178) = 0.14$, $p = .893$, Hedges' $g = 0.02$, 95% CI: $-0.28, 0.32$]. On average, participants began playing video games at 9.06 years ($SD = 3.42$, range: 3–18), with a mean weekly gaming time of 4.08 h ($SD = 1.81$, range: 1–7).

Regarding educational background, 2.2% ($n = 4$) had completed secondary education, 38.9% ($n = 70$) had finished high school, 12.2% ($n = 22$) had completed vocational training, 36.1% ($n = 65$) held a university degree, and 10.6% ($n = 19$) had completed a master's or postgraduate program (Table 2).

Most students, 86.1% ($n = 155$), reported enrolling in public institutions, whereas 6.7% ($n = 12$) attended private institutions. Most study centers were in the Valencian community, representing 92.8% ($n = 167$) of the sample. Smaller proportions were from Castilla La Mancha and Andalusia (2.2%, $n = 4$) and other autonomous communities (0.6%, $n = 1$).

In terms of monthly family income, 32.8% of participants reported an income between €2001 and €3,000, 26.1% had an income between €1,001 and €2000, 17.2% reported earning either less than €1,000 or between €3,001 and €4,000, and 6.7% had a monthly income exceeding €4,000.

Variables and instruments

Sociodemographic and gaming information. Participants provided demographic information, including age, biological sex, income, and educational level. Additionally, gaming-related characteristics were assessed, such as the age of gaming initiation, weekly hours spent gaming, and the perceived level of toxicity within the gaming community.

Motivations for gaming (e-MUV). The e-MUV instrument (López Fernández et al., 2019) consists of 32 items, each rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). These items assess eight dimensions of gaming motivations: immersion (e.g., *“I feel immersed in a fantasy/fictional world”*), customization (e.g., *“I enjoy designing things in-game”*), violent gratification (e.g., *“I enjoy violence in games; the more, the better”*), coping (e.g., *“I forget my worries when I play”*), fun (e.g., *“I enjoy gaming”*), cognitive challenge (e.g., *“The games challenge me mentally”*), competition (e.g., *“I like to win”*), and social interaction (e.g., *“I make new*

friends”). Higher scores in each dimension indicate a stronger motivation for that particular gaming aspect.

In the current sample, the integrity of the e-MUV measurement model was preserved, with ULSMV $\chi^2 = 471.866$ ($p < .0$, $df = 436$), $CFI = 0.996$, $RMSEA = 0.021$ (90% CI = 0.00, 0.034), $SRMR = 0.060$. As reported by López Fernández et al. (2019), Cronbach’s alpha for the dimensions ranged from 0.79 (cognitive challenge) to 0.89 (social interaction). In this study, omega reliability (BCA bootstrap 95% CI, 1000 samples) confirmed internal consistency across all dimensions: immersion = 0.818 (95% CI = 0.757, 0.866), customization = 0.887 (95% CI = 0.884, 0.915), violent gratification = 0.898 (95% CI = 0.866, 0.921), coping = 0.859 (95% CI = 0.811, 0.891), fun = 0.901 (95% CI = 0.833, 0.952), cognitive challenge = 0.861 (95% CI = 0.818, 0.894), social interaction = 0.831 (95% CI = 0.779, 0.867), and cognitive challenge = 0.855 (95% CI = 0.809, 0.888).

Procedures

The online survey was conducted using LimeSurvey and distributed through various social and academic networks. Participants were thoroughly informed about the study’s objectives, and before beginning the survey, they provided electronic, written consent. Only those who consented were able to proceed with the questionnaire. Participation was entirely voluntary, anonymous, and without compensation.

Statistical analysis

Descriptive statistics were first used to summarize the study’s demographic characteristics and critical variables. For continuous variables, means, standard deviations, and minimum and maximum values were calculated, while categorical variables were reported as frequencies and percentages. Skewness and kurtosis statistics

were also examined to assess the distribution shape of continuous variables, helping to determine whether they followed a normal distribution (Kline, 2022).

Group comparisons assume the instrument's psychometric properties are equivalent to the compared groups. To ensure this equivalence, we conducted a preliminary analysis of the e-MUV scores for males and females (using sex as a covariate) by detecting differential item functioning (DIF). Given the small group sizes, a non-parametric DIF analysis based on contingency tables was used (Fidalgo et al., 2004). Two tests for polytomous variables were applied, using the observed score (i.e., the sum of item responses) as the matching variable: the Mantel test χ^2 ($M\text{-}\chi^2$) (Mantel, 1963; Zwick et al., 1993) and Generalized Mantel–Haenszel χ^2 (GMH- χ^2) (Zwick et al., 1993). These tests effectively identify different types of DIF (Zwick et al., 1993; Elosua and Wells, 2013; Fidalgo and Bartram, 2010): uniform DIF (related to scalar invariance of thresholds or intercepts) and non-uniform DIF (related to metric invariance of factor loadings). p -values were corrected by multiple testing using the Bonferroni adjustment (Penfield, 2001), resulting in a significance threshold of 0.002 for the four items in each e-MUV dimension.

Subsequently, a chi-square (χ^2) test was used to compare the distribution of males and females in the player sample. Independent samples t -tests were conducted to examine gender differences across the variables under study. Before performing these analyses, we ensured that all statistical assumptions were met. Hedges' g was used to measure effect size, providing an unbiased estimate of the standardized mean difference. Effect sizes of 0.15, 0.36, and 0.65 were interpreted as small, moderate, and large, respectively (Lovakov and Agadullina, 2021).

Finally, linear discriminant analysis (LDA) was conducted using the forward stepwise selection method (Tabachnick and Fidell, 2014) to identify the gaming-related

variables that most effectively differentiate between men and women. Only statistically significant variables associated with the participant's gender in prior analyses were included as predictors in the LDA. The selection criterion for predictor variables was based on minimizing Wilks' Lambda (tolerance <0.001 , entry $F = 3.84$, and removal $F = 2.71$). This stepwise method progressively added predictor variables to the discriminant function, optimizing the distinction between groups by minimizing within-group variation and maximizing between-group variation. The discriminant function was then used to classify participants into one of the two groups.

Several tests were used to evaluate the discriminant function's fit (Tabachnick and Fidell, 2014): (1) Wilks' Lambda and the χ^2 significance test were employed to assess whether the group centroid scores were equal; (2) the percentage of variance explained by the discriminant function in group differences was measured using Canonical R^2 ; (3) the predictive accuracy was evaluated by examining the percentage of correct classifications made by the discriminant function; and (4) the quality, stability, and generalizability of the discriminant function were tested using the "leave-one-out classification" technique, a cross-validation method (data resampling method). In this technique, all but one sample observation is used to develop the discriminant function, which is then applied to predict the group membership of the omitted observation. This process is repeated for each observation in the dataset, ensuring that every observation is classified by a function derived from the remaining data.

The LDA was performed using SPSS statistical software version 28 for Windows, with a significance level of 0.05 (two-tailed) assumed for all interpretations. The R packages used included *lavaan* (Rosseel, 2012), *MeasInv* (Wells, 2022), and *MBESS* (Kelley, 2023).

Results

Descriptive statistics

Table 1 presents the descriptive statistics for the variables under study. Notably, the univariate skewness and kurtosis values for all analyzed variables fall within the conventional normality threshold (Kline, 2022).

In terms of the perceived toxicity level of the video game community most frequented by the sample, 22.8% ($n = 41$) rated it as low, 18.3% ($n = 33$) as medium-low, 20.6% ($n = 37$) as medium, 26.7% ($n = 48$) as medium-high, and 11.7% ($n = 21$) as high.

Table 1

Descriptive statistics for variables under study

Variable	<i>M</i>	<i>SD</i>	<i>Min.</i>	<i>Max.</i>	<i>Sk</i>	<i>Kr</i>
Age	21.52	3.08	18	33	1.25	1.39
Age of gaming initiation	9.06	3.42	3	18	0.50	-0.45
Gaming hours per week	4.08	1.81	1	7	0.14	-1.13
Video game toxicity	2.86	1.35	1	5	-0.02	-1.25
Motives of gaming						
Immersion	14.66	3.47	4	20	-0.48	0.11
Customization	14.86	3.86	4	20	-0.54	-0.20
Violent Gratification	11.42	4.25	4	20	0.17	-0.72
Coping	14.11	3.61	4	20	-0.47	0.01
Fun	18.24	2.20	4	20	-1.90	8.37
Cognitive challenge	14.16	3.58	4	20	-0.66	0.42
Competition	12.88	3.91	4	20	-0.31	-0.49
Social Interaction	14.17	4.11	4	20	-0.78	0.08

Differential item functioning

During the preliminary evaluation of the psychometric equivalence of the e-MUV between males and females, p -values for the M- χ^2 (uniform DIF) and GHM- χ^2 (non-uniform DIF) tests exceeded 0.002. These results indicate that no item exhibited significant uniform or non-uniform DIF (see Supplementary Table S1).

Differences by gender in variables under study

Table 3 illustrates the outcomes of the Student's t -test examining gender differences in the study variables. Initially, a statistically significant difference was found in the distribution of males and females in the sample [$\chi^2(1) = 5.00, p = .025$], indicating that the proportion of males (58.3%) and females (41.7%) deviated from what would be expected by chance. A significant difference was also observed in the age of video game initiation ($p < .001$), with males starting at a younger age ($M = 7.84, SD = 2.60$) compared to females ($M = 10.76, SD = 3.64$). Additionally, there were statistically significant differences in weekly gaming hours ($p = .009$) and perceived toxicity in the video gaming community ($p < .001$), with males reporting more weekly gaming hours and experiencing higher levels of toxicity. No significant differences between males and females were found in monthly family income [$\chi^2(4) = 1.25, p = .869$].

Table 3

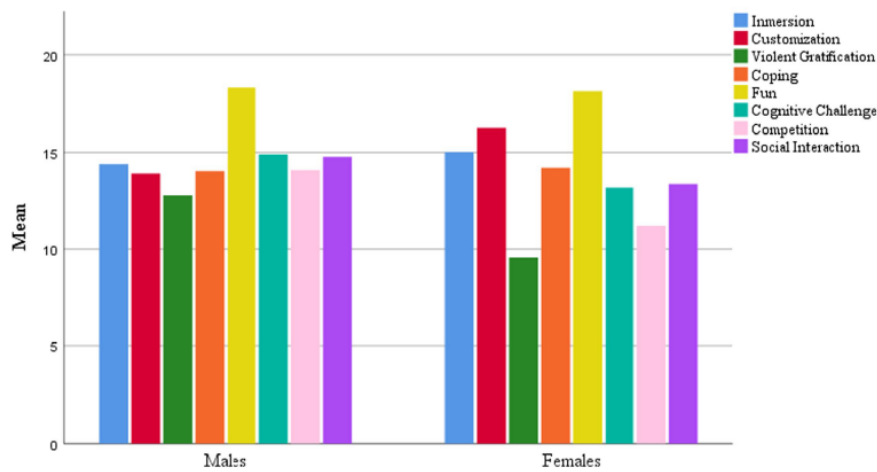
Differences by gender in variables under study

Variable	Males <i>M</i>	Males <i>SD</i>	Females <i>M</i>	Females <i>SD</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>g</i>	95% CI
Age	21.54	3.08	21.48	3.10	0.14	178	.893	0.02	-0.78, 0.32
Age of gaming initiation	7.84	2.68	10.76	3.64	-5.91	128.76	<.001	-0.94	-4.24, -0.62
Gaming hours per week	4.39	1.78	3.66	1.78	2.66	177	.009	0.40	0.10, 0.70
Video game toxicity	3.27	1.24	2.29	1.29	5.10	178	<.001	0.77	0.46, 1.07
Immersion	14.41	3.28	15.01	3.71	-1.15	178	.251	-0.17	-0.47, 0.12
Customization	13.86	3.67	16.25	3.70	-4.31	178	<.001	-0.65	-0.95, -0.35
Violent gratification	12.75	3.54	9.56	4.49	5.13	135.38	<.001	0.80	0.50, 1.11
Coping	14.04	3.43	14.21	3.86	-0.32	178	.749	-0.05	-0.34, 0.25
Fun	18.31	1.96	18.13	2.51	0.54	178	.588	0.08	-0.21, 0.38
Cognitive challenge	14.90	3.04	13.13	4.02	3.20	131.23	.002	0.50	0.20, 0.80
Competition	14.10	3.24	11.19	4.14	5.08	134.68	<.001	0.80	0.49, 1.10
Social interaction	14.77	3.72	13.32	4.94	2.29	140.17	.023	0.36	0.06, 0.65

Regarding the e-MUV dimensions, statistically significant differences were found in customization ($p < .001$), violent gratification ($p < .001$), cognitive challenge ($p = .002$), competition ($p < .001$), and social interaction ($p = .023$) (see Figure 1). Specifically, males showed higher motivations for violent gratification, cognitive challenge, competition, and social interaction, while females reported higher motivations for customization. No statistically significant differences were found between groups for the remaining variables.

Figure 1

Mean distribution of gaming motivations (e-MUV) by gender



Linear discriminant analysis

A forward stepwise discriminant analysis was carried out, using the minimization of Wilks' Lambda as the criterion for selecting predictor variables. Before the analysis, the statistical assumption was verified. The Box's M test indicated a violation of the assumption of equality of covariance matrices (Box's $M = 36.70$, $F = 3.58$, $p < .001$). However, this problem is not considered problematic (Tabachnick and Fidell, 2014) given the large sample size.

Since only two groups were analyzed, a single discriminant function was derived. The function demonstrated a statistically significant association between the groups and all predictor variables, accounting for 36.7% of the between-group variability. The overall Wilks' lambda was statistically significant [Wilks' lambda = 0.63, $\chi^2(4) = 80.16$, $p < .001$], indicating that the predictors effectively differentiated between the gender groups. Women had higher discriminant function scores ($M = 0.69$, $SD = 0.46$) compared to men ($M = 0.12$, $SD = 0.33$), and this difference was statistically significant [$t(125.70) = -9.10$, $p < .001$, Hedges' $g = -1.45$, 95% IC: -1.78 , -1.11].

Table 4 displays the within-group correlations among the predictors, the discriminant function, and the standardized weights. The correlation coefficients represent Pearson correlations between the predictors and the discriminant function. Notably, all coefficients exceeded 0.30, a commonly accepted threshold indicating the relevance of predictor variables in discriminant function analysis (Burns and Burns, 2008). The strongest relationships with the discriminant function were observed for the age of gaming initiation ($r = 0.61$) and the violent gratification dimension ($r = -0.51$), followed by community toxicity ($r = -0.49$) and customization ($r = 0.41$). Specifically, a later age of gaming initiation and higher customization, along with lower levels of violent gratification and community toxicity, were associated with higher discriminant function scores.

Table 4

Results of discriminant analysis

Predictors	Structure coefficients	Standardized coefficients	Video game toxicity	Customization	Violent gratification
Age of gaming initiation	0.61	0.67	0.14	-0.02	-0.05
Video game toxicity	-0.49	-0.47		-0.07	0.23
Customization	0.41	0.40			0.02
Violent gratification	-0.51	-0.38			
Canonical R	0.61				
Eigenvalue	0.58				

Table 5 shows the classification results using the “leave-one-out” cross-validation method (jackknifed classification). The overall accuracy rate was 80.0%, correctly classifying 80.0% of respondents into “male” or “female” groups. Males were classified with slightly higher accuracy (87.6%) than females (69.3%). These results were consistent in the cross-validated classification (Table 5).

Table 5

Classification results using the “leave-one-out” cross-validation method

Sample	Gender	Predicted Men	Predicted Women	% Correctly classified
Original	Men	92	13	87.6
Original	Women	23	52	69.3
Original	% Total cases correctly classified			80.0
Cross-validated	Men	92	13	87.6
Cross-validated	Women	23	52	69.3
Cross-validated	% Total cases correctly classified			80.0

Discussion

This study explores the differences between male and female gamer profiles, focusing on variables related to gaming habits, motivations, and characteristics such as community toxicity. The video game industry and its content reflect inherent gender disparities, possibly contributing to divergent gaming profiles and outcomes (Kuss et al., 2022). While certain factors like game genre preferences and gaming motivations, have been extensively studied, the findings remain inconsistent (Lopez-Fernandez et al., 2019; Lopez-Fernandez et al., 2019). Less examined variables, like gaming community toxicity, may have a distinct gendered influence and deserve further investigation (Belskie et al., 2023).

The results support hypothesis 1 (H1), revealing a higher proportion of male gamers in the sample (58.3%). These findings align with previous studies (Lopez-Fernandez et al., 2019; Phan et al., 2012), challenging the notion that female gamers constitute a minority (Entertainment Software Association, 2018). While many video games still target primarily male audiences (Lopez-Fernandez et al., 2019), these results

may suggest that the industry is gradually shifting toward creating games that also appeal to women.

The results also support Hypothesis 2 (H2), highlighting differences between males and females in the age of gaming initiation, weekly gaming hours, and the perceived toxicity of video gaming communities. As expected, female gamers reported a later gaming onset than males (H2a). This delay may be attributed to the widespread belief that video games are primarily designed for a male audience (Lopez-Fernandez et al., 2019). Consequently, males reported more weekly gaming hours (H2b), consistent with Nakayama et al.'s findings (Nakayama et al., 2020), which link earlier gaming initiation to increased gaming activity. Additionally, male gamers were more likely to engage in toxic gaming communities than their female counterparts (H2c).

This trend may be related to the traditional association of males with competitive and violent video games (Lange et al., 2021; Bopp et al., 2022). Female gamers, on the other hand, may avoid toxic communities in competitive games due to the risk of encountering sexism or harassment, prioritizing their psychological well-being over gaming interests (Belskie et al., 2023; Kuss et al., 2022). For women, the decision to play certain video games is often influenced by the need for psychological safety rather than purely personal preferences, given the potential risks associated with toxic gaming environments (Belskie et al., 2023).

Our findings partially support Hypothesis 3 (H3), revealing significant differences in gaming motivations between male and female players. Distinctions were observed in customization, violent gratification, cognitive challenge, competition, and social interaction. Consistent with previous research (López-Fernández et al., 2020; Gursesli et al., 2024), male gamers exhibited higher motivation for competition, violent gratification, and social interaction, whereas female gamers were more motivated by customization and

creative aspects of video games. This discrepancy may be due to female gamers' tendency to avoid competitive, toxic, or socially interactive games, particularly those that require revealing their identity, such as through audio channels (Belskie et al., 2023). Additionally, male gamers demonstrated a greater motivation for cognitively challenging video games.

Male gamers' motivations often align with genre preferences, such as shooters (Phan et al., 2012; Kim et al., 2016). Shooters and massively multiplayer online role-playing games (MMORPGs) are frequently associated with gaming disorder (Na et al., 2017), with social interaction motivation linked to increased time spent in online games (Király et al., 2017). Both social interaction and the pursuit of violent gratification have been implicated in the development of problematic gaming behaviors (Lopez-Fernandez et al., 2019). In contrast, female gamers' preference for customization and creation is typically associated with construction and role-playing games. Notably, customization has been found to have a negative relationship with the development of problematic gaming (López-Fernández et al., 2020).

The findings supporting H2 and H3 are consistent with gender socialization theory (Bem, 1993) and social identity theory (Tajfel and Turner, 1979). Gender socialization theory (Bem, 1993) suggests that from an early age, boys and girls socialize differently regarding their interests and activities. Due to cultural and social stereotypes, video games are often more closely associated with male interests. This situation may explain why females start playing video games later and spend fewer hours per week gaming. Social identity theory (Tajfel and Turner, 1979) also posits that individuals tend to identify with groups that reinforce their sense of identity. Men may be more attracted to specific video games because they provide an opportunity to strengthen their masculine identity, particularly in genres that emphasize competition and action. This tendency to seek out

competitive and action-oriented games could also explain the greater participation of men in toxic gaming communities, where competition and aggression are more prevalent.

Building on these findings, Hypothesis 4 (H4) is supported. The study suggests that distinct gender patterns emerge based on gaming motivations, the age of gaming initiation, and the perceived toxicity of video gaming communities. Through linear discriminant analysis, the variables most strongly associated with the discriminant function were the age of initiation and the gaming motive of violent gratification, followed by community toxicity and the gaming motive of customization. Higher scores for age of initiation (indicating older ages) and customization, combined with lower scores for violent gratification and toxicity, represent the most practical combination of predictor variables for distinguishing between genders.

Several conclusions can be drawn from these findings. First, there is an apparent gender disparity in the age of video game initiation, with male gamers being exposed to the positive and negative effects of video gaming at an earlier age. Second, gaming motivations differ by gender, suggesting that male and female gamers have distinct reasons for engaging in video games. Consequently, it can be inferred that they may not gravitate toward the same types of games (Lange et al., 2021; López-Fernández et al., 2020; Bopp et al., 2022). Third, this difference in video gaming preferences leads to varied exposure to toxic communities. Women may avoid certain video games that involve female objectification or communities where they are likely to encounter sexism or harassment due to high toxicity levels (Belskie et al., 2023). While this avoidance highlights the persistence of gender stereotypes in video gaming, it can also have positive outcomes. It promotes healthier video gaming habits among female players, characterized by a later onset of gaming, more creative motivations, and participation in less toxic communities.

Finally, the predictor variables associated with male gamers, such as higher scores in violent gratification and community toxicity, are positively linked to the development of gaming disorder. In contrast, the predictor variables associated with female gamers show the opposite effect (Lopez-Fernandez et al., 2019; Kim et al., 2016).

Limitations and future avenues of research

Several limitations of the current study should be acknowledged. First, there may be selection bias in the sample, as the accessibility of the questionnaires may have favored certain groups, such as those with access to computers. The sample, composed predominantly of university students, also limits the generalizability of the findings to broader age populations. Additionally, the study relies solely on observed variables, introducing some measurement error by not incorporating unobservable variables that could be estimated through Structural Equation Modeling (SEM) or Item Response Theory (IRT). Using latent variables would help control for variance unrelated to the construct.

Furthermore, future research could benefit from a more extensive and diverse sample, including gamers of various ages, to examine the stability of gender-related predictor variables across different age groups. Exploring the consistency of results in multicultural samples would also be valuable. Lastly, the development and validation of questionnaires specifically designed to assess constructs related to video games, such as toxicity, is recommended.

Practical implications

Understanding the disparities between male and female gamers is crucial for gaining insights into current gaming trends. The findings, which highlight gender differences, stress the importance of reducing gender stereotypes and fostering healthier gaming

communities to promote more equitable gaming experiences. This perspective also underscores the need for more inclusive game design, offering gaming experiences that align with the preferences and needs of players across genders.

The study has clinical implications as well, suggesting that gender-specific profiles may be linked to problematic gaming. This notion highlights the importance of developing tailored prevention programs that address the unique challenges faced by individuals with diverse gender identities in the context of gaming-related disorders. Such targeted interventions could lead to more effective, personalized strategies for mitigating the risks of excessive gaming behaviors.

Addressing the toxicity in gaming communities is also essential, as it can have severe psychological effects. Specific actions must be taken from both educational and familial perspectives. Schools and communities should implement educational programs that promote gender equity in gaming spaces, including workshops to teach young people about the importance of diversity, inclusion, and respect in gaming, with family involvement. While video game design is becoming more inclusive, the gaming community must also embrace these initiatives. Cultivating a culture of respect and equity early on is crucial for creating lasting behavioral change within gaming communities.

Conclusion

This study provides new insights into the impact of gender on gaming behaviors. The results highlight gender differences in the age of gaming initiation, gaming hours, motivations for gaming, and the toxicity levels within gaming communities. Additionally, the identified predictor variables—age of gaming onset, gaming motivations (customization and violent gratification), and community toxicity—further underscore the distinctions between male and female gamers. These findings emphasize the

importance of examining the gaming population, focusing on gender differences and the underlying factors that contribute to them.

In conclusion, fostering more inclusive game design and taking concrete steps in education and community involvement can help create a healthier and more equitable gaming environment. Addressing these issues is essential for players' mental well-being and cultivating a more positive and enriching gaming culture.

Study 5. Exploring gender differences in gaming among Italian university students: a discriminant analysis

Gisbert-Pérez, J., Longobardi, C., Martí-Vilar, M., Ijaz, A., Badenes-Ribera, L. Exploring gender differences in gaming among Italian university students: a discriminant analysis. (*Under review*)

Abstract

Gaming is a common leisure activity among university students, a life stage marked by late adolescence and emerging adulthood, when digital habits and psychosocial outcomes are still developing. However, gaming behaviors and motivations differ by gender, making it important to understand these variations to identify trends and potential risks linked to excessive use. This study aimed to examine gender-based differences in gaming habits, motivations, and perceived toxicity among Italian university students. A total of 394 participants ($M = 22.8$ years, $SD = 3.6$; 57.9% male) who actively played video games completed an online questionnaire on sociodemographic and gaming variables. Data were analyzed using t-tests, chi-square tests, and linear discriminant analysis. Results revealed significant gender differences in age of gaming onset, weekly gaming time, perceived toxicity, and motivations such as violent gratification, cognitive challenge, coping, and social interaction. Men started gaming earlier, spent more hours playing, and reported higher toxicity levels. Discriminant analysis identified weekly gaming hours, violent gratification, and age as the strongest differentiating factors. These findings highlight gender-based patterns in gaming and stress the need for inclusive design, respectful gaming environments, and targeted strategies to prevent problematic gaming behaviors.

Keywords: gaming, gender, university, Italy, gaming motivations, perceived toxicity.

Introduction

Video games are immersive virtual environments in which players pursue goals and interact with complex systems (Jenkins, 2009). Despite the medium's global growth, its history and culture have long been shaped by male dominance. The industry narrative has frequently centered on prominent male figures such as Shigeru Miyamoto, known for franchises like *Super Mario Bros.* and *The Legend of Zelda*, or Hideo Kojima, associated with series such as *Metal Gear*. This gender imbalance extends across the entire value chain of the industry. Women remain underrepresented in development teams and leadership positions, while men are disproportionately represented in highly visible competitive spaces such as esports (Kuss & Griffiths, 2012; Paaßen et al., 2017). As a result, the historical male orientation of gaming culture continues to shape contemporary perceptions of player behavior, including assumptions about gendered preferences, habits, and motivations (Lopez-Fernandez et al., 2019).

However, gaming culture is evolving due to increased accessibility and the diversification of gamer communities. The proliferation of platforms and expansion of game genres in recent years has made this digital leisure more inclusive. This has broadened the industry's scope in terms of gender, geography and age. According to the Entertainment Software Association (2025), by 2025 women will represent 48% of the global gaming population. Furthermore, Italy is one of the most profitable gaming industries in Europe, beyond the largest global markets. According to Statista's market research data (2024), 63% of the Italian population actively engages in gaming. The most gaming-represented demographic in Italy is the 15 to 24 age group (IIDEA, 2024). In this context, late adolescence and emerging adulthood have become important stages in the development of the contemporary Italian gamer population.

Despite increased female representation and progress in inclusivity, gender stereotypes and perceptions still influence gaming communities. On the one hand, many video games still feature female characters that are overly sexualised and objectified, which can create a hostile environment for women (López-Fernández et al., 2019). Conversely, women in certain gaming communities are exposed to sexist behaviours and gender-based violence (Belskie et al., 2023). Such experiences may affect their self-perception and influence their decisions about which communities to join or avoid. Consequently, these factors may affect how willing women are to identify as 'gamers'. Despite the narrowing gap in participation rates, only 35% of women identify as gamers, compared to 51% of men (ESA, 2025; Le Ngoc, 2022).

Therefore, although the industry is moving towards gender parity in player statistics, certain aspects of video games and their communities continue to influence the gaming habits of men and women differently, as evidenced by studies in Spain and Mexico (Gisbert-Pérez et al., 2024; under review). Variables studied in this field include gaming habits, player motivations, and the negative consequences of gaming.

Previous studies have identified distinct patterns in gaming preferences and levels of engagement by gender and sex. Studies consistently show that men are more engaged, resulting in a higher frequency of weekly gaming. For example, Miezah et al. (2020) found that males played for an average of 14 hours per week, compared to 8 hours for females. Similarly, Homer et al. (2012) observed even greater disparities, with males gaming for an average of 43 hours per week (6 hours per day), compared to 30 hours per week (4 hours per day) for females. Similarly, van Rooij et al. (2014) found that men spent an average of 15 hours per week on online games, compared to 7 hours for women. Furthermore, early exposure to video games has been linked to higher levels of engagement later in life (Nakayama et al., 2020), suggesting that the age at which people

start gaming may influence their long-term gaming habits. However, research on gender differences in this area is limited.

Disparities in gaming frequency also appear to be reflected in the clinical prevalence of internet gaming disorder (IGD). Research indicates that risk patterns for IGD differ significantly by gender (Kuss et al., 2022). Stevens et al. (2021) conducted a meta-analysis of 53 studies published between 2009 and 2019 and identified a male-to-female prevalence ratio of 2.5:1. Notably, of the 31 studies that reported specific gender ratios, only three (9.6%) found a higher prevalence of IGD among female players. This suggests that higher engagement levels typically observed in males may be associated with increased vulnerability to problematic gaming behaviours.

Research indicates that gaming motivations and genre preferences are closely linked and vary by gender and region. According to a systematic review by Martucci et al. (2023), men typically play games for competitive reasons, whereas women often prioritise social and relational goals. However, these patterns showed geographic variability. In Europe, women often play to compete and demonstrate their skills (Lewis & Griffiths, 2011; Laconi et al., 2017), whereas in the United States, their motivations appear to be more closely linked to achievement, empowerment and social bonding. While women participate across a wide range of categories (Hassan et al., 2019), some studies suggest they prefer less aggressive or competitive genres than men do (Lange et al., 2021; López-Fernández et al., 2020).

This preference for specific genres may be a strategic response to the community environment, rather than indicating a lack of interest in competition. In certain competitive genres, the requirement for verbal communication can make women vulnerable to gender-based harassment, such as sexist comments, and toxic behaviour (Belskie et al., 2023; Crothers et al., 2024). Toxicity refers to anti-social and/or disruptive

behaviour towards other gamers. These behaviours can range from offensive language during gameplay to trolling and hateful posts in game chats or on social media (Gandolfi & Ferdig, 2021). Such behaviours, particularly when gender-based, may cause women to avoid social online gaming, conceal their gender or abandon their 'gamer' identity. This limits their access to the social and psychological benefits of gaming (Kuss et al., 2022). Therefore, understanding the interplay between gaming motivations and external social barriers is crucial for grasping gendered gaming habits and the types of digital environments players choose to inhabit.

Similarly, several studies have examined women's gaming behaviour, producing mixed results (Kuss et al., 2022; Labrador et al., 2022; López-Fernández et al., 2019; McLean & Griffiths, 2019; Vermeulen et al., 2017). Given the inconsistencies observed in recent research, a more comprehensive investigation into gender differences among gamers is essential.

Gender differences identified in previous research may stem from methodological limitations, such as instruments lacking validation or reliability, or sociodemographic sampling variations, such as cross-national or broad age samples with high developmental variance (Hassan et al., 2019; Lange et al., 2021; Labrador et al., 2022). As gaming industries expand differently across countries, gaming dynamics in one region may not accurately reflect those in another. To address these limitations, the present study adopts a twofold approach: (1) focusing on a specific demographic group within a single national context to minimise geographical and age-related variation, and (2) using a validated instrument with good internal consistency. Understanding these gender differences is crucial for grasping current gaming trends, deconstructing stereotypes and fostering more inclusive gaming communities. Beyond its social implications, this insight can inform game design, enabling experiences that cater to the diverse needs of all players.

Aim of the study

This study aims to explore differences in gaming characteristics based on gender. Specifically, it examines gaming habits, motivations, and community-related variables in a sample of Italian university students. Due to the geographical variation in gaming participation (Visual Capitalist, 2025), it is important to establish whether global trends remain consistent within specific sociodemographic contexts. Therefore, this research analyses whether the gaming patterns observed in general populations also apply to an Italian university sample. By focusing on this specific demographic, the study seeks to provide a nuanced understanding of how gender influences the gaming experiences of university students.

The university years represent a critical developmental transition from late adolescence to emerging adulthood (Arnett et al., 2014). This period is characterised by increasing independence and engagement with digital spaces. However, it is also a period of instability and vulnerability, which can increase the likelihood of developing Internet Gaming Disorder (IGD) (Kinghorn et al., 2018). In line with this, research conducted in Italy suggests that a significant proportion of university students may be at risk of IGD, with around 15% potentially meeting the full diagnostic criteria (De Pasquale et al., 2018). Therefore, examining the gaming habits, motivations and perceived toxicity of gaming within this population could improve our understanding of how gender influences engagement with and experiences of video games during this developmental stage.

Based on the aforementioned research, the hypotheses of this study were as follows:

H1: A higher proportion of men engage in video gaming than women do in university context.

H2: Men will report an earlier age of gaming onset.

H3: Men will report more hours spent gaming per week.

H4: Men will report gaming in communities with higher levels of perceived toxicity.

H5: There will be statistically significant differences in gaming motivations between genders.

H6: Gaming habits and motivations are discriminant factors between genders.

Methods

Procedure and sample

A cross-sectional study was carried out using a LimeSurvey online survey administered in university classrooms. Participants were recruited between 2022 and 2024 through non-probabilistic convenience sampling, selected based on their accessibility and availability within the university environment. The recruitment process began with in-person invitations during face-to-face classes attended by students enrolled in different undergraduate programs. Participation in the study was voluntary, and all participants provided informed consent before data collection. No incentives were offered to minimize potential self-selection bias. Additionally, participants were assured that their responses would remain anonymous to reduce the likelihood of social desirability bias. This study adhered to the ethical principles outlined in the 1964 Declaration of Helsinki and its subsequent amendments or comparable ethical standards. Ethical approval was obtained by the Institutional Review Board of the University of Turin (Protocol No. 0592473).

The target population comprised Italian-speaking university students aged 18 years or older who reported currently playing video games. The original samples consisted of 402 participants. However, as the present study focuses on gender differences

and the representation of gender-diverse identities was insufficient for statistical analysis (non-binary, $n = 3$; genderfluid, $n = 2$; queer, $n = 1$), gender was treated as a binary variable, and only participants identifying as men or women were retained in the final sample. The final sample included 394 university gamers ($M_{\text{age}} = 22.81$, $SD_{\text{age}} = 3.67$, range = 18-34). The 42% of the sample identified as women.

Measures

Sociodemographic information. Participants provided sociodemographic information such as age, gender, and family income.

Gaming information. Participants provided gaming information such as age of gaming onset, weekly hours of gaming, and the level of perceived toxicity within their gaming communities (evaluating toxicity level from 1 to 5).

Motivations for gaming. The e-MUV scale (López Fernández et al., 2019) was administered to measure gaming motivations. This scale comprises 32 items assessing eight gaming motivations: immersion (items 1-4), customization (items 5-8), violent gratification (items 9-12), coping (items 13-16), fun (items 17-20), cognitive challenge (items 21-24), competition (items 25-28), and social interaction (items 29-32). Items were rated on a five-point Likert scale, from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores indicated higher motivation for gaming in each specific gaming motivation. The e-MUV scale was translated into Italian following the eight steps of the backward-forward translation method (Wild et al., 2005). Prior to the main analyses, a confirmatory factor analysis (CFA) was conducted to test the hypothesized 8-factor structure of the scale, showing an adequate model fit ($\chi^2(436) = 1395.29$, $p < .001$, CFI = .95, TLI = .94, RMSEA = .07, SRMR = .06). The Cronbach's alpha (α) and McDonald omega reliability coefficients (ω) for the e-MUV dimensions ranged from .83 to .91.

Statistical analysis

Descriptive statistics were initially computed to summarize the demographic characteristics and study variables. For continuous variables, means, standard deviations, and range were calculated, while categorical variables were summarized using frequencies and percentages. Additionally, skewness and kurtosis were examined to assess the normality of continuous variables (Kline, 2023).

Group comparisons assume the instrument's psychometric properties are equivalent across gender groups. To ensure this equivalence, we conducted a differential item functioning (DIF) analysis using ordinal logistic regression (OLR; Zumbo, 1999). This method is suitable for small samples and does not require parametric assumptions of the shape of the construct distribution or item response (Belzak, 2020). To accurately capture the latent trait of each item in the e-MUV's multidimensional structure, subscale-specific rest scores were utilized for matching. Research indicates that relying on a total test score in multidimensional assessments may inflate false-positive DIF detection, potentially misrepresenting the constructs measured (Mazor et al., 1998). OLR uses the likelihood ratio χ^2 test and an effect size estimator to model three models: M1 (effect of dimension total score, T), M2 (T + gender), and M3 (T $\times$ gender). The DIF detection tests were $\Delta \chi^2$, for global DIF detection (M3-M1 χ^2), non-uniform DIF (M3-M2 χ^2) and uniform DIF (M2-M1 χ^2). The statistical significance criterion was $p < .0003$ (Bonferroni correction: .01/32 items; Kim & Oshima, 2013). Effect size criterion was the difference between Nagelkerke- R^2 of each model compared (ΔR^2) in three classifications (Jodoin & Gierl, 2001): negligible ($< .035$), moderate ($\geq .035$), and large ($\geq .070$). The uniform (M2-M1) and non-uniform (M3-M2) DIF tests were conditional on the statistical significance and effect size of the overall DIF test (M3-M1).

To compare the distribution of men and women within the sample, a chi-square (χ^2) test was conducted. After verifying that all relevant statistical assumptions were satisfied, gender differences across the study variables were then examined using independent samples t-tests. Hedges' g was calculated to estimate effect sizes, providing an unbiased measure of the standardized mean difference. Following Lovakov and Agadullina (2021), effect sizes of 0.15, 0.36, and 0.65 were interpreted as small, moderate, and large, respectively.

A linear discriminant analysis (LDA) was conducted using the forward stepwise selection method (Tabachnick & Fidell, 2014) to identify the gaming-related variables that best distinguished between men and women. Only those variables that had shown a statistically significant association with gender in previous analyses were included as predictors. The stepwise procedure added predictor variables sequentially based on the criterion of minimizing Wilks' Lambda (tolerance $< .001$; entry $F = 3.84$; removal $F = 2.71$), thereby optimizing the discriminant function by reducing within-group variance and maximizing between-group variance. The resulting discriminant function was then employed to classify participants into their respective gender groups.

Different procedures were used to evaluate the fit and performance of the discriminant function (Tabachnick & Fidell, 2014). First, Wilks' Lambda and the χ^2 significance test were applied to determine whether the group centroids differed significantly. Second, Canonical R^2 was calculated to quantify the proportion of variance in group differences explained by the discriminant function. Third, the predictive accuracy of the function was assessed by examining the percentage of correctly classified cases. Finally, the stability, quality, and generalizability of the discriminant function were evaluated using a "leave-one-out" cross-validation procedure. Statistical analyses were

conducted with SPSS 28 (IBM Corp., 2021) and R packages *lavaan* (Rosseel, 2012), *MASS* (Venables & Ripley, 2002), and *dyplr* (Wickhan et al., 2023).

Results

Descriptive statistics

Participants' mean age of gaming onset was 8.31 years old ($SD = 3.12$, range 3-23), with a mean weekly gaming time of 10.8h ($SD = 9.7$, range 1-50). Regarding monthly family income, 4.1% ($n = 17$) reported less than 1000€/month, 30% ($n = 118$) reported between 1001 and 2000€/month, 26.2% ($n = 103$) reported between 2001 and 3000€/month, 24.4% ($n = 96$) reported between 3001 and 4000€/month, and 15.2% ($n = 60$) reported more than 4000€/month.

In terms of toxicity levels, the data indicates that 19.8% ($n = 78$) of participants perceived low or no toxicity, 21.1% ($n = 83$) perceived low to medium levels of toxicity, 25% ($n = 99$) perceived medium levels, 17.8% ($n = 70$) reported high-medium levels, and 6.3% ($n = 25$) identified high levels of toxicity. Additionally, 9.9% ($n = 39$) of the participants did not report their perceived levels of toxicity in gaming communities.

Differential item functioning

DIF analysis using subscale-specific rest scores as matching variables showed that only one item (item 1, Immersion) remained statistically significant after Bonferroni correction ($\Delta R^2 = .0405$), indicating moderate DIF. All remaining items show no evidence of meaningful uniform or non-uniform DIF. As only one item showed DIF, it was retained due to its limited impact on the overall scale and to preserve the conceptual coverage of the 'Immersion' dimension (Jodoin & Gierl, 2001).

Gender differences in study variables

Table 1 includes Student's t -test results examining gender differences in age and gaming variables included in the study. A statistically significant difference was initially found in the gender distribution of the sample, $\chi^2(1) = 9.76$, $p = .002$. This indicates that the proportions of the two gender categories differed from what would be expected by chance. Specifically, the men's group comprised 228 participants (57.9%), while the women's group included 166 participants (42.1%), demonstrating a deviation from equal distribution. Moreover, a statistically significant difference was found in the age distribution by gender, with women being younger in this sample ($M_{\text{men}} = 23.36$; $SD_{\text{men}} = 3.67$; $M_{\text{women}} = 22.07$; $SD_{\text{women}} = 3.56$; $p < .001$).

Regarding gaming variables, statistically significant differences by gender were observed in age of gaming onset ($p = .008$), weekly gaming hours ($p < .001$), and perceived toxicity of the community gaming ($p < .001$). Men began gaming at earlier ages than women ($M_{\text{men}} = 7.96$, $SD_{\text{men}} = 2.96$; $M_{\text{women}} = 8.8$, $SD_{\text{women}} = 3.26$), reported spending more hours gaming per week ($M_{\text{men}} = 12.36$, $SD_{\text{men}} = 10.47$; $M_{\text{women}} = 8.66$, $SD_{\text{women}} = 2.14$), and were more likely to participate in gaming communities perceived as more toxic ($M_{\text{men}} = 2.59$, $SD_{\text{men}} = 1.39$; $M_{\text{women}} = 2.14$, $SD_{\text{women}} = 1.38$).

Regarding gaming motivations, statistically significant differences were found in violent gratification ($p < .001$), coping ($p = .004$), cognitive challenge ($p = .003$), and social interaction ($p = .002$; Figure 1). Men showed higher levels of all of these motivations compared to women. No statistically significant differences were found in the other gaming motivations.

Table 1

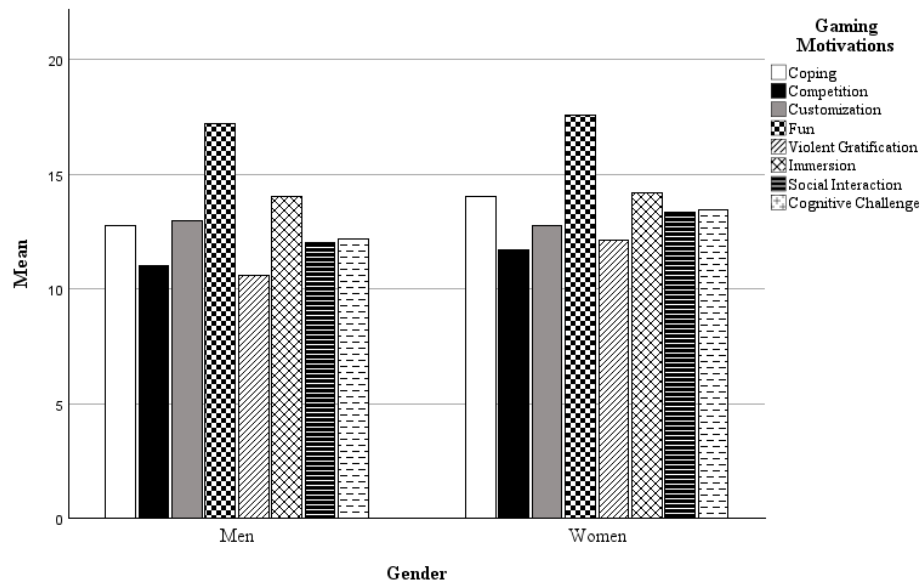
Sociodemographic and gaming variables by gender

	Men		Women		<i>t</i>	df	<i>p</i>	<i>g</i>	95% CI
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>					
Age	23.36	3.67	22.07	3.56	-3.47	392	<.001	0.35	-0.55, -.015
Age of gaming onset	7.96	2.96	8.80	3.26	2.65	390	.008	0.27	0.07, 0.47
Weekly gaming hours	12.36	10.47	8.66	2.14	-3.78	389	<.001	0.38	-0.58, -0.18
Toxicity Gaming	2.59	1.39	2.14	1.38	-3.20	392	<.001	0.32	-0.52, -0.12
Motivations									
Immersion	14.18	4.12	14.07	4.50	-0.07	392	.394	0.02	-0.22, 0.17
Customization	12.78	4.42	12.98	4.23	0.44	392	.660	0.04	-0.15, 0.24
Violent Gratification	12.12	4.35	10.60	4.42	-3.39	392	<.001	0.34	-0.54, -0.14
Coping	14.06	4.02	12.80	4.41	-2.93	392	.004	0.29	-0.49, -0.09
Fun	17.58	2.94	17.20	3.15	-1.21	392	.228	0.12	-0.32, 0.07
Cognitive Challenge	13.44	4.15	12.17	4.14	-3.01	392	.003	0.31	-0.51, -0.11
Competition	11.72	4.15	11.03	4.03	-1.64	392	.100	0.17	-0.37, 0.03
Social Interaction	13.34	4.35	12.03	4.69	-2.84	392	.002	0.29	-0.49, -0.09

Note. *M*: mean; *SD*: standard deviation; *df*: degree of freedom; *g*: Hedge's *g*.

Figure 1

Mean distribution of gaming motivations by gender



Linear discriminant analysis

A single discriminant function was derived as only two gender groups were analyzed. Prior to the analysis, the assumption of equality of covariance matrices was checked with Box's M test (Box $M = 20.28$, $F = 3.35$, $p = .003$), indicating a violation of the assumption. This problem was not considered problematic due to the large sample size (Tabachnick & Fidell, 2014).

The discriminant function demonstrated a statistically significant association between the groups and all predictor variables, accounting for 8.7% of the between-group variability. The overall Wilks' lambda was statistically significant (Wilks' lambda = 0.91, $\chi^2(3) = 35.44$, $p < .001$), indicating that the predictors effectively differentiated between the gender groups. Men had higher discriminant function scores ($M = 0.26$) compared to women ($M = -0.36$), and this difference was statistically significant ($t(392) = -6.06$, $p < .001$, Hedges' $g = 0.62$, 95% IC: 0.41, 0.82).

Regarding the predictor variables, the correlation coefficients represent Pearson correlations between the predictors and the discriminant function. Notably, all coefficients for the variables included in the model exceeded 0.50, surpassing the commonly accepted threshold of 0.30 for relevance in discriminant analysis. The strongest relationships with the discriminant function were observed for hours of weekly gameplay ($r = .616$) and violent gratification ($r = .577$), followed by age ($r = .563$). Specifically, higher levels of weekly gameplay, greater motivation for gratification, and being older were associated with higher discriminant function scores, which characterize the male group in this sample.

Table 2

Discriminant analysis results

Predictors	Structure coefficients	Standardized coefficients	Pooled within-group correlations among predictors	
			Violent Gratification	Age
Weekly hours of gaming	.62	.46	.134	.121
Violent Gratification	.58	.63		-.188
Age	.56	.63		
Canonical R	.30			
Eigenvalue	.10			

The overall accuracy rate was 62.7%, correctly classifying 62.7% of respondents into “male” or “female” groups. Women were classified with higher accuracy (66.3%) than males (60.1%; Table 3). The consistency between the original classification (62.7%) and cross-validation (61.7%) suggests high stability of the discriminant model.

Table 3

Classification results using leave-one-out cross-validation method

Sample	Gender	Men (predicted)	Women (predicted)	% Correctly classified
Original	Men	137	91	60.1
	Women	56	110	66.3
	% total cases correctly classified			62.7
Cross- validated	Men	135	93	59.2
	Women	58	108	65.1
	% total cases correctly classified			61.7

Discussion

This study aimed to explore gender differences in gaming characteristics. Specifically, it examined gaming habits, motivations and toxicity in gaming communities within a sample of Italian university students. The evolving demographic profiles of gamers, in contrast to the persistence of exclusionary behaviors in certain gaming communities, suggest that gender disparities may influence gaming habits and interests (Kuss et al., 2022).

Regarding H1, the results confirmed a higher proportion of male gamers than female gamers in this Italian university sample (57.9%). This finding is consistent with previous research conducted with Spanish university students (Gisbert-Pérez et al., 2024) as well as studies involving young people and university populations (López-Fernández et al., 2019). However, it contrasts with global market reports suggesting that the overall gaming population is nearly equally distributed by gender (Entertainment Software Association, 2018). Although many video games have traditionally been designed for

male audiences (López-Fernández et al., 2019), the current findings may reflect differences between general population trends and gaming engagement patterns within specific subgroups, such as university students.

Regarding H2, Italian male gamers appeared to start gaming earlier than their female counterparts. The results showed a statistically significant difference in the age of gaming onset between men and women, with men beginning gaming approximately one year earlier on average. These findings align with previous studies, which attribute earlier gaming onset in men to leisure activities historically designed for and promoted among males (López-Fernández et al., 2019). In line with H3, men also demonstrated statistically significant differences in weekly gaming hours, playing nearly four hours more on average. Findings from Nakayama et al. (2020) highlighted that an earlier gaming onset often involves higher engagement in gaming, supporting the confirmation of hypotheses H2 and H3.

Regarding H4, men were more likely to play in gaming communities perceived as more toxic compared to women. This result may be due to greater male participation in games with strong competitive and/or violent components (Lange et al., 2021; Bopp et al., 2022). Additionally, competitive or violent gaming communities may present a higher risk of gender-based harassment. Consequently, some female gamers may choose alternative gaming contexts where there is less risk of exposure to harassment or violence, regardless of their gaming interests (Belskie et al., 2023; Kuss et al., 2022).

Regarding H5, statistically significant differences were found only in certain gaming motivations between men and women. Specifically, men reported significantly higher scores in violent gratification, coping, and social interaction. These results partially resemble those found among Spanish university students, where men also showed higher scores in violent gratification, social interaction, and cognitive challenge (Gisbert-Pérez

et al., 2024). Previous studies suggest that male gamers' motivations are often associated with specific game genres, such as shooters or massively multiplayer online role-playing games (Kim et al., 2016). Similarly, women may prefer contexts where aggressive components or social interactions do not make them feel exposed (Belskie et al., 2023).

Moreover, motivation for cognitive challenge was also statistically higher in men than in women in this sample. Some gaming environments often reinforce competence- and strategy-based identities among male players, as stereotypical "gamer" traits are strongly associated with skill and performance, which can strengthen men's identification with the gamer role (Yao et al., 2022). In this context, cognitive challenge may also function as a way of demonstrating gaming ability and status within the gaming environment. However, no differences were observed in competition-oriented motivations, which focus on competing against others. Since previous studies with Spanish university students and young gamers did find differences in both motivations (Demetrovics et al., 2011; Gisbert-Pérez et al., 2024), these results may indicate a stronger tendency toward self-competition, possibly linked to a more individualistic culture.

Finally, no statistically significant differences were found in other gaming motivations, such as immersion, customization, and fun, suggesting that these may represent common motivational components among Italian university students regardless of gender. Although customization has traditionally been associated more with female gamers (López-Fernández et al., 2020), these three motivations have shown lower risk in relation to gaming-related problems (Slack et al., 2022; Wang et al., 2020).

Hypotheses H1–H5 are consistent with expectations derived from gender socialization theory (Bem, 1993). This theory suggests that from an early age, boys and girls socialize differently regarding their interests and activities. Due to cultural and social stereotypes, video games are often more closely associated with male interests. Similarly,

social identity theory (Tajfel & Turner, 1979) posits that individuals tend to identify with groups that reinforce their sense of self. Men may be particularly attracted to certain video games because they provide opportunities to express and consolidate masculine identity, particularly in genres emphasizing competition and action. This tendency to seek out competitive and action-oriented games may also explain the higher presence of men in gaming communities perceived as more toxic, where aggressive behaviors are more common.

Regarding H6, the discriminant analysis showed that weekly gaming hours, violent gratification, and participants' age significantly differentiated between genders. Several conclusions can be drawn from these findings. Weekly gaming hours and violent gratification reflect behavioral patterns more characteristic of male university students in Italy. Spending more time playing may indicate greater practice and a stronger drive to master gaming skills, while higher violent gratification scores may reflect the influence of gendered socialization processes. Age, on the other hand, captures demographic differences between the groups and serves as an additional contextual factor without directly reflecting gaming behavior. Additionally, the relatively low proportion of explained variance by the discriminant function suggests that many gaming habits and motivations are shared across genders or that there is substantial variability within each gender group, potentially influenced by psychosocial factors such as individual needs (Przybylski et al., 2010) or social and contextual influences (Angelini et al., 2023). While research with Spanish university students found that gaming habits and motivations accounted for 36% of variance (Gisbert-Pérez et al., 2024), in the present sample this did not reach 10%, indicating potentially more homogeneous gaming patterns and a narrower gender gap in gaming behavior among Italian university students.

Limitations and future research

This study has several limitations. First, sampling bias may have affected the study, as participation depended on voluntary access to the questionnaire. This may have favored individuals with easier access to digital devices or a greater interest in gaming-related topics. Second, the sample consisted of Italian university students, limiting the generalizability of the findings to other age groups or populations outside of an academic context. Third, the cross-sectional design prevents drawing causal conclusions about the relationships between gender, gaming habits, motivations, and perceived toxicity. Fourth, the model did not include other relevant variables that may influence gaming behavior, such as personality traits, or psychosocial factors. Finally, the study relied on self-report measures, which may be influenced by social desirability and introduce measurement error.

Future research should include more diverse samples, including gamers from different age groups, to examine whether gender-related predictors of gaming behavior remain stable across the lifespan. Cross-national studies will help to confirm whether findings are similar or different across countries. Finally, further work is needed to develop and validate measurement instruments specifically tailored to gaming-related constructs, such as perceived toxicity within gaming communities.

Practical implications

Some practical implications can be drawn, particularly for Italian university students. First, the presence of shared gaming motivations across genders suggests that game developers may benefit from designing experiences that appeal to a broad range of players, emphasizing elements such as immersion, enjoyment, and customization. Second, the higher perception of toxicity in certain gaming environments highlights the

importance of fostering inclusive and respectful online communities, which can create safer gaming spaces regardless of gender. Within university settings, educational initiatives that promote awareness of respectful interaction and gender inclusion could further support healthier community dynamics.

Discriminant results indicated that gaming intensity and motivation for violent gratification were the components that most clearly differentiated between genders, suggesting that profiles characterized by higher engagement and attraction to violent content are more prevalent among male students. Understanding these gender-related patterns may help inform more targeted prevention strategies for addressing problematic gaming behaviors in this population.

Conclusion

This study examined gender differences in gaming habits, motivations, and perceived toxicity among Italian university students. Overall, men reported earlier gaming onset, higher weekly gaming hours, and greater motivation for violent gratification, while several other motivations, such as immersion, fun, and customization, were shared across genders. Men also perceived higher levels of toxicity in their gaming communities. Discriminant analysis confirmed that gaming intensity and violent gratification were the strongest factors differentiating male and female gamers, although much of gaming behavior appears shared. These findings underscore the importance of considering gender when studying gaming behavior. They also suggest practical implications for designing inclusive games, fostering safer online communities, and developing targeted prevention strategies for problematic gaming among university populations.

Study 6. Gender gaps in gaming: a discriminant analysis of Mexican university students

Gisbert-Pérez, J., Martí-Vilar, M., Chans, G. M., Badenes-Ribera, L. Gender gaps in gaming: a discriminant analysis of Mexican university students (*Under review*)

Abstract

Gaming has evolved into a mainstream adult pastime, diversifying across genders and geographies. The Latin American market is growing rapidly, with Mexico at the forefront. Understanding specific consumption patterns is crucial for identifying market trends and gender-based risks. This study examines gaming habits, motivations, and community toxicity among Mexican university students. 745 university gamers ($M_{age} = 19.77$, $SD_{age} = 1.64$; 35% women) completed an online questionnaire assessing gaming characteristics, motivations, and perceived toxicity in gaming communities. Gender differences were examined using chi-square tests, independent samples t-tests, and linear discriminant analysis. The results revealed significant gender differences in the age of gaming onset, weekly gaming hours, perceived toxicity in gaming communities, and several gaming motivations, including violent gratification, cognitive challenge, competition, social interaction, and customization. Men reported starting to play video games at an earlier age, weekly gaming hours, and perceiving higher levels of toxicity in gaming communities. The discriminant analysis further indicated that violent gratification, age of gaming onset, perceived toxicity, competition, and weekly gaming hours were the variables that most strongly differentiated between genders. Overall, these findings highlight distinct gender-related patterns in gaming behavior within a Mexican university context. They underscore the importance of promoting inclusive game design and

fostering respectful gaming environments, while also providing insights that may inform prevention strategies of problematic gaming behaviors.

Keywords: gaming, gender differences, Mexico, university students, motivations.

Introduction

Video games provide immersive virtual environments where players can achieve goals (Jenkins, 2009). In recent years, the proliferation of platforms and the expansion of game genres have facilitated more inclusive access to this form of digital leisure. This progression has broadened the industry's scope in terms of gender, geography, and age. By 2025, women are expected to represent 48% of the global gaming population (ESA, 2025). Beyond the largest global markets, the Latin American gaming sector has become one of the fastest-growing regions worldwide, with Mexico leading the region in video game consumption (Newzoo, 2024). In Mexico, 87.5% of individuals under the age of 20 identify as gamers, while 77.4% of young adults aged 21 to 30 report playing video games (CIU, 2024). These trends highlight the increasing diversification of gaming audiences.

As the gaming population has diversified, research has increasingly focused on understanding how different groups engage with video games. Traditionally, the gaming industry has had a predominantly male character, often framed as a leisure activity created by and for men (López-Fernández et al., 2019). Although gaming culture is becoming increasingly accessible and diverse, men still commonly occupy positions of visibility and influence, particularly in videogame content creators and professional environments such as esports (Paaßen et al., 2017). These historical dynamics may continue to shape perceptions of who participates in gaming and how individuals interact with gaming spaces.

Despite advancements in inclusivity, gender stereotypes continue to shape gaming communities. The persistent over-sexualization and objectification of female characters often cultivate a hostile climate for women (López-Fernández et al., 2019). Furthermore, frequent exposure to sexist behavior and gender-based harassment (Belskie et al., 2023)

negatively impacts women's self-perception and their sense of belonging within these spaces. This creates a significant gamer identity gap: while participation rates are nearly equal, only 35% of women self-identify as gamer, compared to 51% of men (ESA, 2025; Le Ngoc, 2022). These dynamics suggest that gender may play a significant role in shaping how individuals participate in gaming environments and how they interact with video games.

Previous studies have highlighted differences in gaming preferences and levels of engagement based on sex and gender. Research consistently indicates that males are more engaged in gaming, spending approximately twice as much time playing games compared to females (Homer et al., 2012; Miezah et al., 2020; van Rooij et al., 2014). Additionally, early exposure to video games seems linked to higher levels of engagement later in life, suggesting that the age at which individuals begin gaming may influence their long-term gaming behaviors (Nakayama et al., 2020). However, there is a lack of research specifically addressing gender differences in this area. These differences in gaming engagement may also be reflected in the prevalence of Internet Gaming Disorder (IGD), as previous research has shown that risk patterns for problematic gaming tend to vary by gender (Kuss et al., 2022; Stevens et al., 2021).

Beyond the differences in gaming time, the underlying drivers of gaming engagement also diverge significantly by gender. Gaming motivations seem closely linked to game genre preferences, with differences across nations. According to a systematic review by Martucci et al. (2023), men generally engage in gaming for competitive reasons, whereas women often prioritize social and relational goals. However, these patterns showed geographic variability. In Europe, women frequently play to compete and demonstrate skill (Lewis & Griffiths, 2011; Laconi et al., 2017), whereas in the United States, their motivations appear to be more tied to achievement,

empowerment, and social bonding. However, although women participate across a wide range of categories (Hassan et al., 2019), some studies suggest a preference for less aggressive or competitive genres compared to men (Lange et al., 2021; López-Fernández et al., 2020). These results suggest that differences in genre preferences may not be entirely driven by individual motivations.

Preferences for specific game genres can also reflect strategic adaptations to the social dynamics within gaming communities. In many competitive games, the reliance on voice communication can increase women's exposure to gender-based harassment, including sexist and toxic behaviors (Belskie et al., 2023; Crothers et al., 2024). Toxicity in gaming environments generally refers to antisocial or disruptive actions directed at other players. These actions can range from using offensive language during gameplay to trolling or making hostile comments in in-game chats and on social media platforms (Gandolfi & Ferdig, 2021). Such negative experiences may lead women to avoid certain online gaming spaces, hide their gender, or distance themselves from the "gamer" label altogether. As a result, these challenges can restrict women's access to the social and psychological benefits typically associated with gaming (Kuss et al., 2022). Consequently, the interplay between player motivations and the social climate of gaming communities may significantly influence gendered gaming behaviors. Although some studies have specifically examined women's gaming behavior, the findings remain inconsistent (Kuss et al., 2022; Labrador et al., 2022; López-Fernández et al., 2019; McLean & Griffiths, 2019; Vermeulen et al., 2017).

Aim of the study

This study examines gender differences in gaming-related characteristics among university students in Mexico. Specifically, it investigates variations in gaming habits, motivations for gaming, and perceptions of toxicity within the gaming community. Given that participation in gaming shows significant geographic variability (Visual Capitalist, 2025), it is essential to determine whether global patterns are reflected within specific sociodemographic contexts. Therefore, this research evaluates whether widely observed gaming trends apply to a Mexican university population.

The university period comprises a developmental phase between late adolescence and emerging adulthood (Arnett et al., 2014). During this time, individuals typically gain greater autonomy and digital involvement. However, this period is often characterized by transitions and potential vulnerabilities, which may increase the risk of developing problematic gaming behaviors (Kinghorn et al., 2018). Previous research has shown that university students are at an elevated risk for engaging in problematic gaming patterns (De Pasquale et al., 2018). By focusing on this group, the study aims to provide a detailed perspective on how gender influences the gaming behaviors and experiences of university students. Thus, the present study focuses on the following hypotheses:

H1: The proportion of male university students who report current gaming will be higher than that of female students.

H2: Male participants will have started gaming at earlier ages compared to female participants.

H3: Male students will report spending a greater number of hours per week gaming compared to female students.

H4: Male participants will report higher perceived levels of toxicity within gaming communities compared to female students.

H5: Statistically significant gender differences will be observed in reported gaming motivations.

H6: Gaming-related behaviors and motivational factors will function as gender discriminating variables in gaming.

Methods

Sampling procedure

A cross-sectional design was employed. An online questionnaire was developed and distributed through LimeSurvey. Data collection took place in university classrooms in 2024/2025, following a non-probability convenience sampling method. Recruitment commenced with in-person invitations given during face-to-face classes attended by students from various undergraduate programs. Participation was voluntary and anonymous, and informed consent was obtained from all respondents before completing the survey. To limit potential self-selection effects, no incentives were provided. This study was conducted in accordance with the ethical standards established in the 1964 Declaration of Helsinki and its later revisions, as well as with comparable ethical guidelines for research involving human participants. Ethical approval was obtained by the Institutional Review Board of the Tecnológico de Monterrey (Protocol No. EHE-2023-08).

The target population consisted of Spanish-speaking university students in Mexico aged 18 years or older who indicated that they currently play video games. The initial dataset included 776 respondents. Because the present research specifically

examines gender-based differences and the number of participants identifying with gender-diverse categories was too small to permit reliable statistical analysis (non-binary, $n = 8$; no response, $n = 22$), gender was operationalized as a binary variable (men/women). The final sample comprised 746 university students who reported engaging in video gaming ($M_{age} = 19.77$, $SD_{age} = 1.64$; age range = 18–30). Within this group, 35% of participants identified as women.

Measures

Sociodemographic and gaming-related variables. Participants reported sociodemographic characteristics (age, gender, and family income) and gaming information (age of gaming onset, hours of gaming per week, and perceived toxicity in gaming communities). Perceived toxicity was rated on a five-point scale ranging from 1 (very low toxicity) to 5 (very high toxicity).

Motivations for gaming. Gaming motivations were assessed using the e-MUV scale (López Fernández et al., 2019). This instrument consists of 32 items that evaluate eight gaming motivational dimensions: immersion (items 1–4), customization (items 5–8), violent gratification (items 9–12), coping (items 13–16), fun (items 17–20), cognitive challenge (items 21–24), competition (items 25–28), and social interaction (items 29–32). Participants rated their responses on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores represent higher levels of specific gaming motivation. A confirmatory factor analysis (CFA) was estimated using the WLSMV to test the hypothesized 8-factor structure of the scale, showing an adequate model fit ($\chi^2(436) = 1859.69$, $p < .001$, CFI = .98, TLI = .98, RMSEA = .06, SRMR = .06). Cronbach's α and McDonald ω ranged from .79-.91 for the e-MUV dimensions.

Statistical analysis

Descriptive analyses were performed to summarize sample characteristics and gaming variables. Continuous variables were summarized using means, standard deviations, and observed ranges, while categorical variables were expressed as frequencies and percentages. The distributional normality of the continuous variables was examined through skewness and kurtosis (Kline, 2023).

Because comparisons between gender groups require the e-MUV measurement instrument to operate equivalently across groups, a differential item functioning (DIF) analysis was performed. DIF was examined using ordinal logistic regression (OLR; Zumbo, 1999), a method suitable for relatively small samples and one that does not rely on strict parametric assumptions regarding the distribution of the latent construct or item responses (Belzak, 2020). Given the multidimensional structure of the e-MUV, subscale-specific rest scores were used as matching variables to better represent the latent trait measured by each item. Research suggests that using a total test score for matching in multidimensional assessments may lead to inflated false-positive DIF detection, as it may not accurately reflect the construct measured by each item (Mazor et al., 1998). The OLR approach evaluates three nested models: M1 (including the specific-dimension total score, T), M2 ($T + \text{gender}$), and M3 ($T \times \text{gender interaction}$). DIF detection relied on likelihood ratio χ^2 tests and effect size estimates: global DIF was assessed through the comparison between M3 and M1, non-uniform DIF through the comparison between M3 and M2, and uniform DIF through the comparison between M2 and M1. Statistical significance was evaluated using a Bonferroni-adjusted threshold ($p < .0003$; $.01/32$ items; Kim & Oshima, 2013). Effect sizes were interpreted using the difference in Nagelkerke's R^2 between competing models (ΔR^2), categorized as negligible ($< .035$), moderate ($\geq .035$), or large ($\geq .070$; Jodoin & Gierl, 2001). Tests for uniform and non-

uniform DIF were only interpreted when the overall DIF test reached both statistical significance and the specified effect size threshold.

To examine whether the distribution of men and women differed within the sample, a chi-square (χ^2) test was conducted. After confirming that the relevant statistical assumptions were met, gender differences in the study variables were assessed using independent-samples *t*-tests. Effect sizes were estimated using Hedges' *g*, which provides an unbiased standardized mean difference. Following the guidelines proposed by Lovakov and Agadullina (2021), values of 0.15, 0.36, and 0.65 were interpreted as small, moderate, and large effects, respectively.

To identify the set of gaming-related variables that most effectively differentiated men and women, a linear discriminant analysis (LDA) was performed using a forward stepwise selection procedure (Tabachnick & Fidell, 2014). Only variables that had previously shown a statistically significant association with gender were considered as potential predictors. The stepwise algorithm sequentially introduced variables according to their contribution to minimizing Wilks' Lambda (tolerance < .001; entry $F = 3.84$; removal $F = 2.71$), thereby optimizing the discriminant function by maximizing between-group variance relative to within-group variance. The final discriminant function was subsequently used to classify participants according to gender group.

Several indicators were used to evaluate the performance and adequacy of the discriminant model (Tabachnick & Fidell, 2014). First, Wilks' Lambda and its associated χ^2 test were examined to determine whether the centroids of the groups differed significantly. Second, the squared canonical correlation (R^2) was calculated to estimate the proportion of variance in group membership explained by the discriminant function. Third, classification accuracy was evaluated through the percentage of correctly classified

cases. Finally, the robustness and generalizability of the model were assessed using a leave-one-out cross-validation procedure.

All statistical analyses were conducted using SPSS version 28 (IBM Corp., 2021) and the R packages *lavaan* (Rosseel, 2012), *MASS* (Venables & Ripley, 2002), and *dplyr* (Wickham et al., 2023).

Results

Descriptive data

Participants reported a mean age of gaming onset of 8.97 years ($SD = 3.46$; range = 1–27). On average, respondents indicated approximately 5.3 hours per week playing video games ($SD = 4.78$; range = 1–60). In terms of monthly household income, 9.7% ($n = 72$) of participants reported earning below \$10,000 MXN, 12.1% ($n = 90$) between \$10,001 and \$20,000 MXN, 7.5% ($n = 56$) between \$20,001 to \$30,000 MXN, 6% ($n = 45$) between \$30,001 and \$40,000 MXN, 8.3% ($n = 62$) between \$40,001 and \$50,000 MXN, 8.8% ($n = 66$) between \$50,001 to \$60,000 MXN, 8.4% between \$60,001 to \$70,000 MXN and 6.2% ($n = 46$) between \$70,001 and \$80,000 MXN. The largest group, 33% ($n = 246$), reported incomes exceeding \$80,000 MXN per month.

Regarding perceived toxicity in gaming communities, 15.1% of respondents ($n = 113$) reported either an absence of toxicity or a low level, 22.9% ($n = 171$) indicated low levels, 29.4% ($n = 219$) indicated medium levels, 19.7% ($n = 147$) indicated medium-high levels, and 12.9% ($n = 96$) indicate high level of perceived toxicity.

Differential e-MUV item functioning

After applying the Bonferroni correction, DIF analysis revealed that only item 10 remained statistically significant. However, its effect size was below the threshold for

meaningful DIF ($\Delta R^2 = .0329$), indicating negligible differential item functioning. Therefore, no items were considered to exhibit meaningful DIF.

Gender differences in study variables

A statistically significant imbalance in gender distribution of the sample was observed ($\chi^2(1) = 68.46, p < .001$), indicating that the proportions of men (65.1%) and women (34.9%) differed from an equal distribution

Table 1 shows the Student's *t*-test results assessing gender differences in the study variables. A significant difference was observed in the age of video game initiation ($p < .001$), with men starting to play video games at a younger age ($M = 8.15, SD = 3.04$) compared to women ($M = 10.48, SD = 3.68$). Significant gender differences were found in weekly gaming hours ($p < .001$) and perceived toxicity within gaming communities ($p < .001$), with men reporting more weekly gaming hours and higher perceived toxicity than women. No statistically significant differences between men and women were found for age and monthly family income.

Regarding gaming motivations, statistically significant gender differences were identified in customization ($p = .012$), violent gratification ($p < .001$), cognitive challenge ($p = .001$), competition ($p < .001$), and social interaction ($p < .001$). Specifically, men reported higher motivations for violent gratification, cognitive challenge, competition, and social interaction, whereas women showed higher motivations for customization. No statistically significant gender differences were observed in immersion, coping, and fun.

Table 1

Sociodemographic and gaming variables by gender

	Men		Women		<i>t</i>	df	<i>p</i>	<i>g</i>	95% CI
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>					
Age	19.76	1.63	19.77	1.61	-0.14	744	.886	-0.01	-0.16, 0.14
Age of gaming onset	8.15	3.04	10.48	3.68	-8.74	451	<.001	-0.71	-0.86, -0.55
Weekly gaming hours	6.12	5.40	3.73	2.73	7.99	741	<.001	0.51	0.36, 0.66
Toxicity Gaming Motivations	3.19	1.18	2.43	1.19	8.25	744	<.001	0.63	0.48, 0.78
Immersion	14.20	4.09	14.12	3.75	0.26	570	.793	0.20	-0.13, 0.17
Customization	14.58	3.48	15.26	3.56	-2.53	744	.012	-0.19	-0.35, -0.04
Violent Gratification	13.04	3.76	9.80	4.02	10.72	499	<.001	0.84	0.68, 0.99
Coping	14.65	3.41	14.48	3.51	0.62	744	.537	0.05	-0.10, 0.19
Fun	17.75	2.76	17.34	2.99	1.86	744	.063	0.14	-0.08, 0.29
Cognitive Challenge	14.83	3.23	14.01	3.54	3.19	744	.001	0.25	0.09, 0.39
Competition	15.06	3.19	13.34	3.68	6.35	468	<.001	0.51	0.36, 0.66
Social Interaction	15.55	3.25	14.09	3.70	5.36	473	<.001	0.43	0.28, 0.58

Note. *M*: mean; *SD*: standard deviation; *df*: degree of freedom; *g*: Hedge's *g*.

Gender linear discriminant analysis

A forward stepwise discriminant analysis was conducted using the minimization of Wilks' Lambda as the criterion for selecting predictor variables, after the evaluation of statistical assumptions. The Box's *M* test indicated a violation of the assumption of equality of covariance matrices (Box's *M* = 198.96, *F* = 9.38, *p* < .001). However, given the large sample size, this violation was not considered problematic for the interpretation of the discriminant analysis (Tabachnick & Fidell, 2014).

The canonical correlation associated with the discriminant function was .506 (*R*² = .256), accounting for approximately 25.6% of the variance in group membership. The

overall Wilks' lambda was statistically significant, indicating that the set of predictors effectively differentiated between gender groups (Wilks' $\lambda = .744$, $\chi^2(6) = 219.07$, $p < .001$). Women had higher discriminant function scores ($M = 0.72$, $SD = 0.45$) compared to men ($M = 0.22$, $SD = 0.42$), and this difference was statistically significant [$t(743) = -14.95$, $p < .001$, Hedges' $g = -1.15$, 95% CI: $-1.31, -0.99$].

Table 2 displays the within-group correlations among the predictors, the discriminant function, and the standardized weights. The correlation coefficients represent Pearson correlations between the predictors and the discriminant function. Notably, several coefficients exceeded 0.30, a commonly accepted threshold indicating the relevance of predictor variables in discriminant function analysis (Burns & Burns, 2008). The strongest relationships with the discriminant function were observed for violent gratification ($r = .682$) and the age of gaming initiation ($r = -.577$), followed by perceived toxicity in gaming communities ($r = .516$), competition ($r = .420$) and weekly gaming hours ($r = .416$). Social interaction ($r = .262$), cognitive challenge ($r = .235$), and customization ($r = -.153$) showed weaker associations with the discriminant function.

Table 2

Discriminant analysis results

Predictors	Structure coefficients	Standardized coefficients	Pooled within-group correlations among predictors			
			Age of gaming onset	Perceived toxicity	Competition	Gaming h/w
Violent Gratification	.682	.483	-.134	.264	.373	.106
Age of gaming onset	-.577	-.485		-.014	-.047	-.149
Perceived toxicity	.516	.323			.244	.087
Competition	.420	.159				.082
Gaming h/w	.416	.267				
Canonical R	.506					
Eigenvalue	.345					

Note. Only predictors with a structure coefficient $\geq .30$ are shown. *Gaming h/w* = gaming hours per week.

Table 3 shows the classification results using the “leave-one-out” cross-validation method (jackknifed classification). The overall accuracy rate was 75.6%, correctly classifying 75.6% of respondents into “male” or “female” groups. Males were classified with slightly higher accuracy (77.6%) than females (71.8%). These results were consistent in the cross-validated classification, which correctly classified 74.8% of cases.

Table 3

Classification results using the leave-one-out cross-validation method

Sample	Gender	Predicted: Men	Predicted: Women	% cases correctly classified
Original	Men	377	109	77.6
	Women	73	186	71.8
	% Total cases correctly classified			75.6
Cross-validated	Men	374	112	77.0
	Women	76	183	70.7
	% Total cases correctly classified			74.8

Discussion

This study examines gender differences in gaming-related characteristics, such as gaming habits, motivations, and perceived toxicity in gaming communities, among university students in Mexico. Given that previous findings displayed methodological, geographical, and group-age variability, the present research focuses on a specific developmental stage within a single national context.

The findings indicated that men comprised a larger proportion of gamers than women in this university sample, accounting for 65.1% and supporting H1. This trend is consistent with previous research conducted in university settings from other countries, such as Spain and Italy (Gisbert-Pérez et al., 2024, under review; López-Fernández et al., 2019). However, these results contradict global industry reports suggesting that the gaming population is currently almost equally distributed between women and men (Entertainment Software Association, 2018). These results may highlight differences between gaming engagement rates in the general population and within specific groups, such as university students.

Men participants reported starting to play video games at an earlier age and gaming more hours per week than women, supporting H2 and H3. This pattern is consistent with previous research suggesting that earlier engagement among males may be linked to leisure activities historically marketed and socially encouraged among boys (López-Fernández et al., 2019). Moreover, Nakayama et al. (2020) indicated that earlier exposure to gaming is often associated with higher levels of later engagement. Together, these findings suggest that early exposure to video games may lead to continued gaming in later life, particularly among male university students.

Furthermore, men reported playing in gaming communities perceived as more toxic than those reported by women, supporting H4. This finding may be related to the greater male participation in game genres with marked competitive or violent elements (Lange et al., 2021; Bopp et al., 2022), which are often associated with more hostile interaction dynamics. Previous research suggests that gender-based harassment is particularly common in highly competitive multiplayer games that rely on voice communication, such as first-person shooters and other online competitive genres (Fox & Tang, 2017). As a result, some female players may avoid these contexts and instead engage in gaming spaces perceived as less hostile, regardless of their actual gaming preferences (Belskie et al., 2023; Kuss et al., 2022).

Statistically significant differences were found only in certain gaming motivations by gender, partially supporting H5. Specifically, men reported higher scores in violent gratification, cognitive challenge, competition, and social interaction, while women showed higher scores in customization. These findings are consistent with results obtained among Spanish university students, where similar differences were reported (Gisbert-Pérez et al., 2024). In contrast, research conducted with Italian university students found overlapping results only for violent gratification, cognitive challenge, and social interaction (Gisbert-Pérez et al., under review). Previous studies suggest that male gamers' motivations are often linked to particular game genres, such as shooters or massively multiplayer online role-playing games, which emphasize competition, combat, and cooperative interaction (Kim et al., 2016). Similarly, higher scores in cognitive challenge among men may reflect gaming environments that reinforce competence- and performance-based identities, where demonstrating skill and strategic ability contributes to status within gaming communities (Yao et al., 2022). Conversely, women may be more likely to engage in gaming environments where aggressive elements or certain types of

social interaction are less likely to expose them to hostility or harassment (Belskie et al., 2023). The similarities and differences found between countries may be related to cultural variations in gaming practices, differences in the popularity of specific games across regions, and distinct gender socialization processes that shape how men and women engage with gaming.

In this line, the patterns observed for H1–H5 align with explanations proposed by gender socialization theory (Bem, 1993), which argues that boys and girls are encouraged from an early age to develop different interests and engage in distinct types of activities. Within this framework, video games have historically been framed as a form of leisure more closely associated with male interests due to prevailing cultural stereotypes. In addition, social identity theory (Tajfel & Turner, 1979) suggests that individuals are drawn to groups and activities that reinforce their self-concept. Accordingly, some men may be particularly attracted to video games that allow them to express and affirm masculine identities, especially in genres centered on competition (with oneself or others) and action. This inclination toward competitive and action-oriented games may also help explain the greater male presence in gaming environments perceived as more toxic, where aggressive interactions are more prevalent.

The discriminant analysis showed that violent gratification, age of gaming onset, perceived toxicity, competition, and weekly gaming hours were the variables that strongly differentiated between genders. These findings suggest that gender differences in gaming are not explained by a single factor but rather by a combination of gaming habits, motivations, and contextual experiences within gaming communities. Earlier age of gaming initiation, higher gaming hours, and higher scores for violent gratification, competition, and perceived toxicity represent the stronger combination of predictor variables for distinguishing between genders.

Several conclusions can be drawn. First, there is an apparent gender disparity in the age of video game initiation, with male gamers being exposed to the positive and negative effects of video gaming at an earlier age. Second, gaming motivations differ by gender, suggesting that male and female gamers have distinct reasons for engaging in video games. Consequently, they may not gravitate toward the same types of games (Lange et al., 2021; López-Fernández et al., 2020; Bopp et al., 2022). Third, this difference in video gaming preferences leads to varied exposure to toxic communities. Women may avoid certain video games that involve female objectification or communities where they are likely to encounter sexism or harassment due to high toxicity levels (Belskie et al., 2023). While this avoidance highlights the persistence of gender stereotypes in video gaming, it can also have positive outcomes. It promotes healthier video gaming habits among female players, characterized by a later onset of gaming, more creative motivations, and participation in less toxic communities.

Finally, the predictor variables associated with male gamers, such as higher scores in violent gratification and community toxicity, have a positive link with the development of problematic gaming behavior. By contrast, the predictor variables associated with female gamers demonstrate an inverse relationship (López-Fernández et al., 2019; Kim et al., 2016).

Limitations and future directions

Several limitations should be considered. First, voluntary participation may have introduced sampling bias, as individuals with greater access to digital devices or a stronger interest in gaming topics may have been more likely to complete the questionnaire. Second, the sample comprises university students only and followed a convenience sampling method, which may restrict the generalizability of the results. Third, the cross-sectional nature of the study limits the ability to establish causal

relationships between gender, gaming habits, motivations, and perceived toxicity. Fourth, the analytical model did not account for additional variables that could influence gaming behavior, such as personality or psychological characteristics. Finally, self-report instruments may introduce potential biases, such as social desirability effects.

Future research should aim to include more diverse samples of young adults. Cross-cultural research would also be valuable in examining whether these patterns vary across different countries. Furthermore, generating measurement tools designed to assess gaming-related constructs, such as the perceived toxicity of gaming communities, would be necessary to evaluate new gaming phenomena.

Practical implications

Understanding the disparities between male and female gamers is crucial for gaining insights into university gaming trends. The findings, which highlight gender differences, stress the importance of reducing gender stereotypes and fostering healthier gaming communities to promote more equitable gaming experiences. This perspective also underscores the need for more inclusive and safe game designs.

Addressing the toxicity in gaming communities is also essential, as it can have severe psychological effects. Specific actions must be taken from both educational and familial perspectives. Schools and communities should implement educational programs that promote gender equity in gaming spaces. While video game design is becoming more inclusive, the gaming community must also embrace these initiatives.

Regarding clinical implications, some gender-specific characteristics may be more linked to problematic gaming. This notion highlights the importance of developing tailored prevention programs that address the unique challenges faced by individuals with diverse gender identities in the context of gaming-related disorders. Such targeted

interventions could lead to more effective, personalized strategies for mitigating the risks of excessive gaming behaviors.

Conclusions

This study provides new insights into gender differences in gaming behaviors within a Mexican university sample. The findings revealed gender differences in several gaming characteristics, motivations, and perceived community toxicity. The discriminant analysis identified key predictors that differentiate male and female gamers, such as age of gaming onset, violent gratification, competition, weekly gaming hours, and perceived community toxicity. These results emphasize the importance of examining gender-related dynamics in gaming within specific cultural and demographic contexts to better understand the factors underlying these differences. Overall, the findings point to the relevance of promoting more inclusive gaming environments through both game design and community initiatives. Addressing these issues is particularly important for supporting players' well-being and contributing to the development of a more positive and inclusive gaming culture.

Study 7. Psychosocial factors linked to online gaming: Differences between current gamers, non-current gamers and non-gamers

Gisbert-Pérez, J., Cejalvo, E., Martí-Vilar, M., & Badenes-Ribera, L. (2025). Psychosocial Factors Linked to Online Gaming: Differences Between Current Gamers, Non-current Gamers and Non-gamers. *Psychological Reports*, 332941251351231. <https://doi.org/10.1177/00332941251351231>

Abstract

The rise of gaming and gaming-related problems has led to an interest in finding differences between gamers and non-gamers. The present study investigates whether there are differences in psychological variables (prosociality, emotional intelligence, social support, and mental health) between current gamers, non-current gamers, and non-gamers. For this purpose, a quantitative study was conducted with a convenience sample of Spanish university students ($N = 798$, $\text{Mean}_{\text{age}} = 21.48$, $\text{SD}_{\text{age}} = 5.01$). Oneway ANOVAs and MANOVAs were performed to compare the psychological variables between the three groups. Additionally, a binomial logistic regression was conducted with statistically significant variables to identify the most relevant predictors of gaming onset. Results indicated statistically significant differences in sex, prosociality, the appraisal of others' emotions component of emotional intelligence, general social support, and family social support between the three groups. The results of the binomial logistic regression indicated that male sex and having lower levels of prosociality were associated with a higher probability of gaming. These results may imply that there are baseline differences in those who start gaming. Addressing these differences may be key in the prevention of gaming disorder.

Keywords: Gaming, differences, prosociality, emotional intelligence, social support

Introduction

Gaming is a popular and rapidly growing leisure activity, mainly among young ages. In 2016, one billion gamers were reached; by 2024, this figure will triple, reaching 3.09 billion gamers worldwide (Georgiev, 2024). Thus, current gamers account for almost half of the current world population. This growth has led to academic interest in exploring the influence of psychological variables associated with gaming behavior.

To begin with, what is gaming? Gaming is characterized by interactive elements, skill-based gameplay and contextual progress indicators (King et al., 2015). Engagement in gaming is generally viewed as an activity that provides personal benefits, such as enjoyment, achievement, and a sense of belonging (Billieux et al., 2019). However, a portion of gamers may develop pathological behaviors. Pathological gaming is characterized by excessive time spent playing video games and difficulty in disengaging from gaming, leading to functional impairment due to excessive gaming (Coyne et al., 2020). This dysfunction exists on a continuum, with varying levels of impairment in crucial areas of an individual's life. At the more dysfunctional end of the spectrum is Internet Gaming Disorder, which is included in the DSM-V-TR (APA; 2022) as a potential disorder that requires further study.

There are multiple approaches to the concept of gamer. The term “gamer” can be used to designate people who play video games and to designate people with gamer identity. Gamer identity is a social construct that includes elements such as knowledge about videogames and their related contents (gaming capital; Consalvo, 2007), performance, and characteristics and types of gaming consumption established as typical of gamers (e.g., being male and adolescent; Shaw, 2013). Within the typical characteristics of gamers, there are negative connotations that may lead people not to identify themselves as gamers and even not to play video games (Shaw, 2012). Therefore,

in academic studies, gamers are usually considered to be those people who currently consume video games, that is, those who count as gamers (Alsaad et al., 2022; Macur & Pontes, 2021). For this reason, it is important to differentiate between counting as a gamer and identifying oneself as a gamer.

Several studies have explored the differences in mental health between gamers and non-gamers, yielding mixed results. The relationship between gaming and mental health is complex, with no clear link between gaming and anxiety or depression. Kowal et al. (2021) found that playing commercial video games reduced symptoms of depression and anxiety. Similarly, Allaire et al. (2013) reported that adult gamers exhibited lower levels of depression and higher well-being compared with coetaneous non-gamers. However, when examining mental health and maladaptive gaming behaviors, Chung et al. (2020) reported that problematic gamers exhibited significantly higher scores of depression and anxiety compared to casual gamers and non-gamers, with non-gamers showing the lowest levels of these mental health issues. Gaming disorder in adolescents and young adults may be associated with elevated depression and anxiety scores (Wang et al., 2017, 2019; Wartberg et al., 2017a). Consequently, mental health seems to be a concern in gaming, particularly in cases involving problematic gaming behavior.

Another variable related to video games has been social support. Traditionally, there was an image of gamers as isolated people without friends outside the virtual world (PaaBen et al., 2017). However, video games also present an opportunity to generate new social ties online. Frederick and Zhang (2021) analyzed the online and offline social relationships of college gamers. They concluded that the quality of their online relationships was significantly higher than offline ones, contrary to the non-gamer population. However, in the general young adult population, the quality of offline friendships was significantly higher. Yoo (2024) found that social support was a factor

that was inversely related to gaming time. Likewise, Boson et al. (2024) found similar results regarding emotional closeness with parents and hours of gaming. Social support has also been linked to excessive gaming (Wartberg et al., 2017b), relating greater social interaction with less gaming time. In summary, while social support is reduced in cases of problem gaming, it has not been clearly associated with video game consumption.

Other relevant psychological variables in the study of video games are prosociality and emotional intelligence. Several reviews and meta-analyses indicated that these variables could be protective for the development of gaming disorder since this clinical population presents lower scores than the general population (Esparza-Reig et al., 2021; Gisbert-Pérez et al., 2024). Given the increasing percentage of problematic gaming in adolescents and adults (8.8% and 10.4%, respectively, Gao et al., 2022), there is a need to examine whether gamers are enrolled in this activity because they present different scores from the onset or whether these scores get reduced when this activity becomes a habit or problematic behavior. The growing concern about gaming disorder and the still prevalent stereotypes related to gaming highlight the importance of analyzing whether there are root differences between those who play and those who do not.

Aim of the Study

This study aimed to explore factors associated with gaming in a sample of Spanish university young adults. Specifically, this study was focused on prosocial behavior, mental health, perceived social support, and emotional intelligence due to their relationship with the development of gaming disorder. The sample was divided into three groups based on current or non-current gaming (current gamers, non-current gamers, and non-gamers) to examine whether associations were maintained even when gaming ceases. Based on the previous literature, the hypotheses were:

H1. There are more male gamers than female gamers.

H2. People who engage in gaming have lower levels of prosociality.

H3. There are differences in mental health between current gamers, non-current gamers, and non-gamers.

H4. There are differences in social support between current gamers, non-current gamers, and non-gamers.

H5. People who engage in gaming have lower levels of emotional intelligence.

Material and Methods

Sample and Procedure

A cross-sectional research design was applied using an online survey. The online survey was distributed through university classrooms, and students provided informed consent prior to data collection. The research was conducted according to the declaration of Helsinki of 1964 and its later amendments or comparable ethical standards, and the approbation of the Institutional Review Board (protocol no. 2023-MAG-2988759) of the University of Valencia was obtained.

The sample comprised the university community. Inclusion criteria were defined as follows: individuals had to be Spanish-speaking university students aged at least 18 years. No exclusion criteria were applied. In total, 798 participants were recruited.

Measures

Sociodemographic variables (sex, age) and current video gaming were asked (“*Do you currently play video games?*” with response options “*Yes,*” “*No, but used to,*” and “*No*”).

Prosocialness Scale for adults (PBS; Caprara et al., 2005; Spanish version of Rodriguez et al., 2017). This instrument assesses individual tendencies to perform a series of prosocial behaviors in four areas: sharing, helping, caretaking, and feeling empathy for other needs and requirements (Badenes Ribera et al., 2023). This scale consists of 16 items that give a total score of prosocial behavior. Responses are given using a five-point Likert scale, ranging from *(1) never/almost never* to *(5) always/almost always*. Higher scores indicate a higher presence of prosocial behaviors. In the present study, total PBS score had a Cronbach's alpha and a McDonald's omega of .916.

GHQ-12 (Goldberg & Williams, 1988; Spanish version of Brabete, 2014). This instrument measures general mental health through 12 items describing mood states, six of which are positive and six of which are negatively worded. Responses were given using a 4-point Likert scale, ranging from *(0) never* to *(3) always*, and the scoring method used was bimodal (0-0-1-1). The total scores ranged from 0 to 12. Higher scores in GHQ-12 indicated higher general mental health. In the present study, the total GHQ-12 score had a Cronbach's alpha of .792 and a McDonald's omega of .779.

Wong Law Emotional Intelligence Scale (WLEIS-S, Wong & Law, 2002; Spanish version of Pacheco et al., 2019). In this instrument, emotional intelligence (EI) is conceptualized based on Mayer and Salovey's (1997) definition, that is, as a set of interrelated skills related to "the ability to accurately perceive, appraise, and express emotion; the ability to access and/or generate feelings when they facilitate thinking; the ability to understand emotion and emotional knowledge; and the ability to regulate emotions to promote emotional and intellectual growth". This scale consists of 16 items that assess four aspects of EI: appraisal of one's own emotions (SEA), appraisal of others' emotions (OEA), use of emotion (UOE), and regulation of emotion (ROE). Responses are given using a seven-point Likert scale, ranging from *(1) totally disagree* to *(7) totally*

agree. Higher scores indicate higher emotional intelligence ability. In the present study, the total WLEIS score had a Cronbach's alpha of .893 and a McDonald's omega of .889. SEA subscale had a Cronbach's alpha of .827 and a McDonald's omega of .832, OEA subscale had a Cronbach's alpha of .814 and a McDonald's omega of .820, UOE subscale had a Cronbach's alpha of .796 and a McDonald's omega of .804, and ROE subscale has a Cronbach's alpha of .836 and a McDonald's omega of .835.

The Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988; Spanish version of Santos-Vega et al., 2021). The scale comprises 12 items that measure three dimensions of perceived social support: (1) support from significant others, (2) family support, and (3) peer support. The items have a four-point Likert-type response scale ranging from *(1) never or almost never* to *(4) always or almost always*. Higher scores indicate higher perceived social support. In the present study, the total MSPSS score had a Cronbach's alpha of .884 and a McDonald's omega of .847. Support from significant others dimension had a Cronbach's alpha of .971 and a McDonald's omega of .971, Family support dimension had a Cronbach's alpha of .920 and a McDonald's omega of .923, and Peer support had a Cronbach's alpha of .922 and a McDonald's omega of .922.

Statistical Analysis

Data were double-checked for accuracy. Before conducting the analyses, three groups were formed: 'non-gamers', 'non-current gamers', and 'current gamers'. IBM SPSS Statistics 28 was used for the statistical analyses. The univariate skewness and kurtosis values for all the variables analyzed were within the conventional normality criteria (-3 to 3 for skewness and -10 to 10 for kurtosis), per the guidelines Kline recommended (2015). Given that missing values were $<1\%$ for each of the variables, they are not

considered to cause bias in the estimates (Graham, 2009). Therefore, no adjustments were made to the scores for the variables measured in this study.

Descriptive statistics were computed for sociodemographic characteristics in the overall sample and the three groups. Pearson's chi-square tests and Cramer's V were performed to analyze sex differences between groups. Cramer's V was used as an effect size measure. Means and standard deviation were used for continuous variables and frequencies and percentages for categorical variables.

Differences between groups of participants in terms of prosocial behavior, mental health, perceived social support, and overall emotional intelligence were examined using a One-Way Analysis of Variance (ANOVA), while a Multivariate Analysis of Variance (MANOVA) was conducted for the emotional intelligence components. In these analyses, partial eta square was used as effect size measure (η^2). Pillai's Trace and Wilks' Lambda were used to determine if there are significant differences in MANOVA, depending on whether the assumption of normality was met. For pairwise comparisons, Bonferroni and Games-Howell post hoc tests were used.

Finally, a forward stepwise binary logistic regression analysis (Silva & Barroso, 2004) was performed to predict differences between people who engage in gaming and those who do not. The variables identified as statistically significant between groups by ANOVA and MANOVA results were included as independent variables. Sex was also included since it has also been linked to the practice of gaming. To analyze the fit of the logistic regression model, different tests were used (Hahs-Vaughn & Lomax, 2020): (1) for the overall model fit we used the χ^2 test for statistical significance of the model using the change in deviance ($-2LL$); (2) for the goodness of fit of the model we used the Hosmer-Lemeshow test, and the substantive significance of the model or pseudovariance explained using Nagelkerke's R^2 index; (3) to analyze the predictive ability of the model

we used the correct classifications made by the model (i.e., measures of accuracy, sensitivity and specificity), and (4) the comparison of the accuracy of the null model and the final model using the Z statistic (Pardo & Ruiz, 2012). To determine whether the regression coefficients of the independent variables were statistically significantly different from 0, the Wald statistic was used. In addition, the Odds Ratio (OR) index and its 95% confidence interval were estimated as a measure of the effect size, which tests the hypothesis that the effect of the independent variable at the population level is different from the null effect ($OR = 1$). We conducted a prior power analysis with a sample-size calculator for regression using an algorithm by Westland (Soper, 2024). With a conservative effect size of 0.02 and 9 estimated predictors, a minimum sample size of 788 participants is recommended with a statistical power of 0.80.

Results

Comparison of Sociodemographic Characteristics Between Groups

Participants' socio-demographic characteristics by group are included in Table 1. Age of participants across groups did not differ significantly ($F = .498, p = .608, \eta^2 = .001$). Furthermore, sex significantly differed across the three groups ($\chi^2 = 134.809, p < .001, \text{Cramer's } V = .412$). Females predominated in the non-gamer and non-current gamer group (92.3% and 65.4%, respectively), while males in the current gamer group (62.9%).

Table 1

Demographics of the Three Groups of Participants

	Non-gamers	Non-current Gamers	Current Gamers	Total
N	286	237	275	798
Female (%)	92.3%	65.4%	37.1%	65.3%
Mean age (<i>SD</i>)	21.25 (6.10)	21.58 (5.44)	21.64 (2.92)	21.48 (5.01)

Note. *SD* = Standard Deviation.

Differences in Study Variables Between Groups

Differences in Prosociality Between Gaming Groups

Statistically significant differences were found between the three groups on prosociality ($F = 15.848, p < .001, \eta^2 = .038$). Previously, the homogeneity of variances was tested with Levene's statistic ($F [2792] = .492, p = .612$). Bonferroni post hoc tests indicated statistically significant differences between current gamers and non-gamers ($M_{CG} = 62.82, SD_{CG} = 9.50; M_{NG} = 67.00, SD_{NG} = 9.10; p < .001$), and non-gamers and non-current gamers ($M_{NCG} = 63.69, SD_{NCG} = 9.09; p < .001$).

Differences in Mental Health Between Gaming Groups

Non-statistically significant differences were found between the three groups on general mental health ($F = .144, p = .866, \eta^2 = .000$).

Differences in Emotional Intelligence Between Gaming Groups

Non-statistically significant differences were found between the three groups in general emotional behavior ($F = 1.238, p < .290, \eta^2 = .003$). A MANOVA 3 (gaming groups) $\times$ 4 (emotional intelligence components) was performed to estimate whether there are differences in emotional intelligence components between non-gamers, non-current gamers, and current gamers. Previously, we examined the assumption of homogeneity of variances using Levene's test (SEA $F [3793] = .016, p = .984$); OEA $F [3793] = 10.651, p < .001$); UOE $F [3793] = 2.063, p = .128$); ROE $F [3793] = 1.163, p = .313$). The assumption of homogeneity of covariance was tested using Box's M test ($56.65, F = 2.81, p < .001$).

Using Pillai's trace, there was a statistically significant difference in emotional intelligence components between groups ($V = 0.33, F [8,1582] = 3.34, p < .001$).

Statistically significant differences were found in the appraisal of others' emotions (OEA $F [2791] = 7.226, p < .001, \eta^2 = .018$). Post hoc tests showed differences in the appraisal of others' emotions between non-gamers and non-current gamers ($M_{NG} = 22.58, SD_{NG} = 3.12; M_{NCG} = 21.98, SD_{NCG} = 3.33; p = .006$), and non-gamers and current gamers ($M_{CG} = 21.77, SD_{CG} = 4.21; p = .002$).

Differences in Social Support Between Gaming Groups

Marginally significant differences were found between the three groups in perceived social support ($F = 2.873, p = .057, \eta^2 = .007$). Homogeneity of variance was tested with Levene's statistic ($F [2792] = .240, p = .787$). A MANOVA 3 (gaming groups) $\times$ 3 (social support components) was performed to estimate whether there are differences in total perceived social support and its components between non-gamers, non-current gamers, and current gamers. The assumption of homogeneity of variances was tested using Levene's test (Family $F [2792] = 1.494, p = .234$; Friends $F [2792] = .958, p = .384$; Other significant $F [2792] = 1.729, p = .178$). The assumption of homogeneity of covariance was tested using Box's M test (14.307, $F = 1.186, p = .286$).

Using Wilks Lambda, there was a statistically significant difference in perceived social support components between groups ($V = .977, F [6,1582] = 3.017, p = .006$). Separate univariate ANOVAs on the outcome variables revealed statistically significant differences in family social support (Family $F [2792] = 7.961, p < .001, \eta^2 = .020$). Post hoc tests showed differences in perceived family social support between current gamers and non-current gamers ($M_{CG} = 12.07, SD_{CG} = 3.65; M_{NCG} = 13.06, SD_{NCG} = 3.33; p < .001$), and non-gamers and current gamers ($M_{NG} = 13.15, SD_{NG} = 3.44; p = .004$).

Predictor Variables of Gaming Initiation

A binomial logistic regression analysis was performed since statistically significant differences were found between the non-gamers group and the other groups (non-current gamers and current gamers; Table 2). Sex was included as an independent variable in the regression model. For the first step of the regression analysis, sex (model 1) was selected; its incorporation in the model entailed a statistically significant reduction in the misfit of the null model ($\chi^2(1) = 158.51, p < .001$). In the second and final step, the variable prosociality (model 2) was selected and led to a statistically significant reduction in misfit concerning model 1 ($\chi^2(2) = 165.19, p < .001$). These improvements in model fit were also seen in the increase in the pseudovariance statistics explained by the models (R^2) and in the accuracy of the models (total percentage of cases correctly classified in each model). This better fit was verified by Hosmer and Lemeshow's test, which was not statistically significant ($\chi^2(8) = 8.925, p = .349$). The Nagelkerke R^2 coefficient indicated that approximately 26% of the variability in the probability of being or having been a gamer is explained by the independent variables included in the model.

Table 2

Measures of Global Adjustment and Results of the Final Binary Logistic Regression Model for Predicting Gaming Initiation (N = 798)

	-2LL	χ^2	df	R ² Cox y Snell	R ² Nagelkerke	Accuracy		
Final model	871.73	165.19**	2	.188	.258	67.3		
	β	SE	df	Wald	p	OR	95% CI for OR	
							LL	UL
Male sex	2.438	.262	1	86.337	< .001	11.455	6.85	19.16
Prosociality	-.024	.009	1	6.547	.011	0.976	0.958	0.994
Intercept	1.621	.634	1	6.536	.011	5.056		

Note. Final Model (Model 2) = $\text{logit}(\text{Gamers} = 1) = \beta_0 + \beta_1\text{Male sex} + \beta_2\text{Prosociality} + \varepsilon$. β = regression coefficient. *SE* = Standard Error. *df* = degrees of freedom of Wald test. *p* = probability value associated with the Wald test. *OR* = Odds Ratio. 95% CI = 95% Confidence Interval for *OR*. LL = Lower limit. UL = Upper limit

In addition, in the matrix of case classifications according to the observed value and the predicted value of the final model (model 2), it is observed that the final model presented an adequate predictive capacity in terms of sensitivity (77.3%), but not in terms of specificity (49.7%). Thus, people who were or are gamers were better classified (sensitivity) than the people who were not (specificity).

Final model equation was: $\text{logit} (\text{Gameplaying} = 1) = 1.621 + -.025 (\text{Prosociality}) + 2.44 (\text{Male Sex})$. The final model basically indicated that being male and having lower levels of prosociality characterized the profile of individuals who started playing video games. Furthermore, sex had a greater influence on gameplaying ($OR = 11.455$) than prosociality ($OR = 0.976$). Regarding the male sex variable and once the influence of the covariate prosociality on the probability of being/having been a gamer has been controlled, its regression coefficient ($\beta = 2.44$) and its odds ratio ($OR = 11.45$, 95% CI: 6.85, 19.16) indicate that males are 11.45 times more likely to be gamers compared to females. Regarding the variable prosociality, controlling for the influence of the covariate male sex, its regression coefficient ($\beta = -.025$) and its odds ratio ($OR = 0.975$, 95% CI: 0.958, 0.994) indicate that for each unit increase in prosociality, the odds of being a gamer are reduced by 2.5%.

Discussion

Video game playing is a growing habit among adolescents and young adults. However, the prevalence of problems associated with gaming is also growing. Studying variables in general gaming, that are also related to gaming disorder, may facilitate the prevention of gaming disorder. Study hypotheses H1, H2 and H4 were fully supported, H5 was partially supported and H3 was not supported.

Regarding H1, males predominated in the group of current gamers, while females predominated in the group of non-current gamers and non-gamers. These findings are consistent with gaming from a male-centric culture, as men have traditionally developed video games for a male audience (Lopez-Fernandez et al., 2019). However, these results contradict the fact that girls and women now play digital games at almost the same rate as boys and men (Melzer, 2018; PaaBen et al., 2017). The differences found could be due to an overrepresentation of competitive video game players, which represent a more male audience, as well as communities with higher gender stereotypes (Lange et al., 2021). It should be noted, however, that while gender stereotypes in video games are often accurate, actual sex differences tend to be overestimated.

Regarding H2, statistically significant differences were found between current gamers and non-gamers and non-current gamers and non-gamers. However, the longitudinal study by Lobel et al. (2017) indicated that gaming per se was not related to a change in the level of prosocial behavior of pre-adolescent child gamers. These results may indicate that individuals who have started playing video games have lower levels of prosociality than non-gamers, or that having played negatively impacts an individual's prosociality in later stages, such as early adulthood. The second possible explanation could be based on the General Learning Model, which predicts that video games can evoke short- and long-term effects through associations triggered by the content of a game

(Buckley & Anderson, 2006). However, only those who play violent video games (Greitemeyer & Mügge, 2014), high-frequency competitive games (Lobel et al., 2017), and problematic gaming (Lemmens et al., 2015; Tomei et al., 2021) have been examined for reduced prosocial behavior, although some studies reported no relationship (Groves et al., 2015). The differences found in this study suggest a lower tendency for prosociality in those who have played or play video games, which opens new avenues for further research.

Regarding H3, no differences were found between the three groups. These results are in line with the idea that video game consumption itself is not a recreational habit linked to mental health problems, even though comorbidity with gaming disorder has been found (Richard et al., 2020). These similar results in the three groups may be due to several reasons. First, video games as a recreational activity facilitate recovery and contribute to mental health (Rieger et al., 2014). Second, there is a non-gamer population with lower mental health scores, which in turn does not encourage interest in playing video games and omits the potential benefit and enjoyment of this activity (Braun et al., 2015). Third, within the gamer groups, there is also a sector with low mental health scores, which are more associated with problematically inclined gaming (Wang et al., 2017, 2019). All this variability may indicate that no differences were found between groups.

Regarding H4, marginally significant differences were found between the groups. When examining its components, only differences in perceived family support were found between current and non-current gamers, and between non-gamers and current gamers. These findings are similar to those reported by Yoo (2024) with peer social support, who classified gamers according to their pattern of video game use over 5 years. This study found that the group with the highest peer social support scores were those

gamers who had high initial hours of play and a subsequent decline in hours of gaming, compared to those with the reverse pattern (low initial hours and increasing over the years) and those who maintained high hours of gaming over the years. Similarly, the variable of family social support has been explored in groups of high-risk gamers, finding a negative relationship between general social support (von der Heiden et al., 2019) and family social support (Shan et al., 2023; Wang et al., 2023). These findings suggest that, in general, gaming behavior is related to variables that are also associated with gaming disorder. It is, therefore, necessary to explore the causes of these similarities to prevent problematic behavior.

Regarding H5, non-statistically significant differences between groups have been found regarding general emotional intelligence. However, when exploring the components of emotional intelligence, differences were found in the appraisal of others' emotional dimensions between the non-gamers and non-current gamers and non-gamers and current gamers groups. These results are in line with those found in the variable prosocial behavior, as the individual pays attention to whether others need help, which implies the perception and evaluation of EI's ability to perceive and express emotionally about others' environment and others' emotions (Wang et al., 2021). Thus, lower levels of the ability to understand others' emotionality are related to lower levels of prosocial behavior.

Finally, the binomial regression results indicated differences between the general group of gamers and non-gamers on sex and prosocial behavior. Thus, it highlights the importance of two relevant factors in gaming, male sex and levels of prosocial behavior. These results may indicate that people with lower levels of prosocial behavior are more likely to start or maintain gaming habits. These findings contrast with previous literature (Teng, 2008), as no differences were found between gamers and non-gamers on

personality variables associated with prosociality, such as agreeableness (Hilbig et al., 2014). However, the review and meta-analysis by Akbari et al. (2021) found a small negative association between gaming and levels of agreeableness ($r = -.19$, 95CI $-.25$ to $-.12$).

It is important to highlight that prosociality has been identified as a protective factor against addictions. Specifically, regarding Internet addiction, Kasap et al. (2023) reported a negative association between Internet addiction and prosocial behavior. A systematic review by Esparza-Reig et al. (2021) pointed out that some studies suggest that prosocial behavior serves as a protective factor against gambling addiction, while others indicate that addiction can lead to prosocial behavior deficits. Additionally, the meta-analysis of Memmott-Elison et al. (2020) showed similar findings in the relationship between prosocial behavior and both externalizing and internalizing symptoms. They concluded that higher levels of prosocial behavior are associated with lower levels of these symptoms, which include risky behavior and substance use. Given the relevance of prosociality as a protective factor for different addictions, it is important to promote prosocial behaviors from these and previous life stages to reduce the likelihood of developing a pathology associated with gaming.

Limitations and Future Directions

This study has several limitations. Firstly, it is a cross-sectional study, so it lacks an experimental design that enables the establishment of causal relationships. Other potential limitations are the inability to collect data at multiple levels and the use of a national sample, limiting the generability of results. Likewise, the lack of considering differences in the number of hours of gaming among current gamers or not having previously asked whether the participants had psychopathological diagnoses may have been a source of bias in the study. Lastly, other potential limitations may be related to the self-reported

nature of the study. Future research may benefit from studies with similar variables but using a longitudinal design and collecting transcultural data at multiple levels.

Practical Implications

Among the practical implications of this study, two key aspects stand out. On the one hand, knowing what variables are related to gaming provides a baseline for understanding the generic particularities of this population. If the gamer population tends to have lower levels of prosociality compared to the non-gamer population, the gaming industry could generate video games that foster these abilities. On the other hand, this type of study can benefit social and health professionals by learning about possible characteristics of gamers and thus anticipating and facilitating preventive strategies for problem gaming adapted to the characteristics of the population.

Conclusion

The present study examines differences in sociodemographic and psychological variables between current gamers, non-current gamers, and non-gamers. The results indicate statistically significant differences in sex, prosociality, the appraisal of others' emotions component of emotional intelligence, general social support, and family social support between the three groups. When analyzing the relationship between being/having been a gamer and not being a gamer, differences were found in sex and prosociality, indicating that male sex and having lower levels of prosociality are associated with a higher probability of having started gaming.

Study 8. Exploring psychosocial traits across Italian current gamers, non-current gamers, and non-gamers

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Abstract

The increasing prevalence of gaming and the problems associated with it have sparked interest in examining the differences between gamers and non-gamers. This study aims to investigate whether psychological variables, such as prosociality, emotional intelligence, social support, and mental health, differ among current gamers, non-current gamers, and non-gamers. A quantitative study was conducted using a convenience sample of Italian university students ($N = 717$, $Mean_{age} = 22.15$, $SD_{age} = 3.49$; 49.4% female). One-way analyses of variance (ANOVAs) and multivariate analyses of variance (MANOVAs) were employed to compare the three groups. In addition, two binomial logistic regressions were conducted using statistically significant variables to identify the most important predictors of gaming initiation and gaming maintenance. Results indicate that males, particularly older males, and those exhibiting lower levels of prosociality were more likely to initiate gaming. Furthermore, being male, older, and having greater ability to assess one's own emotions were associated with a higher likelihood of maintaining gaming behavior.

Keywords: Gaming; addiction; emotional intelligence; prosociality; university students.

Introduction

Gaming is a popular leisure activity enjoyed by people of all ages. Video games provide interactive experiences that immerse players in virtual environments, featuring a variety of genres and objectives (Jenkins, 2009). Furthermore, gaming serves as an effective means of stress relief, relaxation, and social interaction (Stockdale & Coyne, 2018). With its growing influence, the number of gamers is expected to exceed 3 billion by 2024 (Georgiev, 2024). This surge in popularity has also prompted academic interest in examining the psychosocial factors associated with gaming, particularly in areas such as education and well-being.

There are primarily two ways to conceptualize what it means to be a gamer. From an objective standpoint, the term gamer refers to individuals who play video games (Alsaad et al., 2022; Macur & Pontes, 2021), which is the most commonly used approach in academic contexts. However, from a subjective perspective, being a gamer is more about identity. Gamer identity focuses on the social construction of the gamer, including attachment to specific types of gaming, performance, and knowledge (Shaw, 2013). This perspective highlights that many people who play video games do not consider themselves gamers because they do not feel represented by these characteristics.

Video games have traditionally been associated with both benefits and harms, including conditions such as gaming disorder (American Psychiatric Association, 2022; Sublette & Mullan, 2012). Previous literature has highlighted controversial relationships with gaming, especially regarding the influence of variables such as age and sex (Buono et al., 2020), prosocial behavior (Greitemeyer, 2022), emotional intelligence (Villani et al., 2018), social support (Lobel et al., 2017), and mental health (Sauter et al., 2021).

Gaming is traditionally associated with male children and adolescents. However, recent statistics suggest that young adults are increasingly engaging in gaming (Entertainment Software Association, 2018). In this context, the prevalence of internet gaming disorder (IGD) is rising among adolescents and adults (8.8–10.4%; Gao et al., 2022). Within this age group, university students are an at-risk population for developing IGD (Ohayon & Roberts, 2021). In a sample of 221 Italian university students, it was estimated that approximately 85% of the students were at risk for IGD, and 15% met the criteria for a diagnosis of IGD (De Pasquale et al., 2018). According to previous studies, the prevalence of IGD in university students from different countries ranged from 3.8% to 11% (Chiang et al., 2021; Ohayon & Roberts, 2021). The variability found across studies emphasizes the need for country-specific research to ensure accuracy.

Sex also plays a significant role in gaming. The gaming industry has historically catered to a predominantly male audience, generating content that often reflects this bias (Lopez-Fernandez et al., 2019). Female characters are frequently portrayed in an objectified manner, contributing to a misogynistic environment (Lopez-Fernandez et al., 2019). Despite this, female gamers account for an estimated 45% of the gaming community (Entertainment Software Association, 2018). In summary, the gaming industry is becoming more inclusive. This highlights the need to explore potential sociodemographic differences between individuals who do not play games, those who begin but then stop, and those who continue gaming regularly.

Two systematic reviews and meta-analyses suggest that prosocial behavior and emotional intelligence could act as protective factors against the development of gaming-related problems (Esparza-Reig et al., 2021; Gisbert-Pérez et al., 2024). Prosocial behavior has mostly been examined in relation to prosocial video games, assessing whether these games promote prosocial actions (Greitemeyer, 2022; Greitemeyer &

Osswald, 2010). Emotional intelligence has been reported as a factor negatively associated with IGD; individuals with lower emotional intelligence are more likely to experience psychological issues, which can contribute to problematic gaming (Kircaburun et al., 2020). However, the relationship between the recreational consumption of commercial video games and these two variables is less understood.

There are two perspectives on the relationship between gaming and perceived social support. Video games provide opportunities for virtual social connections. Research indicates that virtual friends within the gaming community often have higher quality interactions than offline friendships, highlighting the social potential of video games (Frederick & Zhang, 2022). Nevertheless, problematic gaming has also been linked to a lack of social support and skills (Paaßen et al., 2017). In this regard, studies have shown that the number of hours spent gaming is negatively correlated with perceived general and family social support (Wartberg et al., 2017).

Considering the increasing problems associated with gaming, another relevant variable in the study of gaming is mental health. In terms of depression and anxiety, video games appear to be a positive means of reducing symptoms (Allaire et al., 2013; Kowal et al., 2021). However, other studies have indicated higher levels of depression and anxiety in gamers compared to non-gamers, although this association is more pronounced in problematic gaming (Chung et al., 2020; J. L. Wang et al., 2019; Wartberg et al., 2017). Thus, though there is evidence of a positive relationship between mental health and gaming, this relationship can shift to a negative one when unhealthy gaming patterns develop (C. Wang et al., 2017). Investigating whether this shift occurs during the initiation or maintenance of gaming could provide valuable insights into the evolving relationship between gaming and mental health.

The increasing prevalence of gaming disorder and the controversial results of studies on variables associated with gaming underscore the importance of analyzing which variables are associated with the initiation and maintenance of gaming behavior in university students.

Aim of the Study

The aim of this study was to investigate the factors associated with the initiation and maintenance of gaming among Italian university students. In particular, it focuses on prosocial behavior, mental health, perceived social support, and emotional intelligence. In line with the aforementioned literature, these variables were selected because they have been differentially linked to gaming and gaming disorder to assess whether differences emerge at the onset of gaming or during its maintenance.

Methods

Sample and Procedure

A cross-sectional study was conducted through the administration of an online survey. The survey was distributed in university classrooms, and informed consent was obtained from all participants prior to data collection. The study was conducted in accordance with the ethical principles outlined in the 1964 Declaration of Helsinki and its subsequent amendments, as well as with comparable ethical standards. Ethical approval was granted by the Institutional Review Board of the University of Turin (Protocol No. 0592473).

The target population consisted of university students. Inclusion criteria specified that participants be Italian-speaking university students aged 18 years or older. A total of 717 participants were recruited. The mean age of the sample was 22.15 years ($SD = 3.49$), and 49.4% ($n = 354$) of the participants identified as female. Participants were categorized

into three groups based on their gaming status: current gamers, non-current gamers, and non-gamers. This categorization enabled an examination of whether associations with psychological variables persist following the cessation of gaming activity.

Measures

Demographic variables such as sex, age, age of gaming onset, and current gaming status were recorded. Current gaming behavior was assessed with the question “Do you currently play video games?,” with the following response options: “Yes,” “No, but used to,” and “No.”

The Adult Prosocialness Behavior Scale (APBS; original Italian version of Caprara et al., 2005) was used to assess individuals’ propensity to engage in prosocial behaviors. The scale evaluates four specific dimensions: sharing, helping, caretaking, and empathizing with others’ needs (Badenes-Ribera et al., 2023). It consists of 16 items rated on a 5-point Likert scale, from 1 (never/almost never) to 5 (always/almost always). Higher values indicate a stronger presence of prosocial behavior. In the present study, Cronbach’s alpha was .933, and McDonald’s omega was .932.

The General Health Questionnaire–12 (Goldberg & Williams, 1988; Italian validation of Politi et al., 1994) was used to assess general mental health. The scale consists of 12 items describing various mood states, rated on a 4-point Likert scale, from 0 (never) to 3 (always). Higher scores on the General Health Questionnaire–12 indicate better general mental health. In the present study, Cronbach’s alpha was .848, and McDonald’s omega was .835.

The Wong Law Emotional Intelligence Scale (Wong & Law, 2002; Italian validation of Illiceto & Fino, 2017) was employed to assess emotional intelligence. Based on the definition of Mayer and Salovey (1997), this scale measures four dimensions:

appraisal of one's own emotions (SEA), appraisal of others' emotions (OEA), emotion awareness (EA), and emotion regulation (ER). This scale consists of 16 items rated on a 7-point Likert scale, from 1 (totally disagree) to 7 (totally agree). Higher scores indicate higher emotional intelligence. In the present study, the Cronbach's alpha was .927, and the McDonald's omega was .921 for the total scale. The SEA subscale had a Cronbach's alpha of .700 and a McDonald's omega of .699. The OEA subscale had a Cronbach's alpha of .718 and a McDonald's omega of .724. The EA subscale had a Cronbach's alpha of .659 and a McDonald's omega of .657. The ER subscale had a Cronbach's alpha of .744 and a McDonald's omega of .747.

The Multidimensional Scale of Perceived Social Support (Zimet et al., 1988; Italian validation of Di Fabio & Busoni, 2008) was used to assess perceived social support across three dimensions: family support (FS), peer support (PS), and support from significant others (OS). This scale comprises 12 items rated on a 4-point Likert-type response scale ranging from 1 (never or almost never) to 4 (always or almost always). Higher scores indicate higher perceived social support. In the present study, the Cronbach's alpha was .898, and the McDonald's omega was .876 for the total scale. The FS subscale had a Cronbach's alpha of .770 and a McDonald's omega of .641. The PS subscale had a Cronbach's alpha of .710 and a McDonald's omega of .698. The OS subscale had a Cronbach's alpha of .690 and a McDonald's omega of .699.

Statistical analysis

The data were double-checked for accuracy. Prior to analysis, participants were categorized into three groups: non-gamers (NGs), non-current gamers (NCGs), and current gamers (CGs). Univariate skewness and kurtosis values for all variables fell within conventional ranges for normality (-2 to 2 for skewness and -7 to 7 for kurtosis; George & Mallery, 2010; Hair et al., 2010). Missing values for each variable were below

1%, indicating that they are unlikely to bias the estimates (Graham, 2009). Therefore, no imputation procedures were applied.

Descriptive statistics were calculated for the sociodemographic characteristics of the overall sample and each of the three groups. Pearson's chi-square and Cramer's V tests were used to examine sex differences across groups, with Cramer's V serving as the effect size measure. Means and standard deviations are reported for continuous variables, and frequencies and percentages are used for categorical variables.

To assess group differences in prosocial behavior, mental health, perceived social support, and overall emotional intelligence, one-way analyses of variance (ANOVAs) were conducted. When the assumption of homogeneity of variances was violated, the Welch test was applied. A multivariate analysis of variance (MANOVA) was performed to examine differences across the dimensions of emotional intelligence. Partial eta squared was used as the effect size measure (η^2). Depending on the assumption of normality, either Pillai's trace or Wilks' lambda was used to evaluate MANOVA significance. Post hoc comparisons were conducted using Bonferroni and Games-Howell tests, depending on the equality of variances.

Finally, two stepwise binomial logistic regression analyses (Silva & Barroso, 2004) were conducted to examine which variables predicted the onset of gaming and the maintenance of gaming. Variables found to be statistically significant in the ANOVA and MANOVA were included as predictors, along with sex and age.

To assess the fit of the logistic regression model, several tests were performed (Hahs-Vaughn & Lomax, 2020): (a) the χ^2 test assessed the overall model fit based on changes in deviance ($-2LL$); (b) the Hosmer–Lemeshow test evaluated goodness of fit, and Cox–Snell R^2 and Nagelkerke's R^2 indices measured the proportion of variance

explained (pseudo R^2); (c) model classification performance was assessed in terms of accuracy, sensitivity, and specificity; and (d) the Z -statistic compared the predictive accuracy of the final model against the null model (Pardo & Ruiz, 2012). The Wald statistic was used to determine whether each regression coefficient differed significantly from zero. In addition, odds ratios (OR s) with 95% confidence intervals (CI s) were calculated as measures of effect size to test whether the effect of each independent variable significantly differed from the null effect ($OR = 1$).

All statistical analyses were conducted using IBM SPSS Statistics v28 (IBM Corp., 2021).

Results

Comparison of sociodemographic characteristics between the groups

Table 1 presents the sociodemographic characteristics of participants by group. Statistically significant age differences were observed across the groups, $F = 19.469$, $p < .001$, $\eta^2 = 0.052$. Sex distribution also differed significantly among the three groups, $\chi^2 = 170.715$, $p < .001$, Cramér's $V = 0.488$. Specifically, females were overrepresented in the non-gamer and non-current gamer groups (95.3% and 58.3%, respectively), and males were the majority in the current gamer group (69.3%).

Table 1

Demographic data by gaming groups

	Non-gamers	Non-current gamers	Current gamers	Total
N	128	187	402	717
Female (%)	95.3	58.3	30.6	49.4
Mean age (SD)	20.94 (2.43)	21.50 (3.41)	22.83 (3.65)	22.15 (3.49)
Mean age gaming onset (SD)	—	9.34 (3.05)	8.25 (3.13)	—

Note. N = number of participants. SD = Standard Deviation.

Differences between the groups in the study variables

Differences in prosociality between gaming groups

Statistically significant differences between the groups were found, $F(2, 324) = 13.047$, $p < .001$. Differences in prosociality were found between the group of current gamers and non-gamers ($M_{CG} = 60.11$, $SD_{CG} = 11.85$; $M_{NG} = 65.11$, $SD_{NG} = 9.36$; $p < .001$) and between non-current gamers and non-gamers ($M_{NCG} = 60.22$, $SD_{NCG} = 13.11$; $p < .001$).

Differences in mental health between gaming groups

Non-statistically significant differences were found between the three groups in mental health, $F = 1.451$, $p = .235$, $\eta^2 = 0.004$.

Differences in emotional intelligence between gaming groups

Statistically significant differences among groups were found, $F(2, 296) = 9.176$, $p < .001$. A 3 (gaming groups) $\times$ 4 (components of emotional intelligence) MANOVA showed statistically significant differences in the variances in appraisal of one's own emotions, emotional awareness and emotional regulation (SEA $F[2, 713] = 6.664$, $p = .001$; EA $F[2, 713] = 4.402$, $p = .013$; ER $F[2, 713] = 3.611$, $p = .028$). Using Pillai's trace, there was a statistically significant difference in the components of emotional intelligence between the groups, $V = 0.49$, $F(8, 1,422) = 4.44$, $p < .001$. Separate univariate ANOVAs on the outcome variables revealed statistically significant differences in the appraisal of other emotions (OEA $F[2, 713] = 5.578$, $p = .004$, $\eta^2 = 0.015$), the appraisal of one's emotions (SEA $F[2, 713] = 13.840$, $p < .001$, $\eta^2 = 0.037$), emotional awareness (EA $F[2, 713] = 8.239$, $p < .001$, $\eta^2 = 0.023$), and emotional regulation (ER $F[2, 713] = 8.629$, $p < .001$, $\eta^2 = 0.024$).

Post hoc tests showed differences in OEA between current and non-current gamers ($M_{CG} = 19.11$, $SD_{CG} = 4.76$, $M_{NCG} = 17.83$, $SD_{NCG} = 5.29$; $p = .009$). Differences in SEA were found between current and non-current gamers ($M_{CG} = 19.39$, $SD_{CG} = 4.56$, $M_{NCG} = 17.21$, $SD_{NCG} = 5.55$; $p < .001$) and between current gamers and non-gamers ($M_{NG} = 17.98$, $SD_{NG} = 4.73$; $p = .010$). Differences in EA were found between current and non-current gamers ($M_{CG} = 18.43$, $SD_{CG} = 4.74$, $M_{NCG} = 16.76$, $SD_{NCG} = 5.41$; $p = .001$) and between current gamers and non-gamers ($M_{NG} = 17.29$, $SD_{NG} = 4.51$; $p = .039$). Differences in ER were found between current and non-current gamers ($M_{CG} = 19.29$, $SD_{CG} = 4.81$, $M_{NCG} = 17.54$, $SD_{NCG} = 5.64$; $p < .001$) and between current gamers and non-gamers ($M_{NG} = 18.02$, $SD_{NG} = 5.02$; $p = .034$).

Differences in social support between the gaming groups

Statistically significant differences in social support were found among groups, $F(2, 329) = 4.713$, $p = .010$. A 3 (gaming groups) $\times$ 3 (components of social support) MANOVA revealed significant differences in all dimensions of social support (family $F[2, 714] = 9.557$, $p < .001$; peers $F[2, 714] = 7.862$, $p < .001$; other significant $F[2, 714] = 4.379$, $p = .013$). Using Pillai's trace, there was a statistically significant difference in the components of social support between the groups, $V = 0.14$, $F(6, 1,426) = 1.65$, $p = .000$. Separate univariate ANOVAs on the outcome variables revealed statistically significant differences in social support from family, $F(2, 714) = 3.219$, $p = .041$, $\eta^2 = 0.009$, social support from peers, $F(2, 714) = 2.350$, $p = .096$, $\eta^2 = 0.007$, and other significant social support, $F(2, 714) = 3.309$, $p = .037$, $\eta^2 = 0.009$. Post hoc tests showed differences in FS between current gamers and non-gamers ($M_{CG} = 12.53$, $SD_{CG} = 3.08$, $M_{NG} = 13.30$, $SD_{NG} = 2.43$; $p = .010$). Differences in PS were found between current gamers and non-gamers ($M_{CG} = 11.85$, $SD_{CG} = 2.93$, $M_{NG} = 12.47$, $SD_{NG} = 2.26$; $p = .034$). Differences in OS were found between non-gamers and current gamers ($M_{NG} = 13.17$, $SD_{NG} = 2.29$, $M_{CG} = 12.51$,

$SD_{CG} = 2.85; p = .021$) and between non-gamers and non-current gamers ($M_{NCG} = 12.42$, $SD_{NCG} = 2.95; p = .030$).

Predictor variables of gaming onset

A binomial logistic regression analysis using the forward selection likelihood ratio (LR) method was conducted to assess the relationship between predictor variables and the likelihood of gaming initiation. The stepwise forward selection LR procedure is summarized in Table 2. Age and sex were included as independent variables in the regression model.

Table 2

Variable selection process: Measures for global adaptation of the models

Model	-2LL	χ^2	df	R^2 Cox-Snell	R^2 Nagelkerke	Accuracy
Model 0	675.83	—	—	—	—	82.3
Model 1	514.99	154.30*	1	.194	.319	82.3
Model 2	507.72	161.57*	2	.202	.333	82.3
Model 3	502.66	166.63*	3	.208	.342	82.1

* $p < .001$.

Model 0 = $\text{logit}(\text{Gamers} = 1) = \beta_0 + \varepsilon$

Model 1 = $\text{logit}(\text{Gamers} = 1) = \beta_0 + \beta_1 \cdot \text{Malesex} + \varepsilon$

Model 2 = $\text{logit}(\text{Gamers} = 1) = \beta_0 + \beta_1 \cdot \text{Malesex} + \beta_2 \cdot \text{Age} + \varepsilon$

Model 3 = $\text{logit}(\text{Gamers} = 1) = \beta_0 + \beta_1 \cdot \text{Malesex} + \beta_2 \cdot \text{Age} + \beta_3 \cdot \text{Prosociality} + \varepsilon$

Sex (Model 1) was selected for the first step of the regression analysis, and its inclusion in the model resulted in a statistically significant reduction in the misfit of the null model, $\chi^2(1) = 154.309, p < .001$. In the second step, age (Model 2) was selected and resulted in a statistically significant reduction in misfit compared to model 1, $\chi^2(2) = 161.576, p < .001$. In the third step, prosociality (Model 3) was selected and resulted in a statistically significant reduction in the misfit of Model 2, $\chi^2(3) = 166.637, p < .001$. These improvements in model fit were also evident in the increase in the pseudovariance statistic explained by the models (R^2) and in the accuracy of the models (overall percentage of

cases correctly classified in each model). This better fit was verified by Hosmer and Lemeshow's test, which was not statistically significant (Model 3: $\chi^2[8] = 13.363$, $p = .100$). The Nagelkerke R^2 coefficient showed that approximately 34.2% of the variability in the probability of being or having been a gamer is explained by the independent variables included in the model.

Table 3 contains the estimates of the regression coefficients. The final model equation $\text{logit (Gaming Initiation} = 1) = -0.046 + 0.105(\text{Age}) + 3.241(\text{Male Sex}) - 0.024(\text{Prosociality})$. The results show that males are 25.55 times more likely to be gamers than females, which has the greatest influence on gaming initiation. Furthermore, for every unit increase in age and prosociality, the likelihood of gaming initiation increases by 11% and decreases by 2.4%.

Table 3

Results of the binary logistic regression model predicting gaming initiation (N = 717)

Predictor	β	SE	df	Wald	p	OR	95% CI for OR LL — UL
Age	0.105	0.039	1	7.316	.007	1.110	1.029 — 1.198
Male sex	3.241	0.030	1	56.821	<.001	25.549	11.001 — 59.334
Prosociality	-0.024	0.011	1	4.817	.028	0.976	0.956 — 0.997
Intercept	-0.046	1.042	1	0.002	.965	0.955	—

Note. β = regression coefficient. SE = Standard Error. df = degrees of freedom of Wald test. p = probability value associated with the Wald test. OR = Odds Ratio. 95% CI = 95% Confidence Interval for OR. LL = Lower limit. UL = Upper limit

Predictor variables of gaming maintenance

A second binomial logistic regression analysis was performed using the forward selection LR method to assess the relationship between predictor variables and the likelihood of maintaining the current gaming. The stepwise forward selection LR procedure is summarized in Table 4.

Table 4

Variable selection process: Measures of global fit of the models

Model	-2LL	χ^2	df	R ² Cox–Snell	R ² Nagelkerke	Accuracy
Model 0	735.596	—	—	—	—	68.2
Model 1	695.122	40.317*	1	.066	.093	68.2
Model 2	675.903	60.135*	2	.097	.136	71.6
Model 3	668.569	70.537*	3	.113	.158	70.4

* $p < .001$.

Model 0 = $\text{logit}(\text{Gamers} = 1) = \beta_0 + \varepsilon$

Model 1 = $\text{logit}(\text{Gamers} = 1) = \beta_0 + \beta_1 \cdot \text{Male sex} + \varepsilon$

Model 2 = $\text{logit}(\text{Gamers} = 1) = \beta_0 + \beta_1 \cdot \text{Male sex} + \beta_2 \cdot \text{Age} + \varepsilon$

Model 3 = $\text{logit}(\text{Gamers} = 1) = \beta_0 + \beta_1 \cdot \text{Male sex} + \beta_2 \cdot \text{Age} + \beta_3 \cdot \text{SEA} + \varepsilon$

Age and sex were included as independent variables in the regression model. Sex (Model 1) was selected for the first step of the regression analysis; its incorporation in the model resulted in a statistically significant reduction in the misfit of the null model, $\chi^2(1) = 40.317$, $p < .001$. In the second step, age (Model 2) was selected and resulted in a statistically significant reduction in misfit compared to model 1, $\chi^2(2) = 60.135$, $p < .001$. In the third step, SEA (Model 3) was selected and resulted in a statistically significant reduction in misfit relative to model 2, $\chi^2(3) = 70.537$, $p < .001$. These improvements in model fit were also evident in the increase in the pseudovariance statistic explained by the models (R^2) and in the accuracy of the models (total percentage of cases correctly classified in each model). This better fit was verified by Hosmer and Lemeshow's test, which was not statistically significant (Model 3: $\chi^2[8] = 4.982$, $p = .759$). The Nagelkerke R^2 coefficient indicates that approximately 15.8% of the variability in the probability of being or having been a gamer is explained by the independent variables included in the model. Table 5 contains the estimates of the regression coefficients. The final model equation is $\text{logit}(\text{Maintenance Gaming} = 1) = -3.168 + 0.087(\text{Age}) + 1.063(\text{Sex}) + 0.077(\text{SEA})$. The results show that males are 2.89 times more likely to be gamers than females, which has the greatest impact on gaming maintenance. In addition, the

likelihood of gaming maintenance increases by 9.1% and by 8% for each unit increase in age and appraisal of one's emotions, respectively.

Table 5

Results of the binary logistic regression model predicting the maintenance of gaming (n = 589)

Predictor	β	SE	df	Wald	p	OR	95% CI for OR LL — UL
Age	0.087	0.027	1	9.982	.002	1.091	1.033 — 1.151
Male sex	1.063	0.189	1	31.658	<.001	2.894	1.999 — 4.191
SEA	0.077	0.019	1	16.846	<.001	1.080	1.041 — 1.121
Intercept	-3.168	0.683	1	21.503	<.001	0.042	—

Note. β = regression coefficient. SE = Standard Error. df = degrees of freedom of Wald test. p = probability value associated with the Wald test. OR = Odds Ratio. 95% CI = 95% Confidence Interval for OR. LL = Lower limit. UL = Upper limit

Discussion

Gaming continues to rise in popularity among adolescents and young adults. Although gaming can serve as a leisure activity, the prevalence of problems associated with excessive gaming, such as gaming disorders, is also increasing. This study aimed to identify the predictors of gaming behavior, focusing on factors influencing both the initiation and continuation of gaming. By examining these predictors, the study sought to highlight potential pathways leading to problematic gaming and to inform prevention efforts.

Findings revealed that males predominated among current gamers, and females were more prevalent in the non-current gamer and non-gamer groups. These results align with prior research suggesting that gaming is embedded in a predominantly male culture (Lopez-Fernandez et al., 2019), with males more likely to engage in gaming behavior (Spilková et al., 2017). However, other studies have reported a more sex-balanced gaming

population (Melzer, 2018; Paaßen et al., 2017). Such discrepancies may be explained by the social nature of certain games and the dominance of competitive genres, which often have a lower proportion of female players due to prevailing gender stereotypes (Lange et al., 2021). Interestingly, current gamers in this sample were older than participants in the other two groups, contradicting previous findings that younger individuals are typically more engaged in video game use (Festl et al., 2013).

Regarding psychological variables, significant differences were observed across the groups in prosociality, emotional intelligence, and perceived social support. Differences in prosociality emerged between non-gamers and both current and non-current gamers. For emotional intelligence, significant differences were found between current gamers and both non-current gamers and non-gamers. Similarly, current gamers reported different levels of perceived social support compared to non-gamers. These findings are consistent with previous research demonstrating psychological differences between gamers and non-gamers (Braun et al., 2016) and extend the literature by showing distinctions not only between gamers and non-gamers but also between those who continue and those who discontinue gaming. No significant differences were found in general mental health across the groups. This contrasts with earlier findings suggesting that recreational gamers tend to report better mental health than non-gamers, with reversed results among female gamers (Finserås et al., 2022). The lack of significance in this study could be due to the overrepresentation of females in the non-gamer group, which may have elevated average mental health scores, or the presence of participants with gaming disorder, which may obscure the potential benefits of recreational gaming.

The first binomial logistic regression analysis indicated that being male, being older, and having lower levels of prosocial behavior were associated with a higher likelihood of having initiated gaming. These findings are in line with previous research

suggesting that individuals who begin playing video games often exhibit lower prosocial tendencies than non-gamers (Gisbert-Pérez et al., 2025). However, longitudinal data from Lobel et al. (2017) showed no significant changes in children's prosocial behavior associated with gaming. Notably, previous research has linked reduced prosociality to specific types of games, such as violent (Greitemeyer & Mügge, 2014) and competitive (Lobel et al., 2017) games. This suggests that the relationship between gaming and prosocial behavior may be moderated by game content and individual characteristics, underlining the need for further research.

The second binomial regression analysis showed that being male, being older, and having a greater ability to recognize one's own emotions were associated with the continuation of gaming in young adulthood. These results diverge from those observed in individuals with problematic gaming behaviors, who tend to exhibit lower emotional competence (Seo et al., 2012). It is possible that regular, nonproblematic gaming may serve as an adaptive coping mechanism for individuals with higher emotional awareness, potentially enhancing their emotional regulation abilities (Villani et al., 2018).

Taken together, the findings suggest that individuals with lower levels of prosociality are more likely to initiate gaming, and continued gaming may be associated with greater emotional intelligence. Given that both prosociality and emotional intelligence are recognized as protective factors against various behavioral and substance-related addictions (Esparza-Reig et al., 2021; Gisbert-Pérez et al., 2024; Tolga et al., 2023), promoting these skills during adolescence and early adulthood may be critical in reducing the risk of problematic gaming (Lemmens et al., 2015; Tomei et al., 2021). Moreover, encouraging the adaptive use of video games could offer psychological and emotional benefits to players, supporting a healthier relationship with gaming.

Limitations and future directions

This study has several limitations that should be acknowledged. First, the sample consisted exclusively of university students, which may limit the generalizability of the results to the broader population of young adults. Second, the cross-sectional design precludes the establishment of causal relationships between variables. Third, information such as the duration of gaming among non-current gamers was not collected, limiting the interpretation of factors related to gaming cessation. Future research should aim to address these gaps by identifying variables that predict the maintenance of gaming behavior. Finally, the reliance on self-report measures may introduce biases, such as social desirability, potentially affecting the accuracy of the results. Future studies would benefit from employing longitudinal designs and more diverse samples of young adults to enhance the robustness and applicability of the findings.

Practical implications

Understanding the factors that predict the onset and continuation of gaming behavior is crucial, because it establishes a baseline for identifying the characteristics of the gaming population. If individuals who begin gaming tend to exhibit lower levels of prosocial behavior, this presents an opportunity for the gaming industry to develop and promote content that fosters these skills. In addition, these findings can be valuable to social and health professionals because they provide insight into the potential characteristics of gamers. Such knowledge can inform the design of targeted prevention and intervention strategies for problematic gaming, tailored to the specific needs of this population.

Conclusion

The present study examined differences in sociodemographic and psychological variables among current gamers, non-current gamers, and non-gamers. The findings indicate that being male, being older, and exhibiting lower levels of prosociality are associated with a greater likelihood of initiating gaming behavior. Furthermore, being male, being older, and having a stronger ability to assess one's own emotions were linked to a higher likelihood of maintaining gaming behavior. These results highlight the existence of distinct profiles between individuals who initiate gaming and those who sustain it over time, an important consideration for the development of targeted interventions aimed at preventing problematic gaming.

Study 9. Gaming onset and engagement among university students: a question of mismanaged emotions?

Gisbert-Pérez, J., Martí-Vilar, M., Chans, G. M., & Badenes-Ribera, L. (2025). Gaming onset and engagement among university students: a question of mismanaged emotions?. *BMC Psychology*, 13(1), 1347. <https://doi.org/10.1186/s40359-025-03657-1>

Abstract

Background. Gaming and associated psychological concerns have become increasingly prevalent among young adults in Latin America. However, little is known about the psychosocial factors that distinguish current, former, and non-gamers in this population.

Methods. A cross-sectional survey design was used with a convenience sample of 1,318 university students in Mexico ($M_{\text{age}} = 19.90$, $SD = 1.67$; 46.5% female). Participants completed measures of prosocial behavior, emotional intelligence, perceived social support, and mental health. One-way ANOVAs and MANOVAs were conducted to examine group differences across gamer profiles. Additionally, three binomial logistic regressions were performed to identify predictors of gaming onset and sustained engagement. **Results.** Significant differences were found across the three gamer profiles, particularly between current gamers and the other groups. Current gamers were more likely to be male and exhibited lower levels of emotional intelligence and prosocial behavior. Sex was the only significant predictor of gaming onset, with males being approximately eight times more likely to begin gaming ($OR = 8.08$, 95% CI [5.61, 11.64]). Maintenance of gaming was associated with being male ($OR = 1.57$, 95% CI [1.22, 2.02]) and having lower emotional awareness ($OR = 0.95$, 95% CI [0.92, 0.97]). Being a current gamer was significantly predicted by male sex ($OR = 9.67$, 95% CI [6.61, 14.15]) and lower emotional intelligence ($OR = 0.98$, 95% CI [0.97, 0.99]).

Conclusions. These findings highlight distinct emotional and sociodemographic profiles among current and former gamers. They suggest that emotional intelligence, particularly emotional awareness, may play a key role in maintaining gaming behavior. The results have potential implications for designing targeted prevention strategies for gaming disorder among university students.

Keywords: Gaming, Differences, University, Emotional intelligence, Sex, Higher education, Innovative education

Introduction

Video games have become one of the most prevalent and engaging forms of leisure in contemporary society. The gaming industry has witnessed rapid and sustained growth, leading to a wide array of genres and formats that appeal to an increasingly diverse global audience (Engelstätter & Ward, 2022). Objectively, the term gamer refers to individuals who engage in video gaming (Alsaad et al., 2022; Macur & Pontes, 2021). While the stereotypical image of gamers often evokes white, heterosexual adolescent males, the actual gaming population is far more heterogeneous (Buono et al., 2020; Shaw, 2012). For instance, gaming has gained substantial popularity across other demographic segments, including adults (Bianchi, 2025).

Yet, this raises the question: Is gaming experienced and characterized similarly across different life stages? Young adulthood is a critical period of biological, psychological, and social development. In early adulthood stages, important processes that began in adolescence, such as brain maturation, identity formation, and the development of meaningful relationships, are still in progress (Institute of Medicine & National Research Council, 2015). Although young adulthood signifies more advanced maturation, it is often characterized by a distinct period of instability and vulnerability (Institute of Medicine & National Research Council, 2015). Adolescents frequently use video games as a cathartic activity—to disconnect from school or family duties, or to deal with negative emotions (Vilasís-Pamos & Pires, 2021). These developmental differences could mean that gaming may be used for different purposes. Therefore, analyzing the psychosocial aspects of gaming in young adults may reveal differences compared to earlier stages.

The expansion of the gaming industry is occurring heterogeneously worldwide. While the main video game powerhouses are the US and China (Clement, 2025), other

regions are also experiencing growth. Notably, Latin America has emerged as the fastest-growing area in the global video game market, with Brazil and Mexico playing significant roles in this progression (Statista, 2024). In 2024, Mexico leads the region in video game consumption, boasting 76 million gamers (Newzoo, 2024). This differential development has sparked interest due to its economic impact and the potential psychosocial implications for emerging gaming countries.

Gaming is associated with both benefits and drawbacks, including the risk of Internet Gaming Disorder (IGD) (APA, 2022; Sublete & Mullan, 2012). However, research on the factors related to gaming has produced mixed results, particularly concerning sociodemographics (Buono et al., 2020). Additionally, psychosocial variables such as prosocial behavior (Greitemeyer & Mügge, 2014), emotional intelligence (Villani et al., 2018), perceived social support (Lobel et al., 2017), and mental health (Sauter et al., 2020) also show varied findings.

As mentioned above, gaming has been traditionally associated with younger male individuals; however, more females and young adults are now part of the gaming community (Entertainment Software Association, 2018; López-Fernández et al., 2019). It is estimated that female gamers now make up 45% of this population (Entertainment Software Association, 2018). Meanwhile, the prevalence of IGD is rising among both adolescents and adults, with prevalence estimates ranging from 8.8% to 10.4% (Gao et al., 2022). University students appear to be an at-risk group for developing IGD (Ohayon & Roberts, 2021). A pre-COVID study in Mexico estimated the prevalence of IGD among university students at 5.2% (95% CI: 4.7–5.8%; Borges et al., 2019), while international estimates range from 3.8% to 11% (Gao et al., 2022; Ohayon & Roberts, 2021). The variability observed across studies, along with the increasing inclusiveness of the gaming

industry, highlights the need for country- and age-specific research that investigates potential differences between gaming and non-gaming conditions.

Previous systematic reviews and meta-analyses suggest that prosocial behavior and emotional intelligence may serve as protective factors against the development of gaming-related issues (Esparza-Reig et al., 2021; Gisbert-Pérez et al., 2024). Prosocial behavior has largely been studied in prosocial video games to explore their influence on positive social actions (Greitemeyer & Mügge, 2014; Greitemeyer & Oswald, 2010). Emotional intelligence, meanwhile, has been identified as negatively associated with IGD (Kircaburun et al., 2019). Individuals with lower emotional intelligence are more likely to experience psychological difficulties that could increase their vulnerability to problematic gaming (Müller & Bonnaire, 2021). However, the relationship between emotional intelligence, prosocial behavior, and recreational gaming is less understood. It remains unclear whether emotional intelligence plays a role in the initiation or maintenance of gaming behavior.

The relationship between social support and gaming has also been studied from two perspectives. On the one hand, video games provide a platform to develop new social connections. Frederick and Zhang (2021) studied the quality of social relationships inside and outside video games. Their results indicated that online relationships among college gamers were of better quality than offline relationships, whereas the opposite results were found for non-gamers. However, they found a higher quality of offline relationships in gamers and non-gamers in a larger non-university sample. Moreover, problematic gaming has also been linked to lower social skills and support (PaaBen et al., 2017). Research has shown that the number of hours spent gaming is negatively correlated with perceived general and family social support (Wartberg et al., 2017). Therefore, it is important to explore whether individuals start gaming out of a need for social support and to examine

the differences between those who continued gaming as young adults and those who have never played.

Mental health exhibits a complex, non-linear relationship with gaming. On one hand, recreational gaming has been associated with reductions in symptoms of depression and anxiety (Allaire et al., 2013; Kowal et al., 2019). On the other hand, several studies report that gamers—particularly those who engage in problematic or excessive gaming—often experience elevated levels of depression and anxiety relative to non-gamers (Chung et al., 2020; Wang et al., 2019; Wang et al., 2017). These divergent findings suggest that while gaming may offer mental health benefits under certain conditions, it may also have detrimental effects when gaming habits become dysregulated or maladaptive (Wang et al., 2021). However, gamers are sometimes stigmatized due to negative societal perceptions, often shaped by media narratives that emphasize rare but extreme cases such as violence, addiction, or social dysfunction (Gelūnas, 2022). These portrayals may contribute to a pathologizing view of gaming behavior, regardless of its actual impact on functioning. Consequently, it is important to examine whether negative psychological outcomes emerge at the onset of gaming or develop over time as gaming becomes a persistent behavior in adulthood. Such insights could clarify the temporal dynamics between gaming and mental health, informing strategies for early detection and intervention.

Aim of the study

The uneven global expansion of the gaming industry, alongside the increasing prevalence of video game use and its potential negative consequences across broader population sectors, underscores the need to examine gaming through a context-specific lens, particularly one that considers age and geography. Accordingly, the primary aim of this study was to investigate psychosocial factors associated with gaming behavior among

young adults enrolled in a Mexican university. The study focused on prosocial behavior, general mental health, perceived social support, and emotional intelligence, given their relevance to recreational gaming and the potential development of gaming-related problems.

Participants were categorized into three groups based on their current gaming status: current gamers (CG), former gamers (FG), and non-gamers (NG). This classification allowed for a nuanced analysis of differences in psychosocial profiles related to the initiation and maintenance of gaming. Specifically, the study aimed to determine whether specific psychological characteristics distinguish individuals before gaming involvement or whether these traits emerge and evolve as gaming becomes a sustained behavior in young adulthood.

Drawing on existing literature, the following hypotheses were proposed:

H1. A higher proportion of males will be identified among current gamers compared to females.

H2. Current gamers will demonstrate lower levels of prosocial behavior compared to non-gamers.

H3. Emotional intelligence will differ significantly among the three gamer groups.

H4. Perceived social support will differ significantly among the three gamer groups.

H5. No significant differences in mental health will be observed among the three gamer groups.

H6. Sex, prosocial behavior, and emotional intelligence will be the main predictors of both gaming initiation and maintenance.

Materials and methods

Sampling procedure

A cross-sectional research design was implemented using an online survey administered at a private university in Mexico between August 2024 and April 2025. All participants provided informed consent before participation. The study adhered to the ethical principles outlined in the Declaration of Helsinki (1964) and its subsequent amendments and other applicable ethical standards. Ethical approval was granted by the university's Institutional Research Ethics Committee (Protocol No. EHE-2023-08). The target population consisted of young adults currently enrolled in higher education in Mexico. Inclusion criteria required participants to be Spanish-speaking students aged 18 or older. The final sample comprised 1,318 students ($M_{\text{age}} = 19.90$, $SD = 1.67$; age range: 18–30), of whom 46% identified as female.

Measures

Sociodemographic information. Participants reported their age and sex. The question, “*Do you currently play video games?*” assessed their current gaming status, offering three response options: “*Yes,*” “*No, but used to,*” and “*No, never.*”

Prosocial Behavior Scale for adults (PBS; Caprara et al., 2005; Rodríguez et al., 2017). This 16-item scale measures the tendency to engage in prosocial behaviors, including sharing, helping, providing care, and expressing empathy (Badenes-Ribera et al., 2023). Responses were rated on a 5-point scale ranging from (1) *never/almost never* to (5) *always/almost always*. Total scores were calculated by summing all item responses, with higher scores indicating a greater tendency toward prosocial behavior. In the current sample, the scale showed excellent reliability (Cronbach's alpha and McDonald's omega: $\alpha/\omega = 0.94$).

General Health Questionnaire (GHQ-12; Goldberg et al., 1988; Brabete, 2014).

This instrument comprises 12 items assessing general mental health, with half positively worded and the other half negatively worded. Responses were given on a 4-point scale from (0) *never* to (3) *always*. Higher total scores indicate better perceived mental health. In the current sample, reliability was acceptable ($\alpha = 0.76$, $\omega = 0.72$).

Wong & Law's Emotional Intelligence Scale (WLEIS-S; Wong & Law, 2002; Pacheco et al., 2019). This 16-item scale assesses four components of emotional intelligence: self-emotion appraisal (SEA; items 1, 5, 9, 13), other-emotion appraisal (OEA; items 2, 6, 10, 14), emotional use or awareness (EA; items 3, 7, 11, 15), and emotion regulation (ER; items 4, 8, 12, 16). The scale conceptualizes emotional intelligence as a set of abilities related to the perception and expression of emotions, the access to emotions that facilitate cognition, and the regulation of emotional states (Mayer & Salovey, 1997). Responses were rated on a 7-point Likert scale ranging from (1) *totally disagree* to (7) *totally agree*. Total scores were calculated by summing the item responses, with higher scores reflecting greater emotional intelligence. In the present sample, reliability was excellent (Cronbach's alpha and McDonald's omega: total scale $\alpha/\omega = 0.95$; SEA $\alpha/\omega = 0.85$; OEA $\alpha/\omega = 0.84$; EA $\alpha/\omega = 0.86$; ER $\alpha/\omega = 0.87$).

Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988; Santos-Vega et al., 2021). This 12-item scale measures perceived social support from three sources: family (PSS-Fam; items 1–4), friends (PSS-Peer; items 5–8), and significant others (PSS-Other; items 9–12). Response options ranged from (1) *never* or *almost never* to (4) *always* or *almost always*. Total scores were calculated by summing all item responses, with higher scores indicating greater perceived social support. In the current sample, reliability was high (Cronbach's alpha and McDonald's

omega: total scale $\alpha/\omega = 0.93$; PSS-Fam $\alpha/\omega = 0.87$; PSS-Peer $\alpha/\omega = 0.91$; PSS-Other $\alpha/\omega = 0.94$).

Statistical analysis

Two researchers independently verified the data for accuracy and categorized participants into three gaming groups: non-gamers, former gamers, and current gamers. All analyzed variables met standard univariate normality criteria, with skewness values within ± 3 and kurtosis values within ± 10 following Kline's criteria (Kline, 2015). Missing data were minimal ($< 1\%$ per variable) and were not adjusted, as such levels are unlikely to bias parameter estimates (Graham, 2009).

Means and standard deviations were computed for continuous variables, and frequencies and percentages were reported for categorical variables. Descriptive statistics were calculated for age and sex across the three gaming groups and the full sample. Pearson's chi-square tests assessed group differences in sex, with Cramer's V as a measure of effect size. One-way ANOVAs were used to evaluate differences in continuous variables across gaming groups. Two MANOVAs were conducted to examine group differences in perceived social support and emotional intelligence components. Partial eta squared (η^2) was reported as the effect size, and Pillai's Trace was used for multivariate significance testing due to covariance matrix inequality (Box's M test). Bonferroni *post hoc* tests were applied for pairwise comparisons, given the assumption of homogeneity of variances.

Binomial logistic regression analyses were performed using the forward stepwise method to identify gaming onset and maintenance predictors (Silva & Barroso, 2004). Independent variables included sex and those found to be statistically significant in the ANOVA and MANOVA analyses. Model fit was evaluated using several criteria (Hahs-

Vaughn & Lomax, 2020): (1) χ^2 test on the change in deviance ($-2 \log$ -likelihood or $-2LL$), (2) Hosmer-Lemeshow goodness-of-fit test, (3) Nagelkerke's R^2 for pseudo-variance explained, (4) measures of classification accuracy, sensitivity, and specificity, and (5) Z-statistic comparison between the null and final models (Pardo & Ruiz, 2012). Wald statistics assessed the significance of regression coefficients. Odds Ratios (OR s) with 95% confidence intervals were calculated to estimate the effect size and test whether each predictor differed significantly from the null effect ($OR = 1$).

A priori power analysis for logistic regression was conducted using Westland's algorithm (Westland, 2024). With a conservative effect size of 0.02 and nine predictors, the recommended minimum sample size to achieve a statistical power of 0.80 is 788 participants. All statistical analyses were performed using IBM SPSS Statistics v. 28.

Results

Sociodemographic differences between gaming groups

Table 1 presents the sociodemographic characteristics of each gaming group. No statistically significant differences were observed in age distribution among the groups ($F = 2.53, p = .079, \eta^2 = 0.004$). However, sex distribution differed significantly across the three groups ($\chi^2 = 169.44, p < .001, Cramer's V = 0.359$). In the non-gamer group, 83.5% of participants were female, whereas in the current gamer group, 65.7% were male.

Table 1

Sociodemographic characteristics of the three gaming groups

	Non-gamers	Former gamers	Current gamers	Total
N	236	431	651	1318
Female (%)	83.5	44.8	34.3	46.5
Mean age (SD)	20.03 (1.58)	19.99 (1.77)	19.80 (1.62)	19.90 (1.67)

Note. SD: Standard Deviation

Differences in psychosocial variables between gaming groups

Differences in prosociality between gaming groups

Statistically significant differences were found among the three gaming groups in prosociality scores ($F = 3.934, p = .020, \eta^2 = 0.006$). *Post hoc* comparisons indicated that current gamers scored significantly lower than non-gamers ($M_{CG} = 60.99, SD_{CG} = 11.6; M_{NG} = 63.24, SD_{NG} = 12.6; p = .031$).

Differences in mental health between gaming groups

No statistically significant differences were observed among the three groups in mental health scores ($F = 0.269, p = .770, \eta^2 = 0$).

Differences in emotional intelligence between gaming groups

Statistically significant differences emerged in overall emotional intelligence ($F = 5.824, p = .003, \eta^2 = 0.009$). Additionally, multivariate analysis revealed significant differences across the four emotional intelligence components ($F[8,2656] = 2.33; p = .017$).

Follow-up univariate ANOVAs showed statistically significant differences in each component: SEA ($F[2, 53] = 3.422, p = .033, \eta^2 = 0.005$); OEA ($F[2137] = 6.39, p = .002, \eta^2 = 0.010$); EA ($F[2137] = 6.27, p = .002, \eta^2 = 0.009$); ER ($F[2, 54] = 3.314, p = .037, \eta^2 = 0.005$). *Post hoc* tests showed that current gamers scored lower than both former gamers and non-gamers in appraisal of others' emotions (OEA: $M_{CG} = 20.88, SD_{CG} = 4.56; M_{FG} = 21.75, SD_{FG} = 4.51, p = .007; M_{NG} = 21.85, SD_{NG} = 5.10, p = .017$).

Current gamers also reported lower scores than former gamers in emotional awareness and emotional regulation (EA: $M_{CG} = 21.03, SD_{CG} = 4.52; M_{FG} =$

22.05, $SD_{FG} = 4.63$, $p = 0.001$; ER: $M_{CG} = 20.81$, $SD_{CG} = 4.54$; $M_{FG} = 21.53$, $SD_{FG} = 4.58$, $p = .041$).

Differences in perceived social support between gaming groups

No statistically significant differences were found between the three groups in overall perceived social support ($F = 2.729$, $p = .066$, $\eta^2 = 0.004$), or in its subdimensions ($F[6,2656] = 1.081$, $p = .372$).

Predictor variables of gaming patterns

Predictor variables of gaming onset

A binomial logistic regression with forward selection (likelihood ratio method, LR) was conducted to examine which variables predict the likelihood of initiating gaming. Sex, prosociality, and emotional intelligence components were included as independent variables.

In the first and final step of the regression analysis, only sex was retained as a significant predictor (model 1). Its inclusion led to a statistically significant improvement in model fit compared to the null model ($\chi^2(1) = 167.44$, $p < .001$). The classification matrix indicated that model 1 achieved perfect sensitivity (100%) but lacked specificity. The Nagelkerke R^2 coefficient showed that sex accounted for approximately 20% of the variance in the likelihood of initiating gaming.

Specifically, being male significantly increased the odds of gaming onset. The regression coefficient for male sex was $\beta = 2.09$, and the corresponding odds ratio was $OR = 8.08$ (95% CI [5.61, 11.64]), indicating that males were over eight times more likely than females to begin gaming (Table 2).

Table 2

Model fit indices and final binary logistic regression results predicting gaming onset

	-2LL	χ^2	df	R^2 Cox y Snell	R^2 Nagelkerke	Accuracy		
Final model	1071.38	167.44**	1	.119	.196	82.1		
	β	SE	df	Wald	p	OR	95% CI for OR	
							LL	UL
Male sex	2.09	0.19	1	129.193	< .001	8.08	5.61	11.64
Intercept	0.74	0.08	1	8.72	< .001	2.11	—	—

Note. Model equation: $\text{logit}(\text{Current and non-current gamers} = 1) = \beta_0 + \beta_1(\text{Male sex}) + \epsilon$. β = regression coefficient; SE = standard error; df = degrees of freedom (Wald); OR = odds ratio; 95% CI = 95% confidence interval for OR; LL = lower limit; UL = upper limit. **p < .01.

Predictor variables of gaming maintenance

A second binomial logistic regression analysis using the forward selection LR method was conducted to examine which variables predict the likelihood of maintaining gaming behavior. Sex was included as an independent variable, while appraisal of others' emotions, emotional awareness, and emotional regulation were potential predictors.

In the first step of the analysis, emotional awareness was selected (model 1), resulting in a statistically significant improvement in model fit compared to the null model ($\chi^2(1) = 12.369, p < .001$). In the second and final step, sex was added to the model (model 2), leading to a further statistically significant improvement in fit over model 1 ($\chi^2(2) = 24.789, p < .001$). These enhancements in model fit were reflected in increased pseudo- R^2 values and improved classification accuracy. The Hosmer–Lemeshow test yielded a non-significant result ($\chi^2(8) = 13.57, p = .094$), indicating an improvement in model fit. The Nagelkerke R^2 coefficient showed that the included predictors could explain approximately 4% of the variance in gaming maintenance.

The classification matrix of observed versus predicted values showed that the final model (model 2) had high sensitivity (92.6%), correctly identifying most current gamers, but low specificity (12.5%), with poor classification of non-gamers.

Table 3 presents the regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals. As shown, the final model equation was: $\text{logit}(\text{Current gaming} = 1) = 1.21 + 0.451(\text{Male sex}) - 0.050(\text{EA})$.

Table 3

Model fit indices and final binary logistic regression results predicting gaming maintenance

	-2LL	χ^2	df	R ² Cox y Snell	R ² Nagelkerke	Accuracy
Final model	1430.14	24.79**	2	.025	.039	60.7
	β	SE	df	Wald p	OR	95% CI for OR LL UL
Male sex	0.451	0.128	1	12.40 < .001	1.57	1.22 2.02
EA	-0.050	0.014	1	12.35 < .001	0.95	0.93 0.98
Intercept	1.208	0.316	1	14.33 < .001	3.34	— —

Note. Model equation: $\text{logit}(\text{Current gamers} = 1) = \beta_0 + \beta_1(\text{Male sex}) + \beta_2(\text{EA}) + \epsilon$. β = regression coefficient; SE = standard error; df = degrees of freedom (Wald test); p = probability value; OR = odds ratio; 95% CI = 95% confidence interval for OR; LL = lower limit; UL = upper limit.

Results indicate that individuals of male sex with lower emotional awareness were more likely to maintain gaming behavior. Specifically, sex had a stronger predictive value ($OR = 1.57$) than emotional awareness ($OR = 0.95$). When controlling for sex, emotional awareness was negatively associated with gaming maintenance, with a regression coefficient of $\beta = -0.50$ and $OR = 0.95$ (95% CI: 0.93, 0.98), suggesting that each unit increase in emotional awareness reduced the odds of being a current gamer by 5%. Conversely, after adjusting for emotional awareness, male participants were significantly more likely to be current gamers than female participants ($\beta = 0.451$, $OR = 1.57$, 95% CI: 1.22, 2.02), indicating that males are 1.57 times more likely to maintain gaming habits than females.

Predictor variables of current gaming vs. non-gaming

A binomial logistic regression analysis using the forward selection (likelihood ratio) method was conducted to examine the relationship between selected predictor variables and the likelihood of initiating and maintaining gaming during this stage of life. The model included sex, prosociality, and general emotional intelligence as potential predictors.

In the first step of the regression analysis, sex was included as the sole predictor (model 1). Its inclusion significantly improved model fit compared to the null model, as indicated by a chi-square test ($\chi^2(1) = 178.75, p < .001$). In the second and final step, emotional intelligence was added to the model (model 2), resulting in a further significant improvement in model fit ($\chi^2(2) = 184.17, p < .001$). Improvements were also seen in the increase of explained variance (Nagelkerke $R^2 = 0.28$) and in the overall classification accuracy of the model.

Model fit was further supported by the Hosmer and Lemeshow goodness-of-fit test, which yielded a non-significant result ($\chi^2(8) = 5.98, p = .649$), indicating adequate model calibration. The final model explained approximately 28% of the variance in the likelihood of being a current gamer.

The classification matrix for the final model (model 2) revealed high sensitivity (94%) but low specificity (28%). This suggests that the model more accurately identified individuals who were current gamers than those who were not.

Table 4 presents the regression coefficients, Wald statistics, odds ratios, and their corresponding 95% confidence intervals. The logistic regression equation for the final model was: $\text{logit}(\text{Current gaming} = 1) = 1.15 + 2.27(\text{Male sex}) - 0.012(\text{EI})$. The results indicated that being male and having lower levels of emotional intelligence significantly

predicted current gaming status. Specifically, sex had a stronger effect on gaming behavior ($OR = 9.67$) than emotional intelligence ($OR = 0.98$). Controlling for emotional intelligence, males were approximately 10 times more likely to be current gamers than females ($\beta = 2.27$, $OR = 9.67$, 95% CI: 6.61, 14.15). Similarly, controlling for sex, each one-unit increase in emotional intelligence was associated with a 2% decrease in the odds of being a current gamer ($\beta = -0.012$, $OR = 0.98$, 95% CI: 0.97, 0.99).

Table 4

Model fit indices and final binary logistic regression results predicting gaming onset and maintenance

	-2LL		χ^2	df	R ² Cox y Snell	R ² Nagelkerke	Accuracy	
Final model	843.51		184.17**	2	.19	.28	76.2	
	β	SE	df	Wald	p	OR	95% CI for OR	
							LL	UL
Male sex	2.27	0.194	1	136.47	< .001	9.67	6.61	14.15
Emotional intelligence	-0.012	0.005	1	5.30	.021	0.98	0.97	0.99
Intercept	1.16	0.461	1	6.31	.012	3.18	—	—

Note. Model equation: β = regression coefficient; SE = standard error; df = degrees of freedom (Wald test); p = probability value; OR = odds ratio; 95% CI = 95% confidence interval for OR ; LL = lower limit; UL = upper limit.

Discussion

Gaming has become increasingly popular among young adults in Mexico; however, this trend also raises concerns about potential gaming-related issues within this demographic. The present study examined key psychosocial variables associated with gaming behavior in early adulthood and identified predictors of gaming onset and maintenance among Mexican university students. Understanding these relationships is crucial for designing targeted strategies to prevent IGD.

Regarding H1, statistically significant differences in sex distribution were found across the gaming groups. Males were overrepresented among current gamers (65.7%),

whereas females predominated in the non-gamer group (83.5%). These results support the well-documented trend of male dominance in gaming (López-Fernández et al., 2019; Spilková et al., 2017). However, they appear to contradict recent reports indicating that female participation in digital gaming is approaching parity with males (Melzer, 2018; PaaBen et al., 2017). This discrepancy may reflect the prevalence of competitive video games among participants, a genre historically characterized by greater male representation and stronger gender stereotypes (Lange et al., 2021). Therefore, while our findings reflect a sex imbalance in gaming participation among Mexican university students, this may not represent the broader trend of increasing female involvement in digital gaming, but rather a subgroup-specific pattern influenced by sex preferences and cultural factors.

In relation to H2, current gamers reported significantly lower levels of prosocial behavior than non-gamers. This finding contrasts with Lobel et al. (2017), who observed no association between gaming and prosocial behavior in preadolescents. Such discrepancies may reflect developmental differences, whereby prolonged gaming into early adulthood could lead to diminished prosocial tendencies. However, the sex imbalance in both the non-gamer and current gamer groups suggests that differences in prosociality may be due to sex differences. Previous empirical studies and meta-analyses have shown that sex differences in prosocial behavior can range from small to moderate, with females exhibiting higher levels of certain types of prosocial conduct (Van Der Graaff et al., 2017; Xiao et al., 2019). Previous research has primarily linked reduced prosocial behavior with violent gaming (Greitemeyer & Mügge, 2014), high-frequency competitive play (Lobel et al., 2017), and problematic gaming patterns (Lemmens et al., 2015; Tomei et al., 2021). The competitive and individualistic nature of many popular games may foster rivalry and undermine cooperative or helping behaviors (Ewoldsen et

al., 2012). This perspective is consistent with the General Learning Model (Buckley & Anderson, 2006), which posits that video game content can shape behavior through learned associations over time. Although some studies, such as Groves et al. (2015), have failed to find a significant association, the present results suggest that sustained gaming in early adulthood may lead to lower levels of prosocial behavior. However, further research is needed to establish whether these associations are the result of an interaction effect between sex and gaming status.

Regarding H3, emotional intelligence significantly differed across gaming groups. Current gamers exhibited lower scores in the ability to appraise others' emotions, emotional awareness, and emotion regulation than former gamers. These findings suggest that ongoing engagement in gaming may be associated with a reduced capacity to identify, understand, and manage emotional experiences. As such, gaming may function as a form of emotional avoidance or escape, a hypothesis supported by previous studies (Snodgrass et al., 2014). Notably, diminished emotional regulation and awareness have been linked to IGD (Müller & Bonnaire, 2021), and difficulties in these domains may underlie escapism-based coping and problematic gaming (Di Blasi et al., 2019; Griffiths et al., 2020).

The observed deficits in the ability to appraise others' emotions among current gamers also align with the reduced prosociality reported in this group. Emotional intelligence —particularly the capacity to recognize others' emotions— is a core component of prosocial behavior (Chung et al., 2020; Kuss & Griffiths, 2012). It is plausible that ongoing engagement in competitive or violent games may impede the development of these interpersonal competencies, contributing to lower emotional appraisal and reduced prosocial responses (Greitemeyer & Mügge, 2014).

For H4 and H5, no statistically significant group differences emerged in perceived social support or mental health. One explanation for the absence of significant group differences is that the sample was composed mostly of recreational gamers, whose gaming behaviors are non-problematic, thus not disrupting social functioning or mental health. Another possible explanation could be that the sample mainly play games with cooperative or team-based elements, which can foster social connectedness and offset any potential negative effects. These findings are consistent with studies that portray gaming as a social platform (Cole & Griffiths, 2007). The evolution of digital socialization — especially after the COVID-19 pandemic— may have also reshaped relational dynamics in young adulthood, reducing disparities between online and offline relationships (Chan & Cheng, 2004; Mesch & Talmud, 2006). Alternatively, the null findings may reflect a broader shift in how social support is experienced and maintained in digital contexts, where gamers and non-gamers alike may rely on other similar platforms (e.g. social media) to maintain interpersonal connections.

Moreover, online social interactions have been identified as protective against psychological distress (Marinucci et al., 2022). The present results suggest that recreational gaming is not inherently detrimental to mental health and may serve as a meaningful social outlet. Although IGD is associated with mental health difficulties (Wang et al., 2017; Richard et al., 2020), gaming in this sample appears unrelated to mental health status. A possible explanation for the absence of significant group differences is that the sample was composed mostly of recreational gamers, whose gaming behaviors are non-problematic and may be integrated into a balanced lifestyle. Thus, mental health does not appear to be a differential variable based on gaming status. Additionally, some psychosocial effects of gaming may emerge after prolonged use. This suggests the need for longitudinal designs to better capture temporal dynamics.

Regarding H6, logistic regression analyses revealed that male sex was the only significant predictor of gaming onset. This finding supports previous research indicating that males are more likely to initiate gaming (López-Fernández et al., 2019). Despite ongoing efforts by the gaming industry to promote inclusion, issues such as discrimination and sexism persist (Belskie et al., 2023), potentially discouraging female participation (Fox & Tang, 2017). Interestingly, unlike findings in Spanish university populations where prosociality also predicted gaming onset (Gisbert-Pérez et al., 2024), this variable was insignificant in the present study. This suggests that cultural context and gendered socialization may shape the relative influence of psychosocial predictors. The absence of psychological predictors of gaming onset in this sample implies that gaming may initially be driven by entertainment or social motives rather than underlying emotional difficulties (Kuss & Griffiths, 2012).

Additional logistic regressions were conducted to differentiate between individuals who maintained gaming habits and those who quit or never played. These analyses revealed that, alongside male sex, lower emotional awareness significantly predicted continued gaming into early adulthood. Prior studies have documented inverse associations between emotional awareness, emotion regulation, and gaming problems (Şalvarlı & Griffiths, 2022). Although this study did not focus on disordered gaming, the findings support functional models suggesting that individuals may use games for unconscious emotional regulation (Kuss & Griffiths, 2012). Video games might offer an emotionally manageable environment that allows players to temporarily avoid or alleviate difficult emotions.

Finally, the combined model revealed that male sex and lower emotional intelligence predicted both the onset and maintenance of gaming. These findings resonate with prior research linking reduced emotional competencies to preferences for solitary or

escapist activities. However, this does not necessarily imply pathology. In some cases, gaming may serve a compensatory role by offering a structured outlet for emotional expression or management (Kowert et al., 2014). Nonetheless, relying exclusively on gaming for emotional regulation may increase the risk of developing problematic patterns.

Notably, previous research has shown that males often receive fewer opportunities for emotional development compared to females (Wright et al., 2018). This differential socialization may contribute to the emotional skill disparities observed in the present study. As emotional identification, awareness, and regulation are essential components of healthy coping, limited access to emotional education may lead some individuals to adopt gaming as an alternative coping strategy. However, if gaming becomes the sole emotional outlet, the risk of IGD may increase (Di Blasi et al., 2019). These results underscore the importance of examining the interplay between emotional competence, gender, and gaming habits to better inform prevention strategies during early adulthood.

Limitations and future directions

This study has several limitations that should be acknowledged. First, its cross-sectional design precludes causal inferences, as no temporal or experimental manipulation was applied. Second, the sample was limited to a university student population, and all data were self-reported, which may affect the generalizability and objectivity of the findings. Similarly, the uneven gender distribution within each group limited the possibility of conducting adequately powered subgroup analyses by sex. Future research should focus on more balanced samples to explore the potential interaction effects between sex and gaming status. Additionally, while some associations reached statistical significance, the explained variance was relatively modest, warranting cautious interpretation of these results.

Future studies would benefit from longitudinal designs that track participants over time to better capture developmental trajectories and causal mechanisms. Moreover, including more diverse and representative samples from different educational levels or regions would enhance the external validity of the findings. Despite these limitations, the study also presents important strengths, for instance, including a distinct former gamer group, which allowed for a more nuanced exploration of both the onset and maintenance of gaming behavior. This classification strategy avoided the common pitfall of grouping former gamers with true non-gamers, which can obscure key behavioral differences. Furthermore, the focus on specific components of emotional intelligence concerning gaming behavior provides a foundation for more targeted future investigations.

Practical implications

Three key implications can be drawn from the findings. First, male sex remains a significant factor in the initiation of gaming among young Mexican adults. To encourage broader female participation, the gaming industry should develop content that aligns with diverse interests and actively work to address issues of discrimination and sexism within gaming communities. At the public level, financial incentives could be offered to video game companies that develop inclusive content or include strategies to control discriminatory and harassing behavior. At the university level, just as video game clubs are encouraged, the creation of mixed gaming communities or gaming conferences could be promoted to raise awareness of these issues. Second, the cross-national differences observed in predictors of gaming onset underscore the importance of culturally sensitive approaches. Preventive strategies should be tailored to specific sociocultural contexts, as factors influencing gaming behavior may vary considerably across countries. Third, the association between emotional intelligence —particularly specific components such as emotional awareness— and sustained gaming engagement highlights the need to integrate

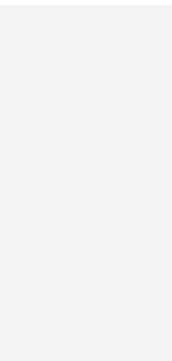
emotional education into both university curricula and earlier educational stages. If individuals use gaming to manage unprocessed emotions, strengthening emotional competencies may enable them to engage with video games more healthily and recreationally, rather than as a form of emotional avoidance. To this end, the university curriculum could be adapted to include workshops that address digital habits, promote emotional and social skills, and encourage alternative leisure activities in this digital society.

Conclusions

This study examined the psychosocial factors associated with the onset and maintenance of gaming among young university students in Mexico. The findings indicate that the initiation of gaming is primarily influenced by sociodemographic characteristics — particularly sex— rather than by psychological variables. In contrast, the continued engagement in gaming during early adulthood appears to be associated with lower levels of emotional intelligence, especially emotional awareness and regulation.

These results suggest that while the initial decision to engage in gaming may be socially driven and not rooted in psychological vulnerability, sustained gaming behavior could reflect underlying difficulties in emotional management. Moreover, no significant differences were observed between gaming and non-gaming groups in terms of mental health or perceived social support, supporting the view that recreational gaming is not inherently detrimental to psychological well-being.

These findings underscore the importance of fostering emotional competencies from an early age and creating more inclusive and supportive gaming environments. Promoting emotional literacy may help individuals engage in gaming in healthier ways and reduce the risk of developing problematic gaming patterns later in life.



Characterization of IGD among university students in Spain, Italy, and Mexico

Study 10. Comparative analysis of Internet gaming disorder prevalence and gaming-related and psychosocial correlates in Spain and Italy

Gisbert-Pérez, J., Longobardi, C., Martí-Vilar, M., Fabris, M. A., Badenes-Ribera, L. (2024). Comparative analysis of Internet gaming disorder prevalence and gaming-related and psychosocial correlates in Spain and Italy. *International Journal of Adolescence and Youth*, 31(1).
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Abstract

Internet Gaming Disorder (IGD) is a growing public health issue among young adults. Cross-national evidence in this population remains limited, particularly among university students. Objective. This study investigated its prevalence and related factors among university students in Spain and Italy. Two convenience university samples from Spain and Italy were surveyed ($N_{\text{Spain}} = 798$, $Mean_{\text{age}} = 21.48$, $SD_{\text{age}} = 5.01$, 67.2% female; $N_{\text{Italy}} = 717$, $Mean_{\text{age}} = 22.20$, $SD_{\text{age}} = 3.83$, 49.4% female). IGD rates were low in both countries, 2.1% in Spain and 2.4% in Italy, rising to 6.1% and 4% among active gamers. Using chi-square tests, correlations, and logistic regressions the study found that in Spain, gaming with strangers, lower emotional intelligence, and low premeditation (acting without considering consequences) were associated with higher IGD risk. In Italy, positive urgency (rash action in very positive mood) and more hours spent gaming emerged as significant predictors. Overall, these findings highlight the multifactorial nature of IGD and underscore meaningful cross-national differences in risk profiles among university students, supporting the international relevance of this issue.

Keywords: Internet gaming disorder, prevalence, Spain, Italy, correlates, university

Introduction

The global gaming industry is rapidly expanding, reaching 3.02 billion active players by 2024 (Statista, 2024). Although gaming is widely acknowledged for its contributions to entertainment, stress reduction, and social interaction (Stockdale & Coyne, 2018), research has also linked it to some risks. The World Health Organization (WHO, 2019) has identified Gaming Disorder (IGD) as a behavioral pattern that can lead to significant functional impairment. Recent meta-analytic evidence estimated the worldwide IGD prevalence at 3.05% and 6.7%, with variability depending on the diagnostic criteria employed and the characteristics of the populations studied (Stevens et al., 2022; Zhou et al., 2024). These estimates—along with cross-country differences—highlight the need to investigate IGD prevalence and its associated factors in different regions.

The Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR) categorizes IGD as a pattern of persistent and recurrent gaming behavior that leads to clinically significant impairment over 12 months (APA, 2022). A diagnosis requires the presence of at least five out of nine criteria, reflecting cognitive, emotional, and functional symptoms.

Beyond its diagnostic definition, vulnerability to IGD is not uniform across the lifespan. Adolescence appears to be a particularly sensitive developmental stage (García-García, 2021; Wang et al., 2021), with meta-analytic evidence estimating a prevalence of 4.6% in this age group (Fam, 2018), higher than the 3.05% reported in general population samples across 17 countries (Stevens et al., 2021). Young adulthood also represents a period of elevated risk, as intergenerational data from Hong Kong show higher prevalence among Millennials compared to Generation X (7.4% vs. 1.3%; Wang & Cheng, 2021).

Estimates of IGD prevalence varies across age groups and cultural contexts, with higher estimates in Asian and North American adolescent samples compared to Europe (Fam, 2018; Müller et al., 2014). However, little comparative evidence is available from Southern Europe. Spain and Italy share cultural similarities, but their gaming patterns may differ as well as their IGD prevalence estimates. In 2024, Spain had around 22.1 million gamers versus 14 million in Italy, with similar revenues (Spain: US \$2.6–2.7 billion; Italy: US \$2.5 billion; Steininger, 2025; Video Games Europe, 2025; Visual Capitalist, 2025). In the general population, IGD prevalence has been estimated at 2.6% in Spain and 1.4% in Italy (Di Carlo et al., 2023; Fuster et al., 2016). Among Spanish adolescents, prevalence estimates seem comparable to those reported in young adults (adolescents: 1.9%–8.3%; Buiza-Aguado et al., 2018; young adults: 2.3%–8.3%; Sprong et al., 2022). In Italy, studies on young adults have focused on university students, with prevalence estimates ranging from 5.3% to 14.9% (De Pasquale et al., 2020; 2018). Given these differences, targeted research is needed to better understand IGD in both countries.

However, prevalence differences alone cannot explain why some individuals develop IGD while others do not, highlighting the need to examine psychological and social mechanisms that could shape vulnerability. Recent reviews have highlighted several gaming-related factors linked to IGD, such as the amount of time spent playing and exposure to violent content (Ji et al., 2021; Zhuang et al., 2023). Likewise, specific gaming motivations have been linked to the occurrence of IGD. Key motivations for gaming, including avoiding negative feelings, escapism, and coping mechanisms, are significantly associated with IGD symptoms (Bäcklund et al., 2022; Wang et al., 2022). Additionally, motivations related to social interaction, achievement, and competition also play a role (Ji et al., 2021; Ropovick et al., 2023). In college populations, motivations like competition, escape, and fun have been linked to IGD (Biegun et al., 2021). Thus, these

findings suggest that gaming motivations constitute a central psychological factor in understanding individual vulnerability to IGD.

Beyond gaming motivations, the social environment of gaming communities may also influence IGD. Studies suggest that perceptions of interdependence and power dynamics within online communities can foster both prosocial and toxic behaviors (Zhu et al., 2022). Toxic gaming environments—characterized by hostility, exclusion, or harassment—can exacerbate stress and negatively impact players’ mental health and well-being (Gandolfi et al., 2023; Zhu et al., 2022). It is crucial to understand the interaction between motivational, behavioral, and social-contextual factors to thoroughly investigate the elements associated with IGD.

Several individual variables are significantly related to IGD. Impulsiveness is positively linked to IGD, possibly due to impaired cognitive functions and reduced ability to defer gratification from gaming (Ji et al., 2021). In contrast, higher self-control is negatively related to IGD development. Social support plays a protective role, helping individuals manage stress and emotional challenges linked to gaming (Ji et al., 2021; Ropovick et al., 2023; Zhuang et al., 2023). Additionally, emotional intelligence (EI)—understood as the ability to perceive, understand, and regulate one’s own emotions as well as those of others—has been identified as a protective factor against maladaptive gaming behaviors. Individuals with lower EI may experience higher psychological distress and use gaming to regulate their emotions, thereby increasing their vulnerability to IGD (Kircaburun et al., 2019; Gisbert-Pérez et al., 2024).

International research showed cross-national variability in the prevalence and correlates of IGD (Van Der Neut et al., 2023; Stevens et al., 2021). Gaming motives and personality traits have been found to vary across countries (López-Fernández et al., 2024), and cultural orientations shape pathways to IGD (Chew et al., 2024). Varchetta et al.

(2024) also stressed the importance of examining differences in Internet-related disorders across both similar and diverse cultures. Meta-analytic findings indicate that variability in IGD estimates often increases among different assessment instruments and methodological approaches (Stevens et al., 2021). Considering this evidence, comparing Spain and Italy offers a unique contribution by examining IGD within two culturally similar yet distinct European contexts, reducing broad cultural confounds while highlighting meaningful cross-national variation.

Aim of the study

The increasing prevalence of IGD in young adults, the variations between countries, and the study of risk factors at the community level suggest a need for specific research on IGD prevalence and related factors in a particular age group and geographic locations. Therefore, the main objectives of this study were (1) to explore the prevalence of IGD in Spanish and Italian university students, (2) to compare the relationship between IGD and potential risk and protective factors in Spain and Italy, and (3) to examine the relationship between the predictor variables and the probability of developing IGD in Spain and Italy. Based on the abovementioned literature, the following hypotheses were proposed:

H1. The prevalence of IGD among university students is higher in Spain than in Italy.

H2. The relationships between gaming time and toxicity and IGD will be statistically significant in Spain and Italy.

H3. The relationships between gaming mode and motivations and IGD will be statistically significant in Spain and Italy.

H4. The relationship between psychological variables (impulsivity, emotional intelligence, perceived social support) and IGD differs between Spain and Italy.

H5. The variables that predict IGD among university students differ between Spanish and Italian university students.

Materials and Methods

Sample and procedure

A quantitative cross-sectional research design was conducted through an online survey distributed in college classes in 2022-2024. A non-probabilistic convenience sampling was used. This sampling method was chosen due to the accessibility and availability of participants within the university environment. The recruitment process was initiated through on-site invitations during face-to-face lessons of students in different undergraduate courses. All eligible students were invited to participate voluntarily. No incentives were provided to avoid self-selection bias. To mitigate social desirability bias, participants were assured anonymity in their responses. Participants provided informed consent before data collection. The research adhered to the Declaration of Helsinki and its subsequent amendments and received approval from the Institutional Review Board of the University of Valencia (protocol no. 2023-MAG-2988759) and the University of Torino (protocol no. 0592473) for the Spanish and Italian research, respectively.

The study targeted the university community, focusing on Spanish and Italian-speaking students aged 18 and older. A total of 798 Spanish participants (average age: 21.48) and 717 Italian participants (average age: 22.15) were recruited. Among them, 67.2% of the Spanish sample and 49.4% of the Italian sample identified as female. Additionally, 64.3% of Spanish participants and 59.3% of Italian participants were exclusively students, while 34.5% of the Spanish sample and 56.1% of the Italian sample reported playing video games.

Measures

The online survey for both Spanish and Italian samples collected the following information. Supplementary Table A1 shows reliability coefficients (Cronbach's alpha and McDonald's omega) of all study instruments in both samples. A pilot study was conducted with a small sample of participants ($n = 10$) with those scales that lacked prior validation in Spanish or Italian. The aim was to assess the content validity of the items and to evaluate their clarity and comprehensibility. Participant feedback was collected and analyzed, allowing refinement of item wording to optimize interpretability and reduce potential measurement error before the main data collection.

Sociodemographic and gaming-related data. Participants provided their age, gender, and current activity (studying, working, or both). Participants also answered questions about gaming hours, community toxicity levels, and gaming mode (alone, with family/ friends, acquaintances, or strangers).

Gaming motivations. The Motives in Video Game Use scale (e-MUV; López-Fernández et al., 2019). The e-MUV comprises 32 items, assessed on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). These items measure eight dimensions of gaming motives: Immersion (items 1-4), Customization (items 5-8), Violent gratification (items 9-12), Coping (items 13-16), Fun (items 17-20), Cognitive challenge (items 21-24), Competition (items 25-28), and Social interaction (items 29-32). Higher scores within each dimension indicate a greater significance of gaming motivation. The Spanish version (Gisbert-Pérez et al., 2025) has been validated in university students, whereas the Italian version was translated and evaluated following Wild et al.'s (2005) standardized procedure. The Spanish version has been validated in university students (Gisbert-Pérez et al., 2025). The Italian version was translated and

assessed by native speakers using the standardized procedure outlined by Wild et al. (2005), and a pilot study was conducted to evaluate the items.

Internet gaming disorder. The Internet Gaming Disorder Scale (IGDS; Lemmens et al., 2015) was administered. This scale contains 9 items using a 6-point Likert-type scale ((0) *never*, (1) *one to four times in the last year*, (2) *five to 11 times in the last year*, (3) *about once to three times a month*, (4) *once or more a week*, and (5) *every day or almost every day*). A criterion was considered met when participants answered the question with a score of 4 or 5, and those with a score of 4 or 5 in more than five items are considered disordered gamers (Lemmens et al., 2015). Likewise, the approach of Evren et al. (2017), which considered response options 3 to 5 as fulfilled criteria, was also contemplated. IGDS was translated into Spanish and Italian and evaluated using the backward-forward translation method, following the eight steps reported by Wild et al. (2005), and a pilot study was conducted to evaluate the items.

Impulsive behavior. The short Impulsive Behavior Scale (UPPS-P; Billieux et al., 2012; Spanish short version of Cándido et al., 2012; Italian short version of D’Orta et al., 2015) consists of 20 items that measure five impulsivity traits (4 items each), namely, Negative urgency (NU; items 4, 7, 12 and 17), Lack of premeditation (LPM; items 1, 6, 13 and 19), Lack of perseverance (LPS; items 5, 8, 11 and 16), Sensation seeking (SS; items 3, 9, 14 and 18) and Positive urgency (PU; items 2, 10, 15 and 20). Higher scores indicate higher general or specific traits of impulsivity. The Spanish version (Cándido et al., 2012) has been validated in populations aged 18–45 in Spain, whereas the Italian version (D’Orta et al., 2015) has been validated in populations aged 17–69 in Italy.

Perceived social support. The Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1998; Spanish version of Santos-Vega et al., 2021; Italian version of Di Fabio & Bussoni, 2008) comprises 12 items that measure three dimensions

of perceived social support: 1) perceived family support (items 1-4), 2) perceived peer support (items 5-8), and 3) support from significant others (items 9-12). The items have a four-point Likert-type response scale ranging from (1) *never or almost never* to (4) *always or almost always*. Higher scores indicate higher perceived social support. The MSPSS has been validated in Spanish and Italian university populations (Gisbert-Pérez et al., 2025; Di Fabio & Busoni, 2008).

Emotional intelligence. Wong and Law's Emotional Intelligence Scale (WLEIS, Wong & Law, 2002; Spanish version of Extremera et al., 2019; Italian version of Iliceto & Fino, 2017) considers EI as Mayer and Salovey's (1997) definition, that is, a set of interrelated skills related to "the ability to accurately perceive, appraise, and express emotion; the ability to access and/or generate feelings when they facilitate thinking; the ability to understand emotion and emotional knowledge; and the ability to regulate emotions to promote emotional and intellectual growth". This scale consists of 16 items that assess four aspects of EI: appraisal of one's own emotions (SEA, items 1,5,9,13), appraisal of others' emotions (OEA, items 2,6,10,14), emotion awareness (EA, items 3,7,11,15), and emotion regulation (ER, items 4,8,12,16). Responses are given using a seven-point Likert scale, ranging from (1) *totally disagree* to (7) *totally agree*. Higher scores indicate higher emotional intelligence ability. The WLEIS has been validated in Spanish and Italian adult populations (Extremera et al., 2019; Iliceto & Fino, 2017).

Statistical analysis

Frequencies and percentages were used to describe categorical variables and mean and standard deviation were used to describe quantitative variables. We estimated the prevalence of IGD among gamers using IGDS scores, based on DSM-5 criteria. The univariate skewness and kurtosis values for all the variables analyzed were within the conventional normality criteria (-2 to 2 for skewness and -7 to 7 for kurtosis; George &

Mallery, 2010; Hair et al., 2010). The Pearson chi-squared test was employed to analyze the correlations of categorical variables with IGD and Cramer's V was used as effect size measure. To evaluate whether sex imbalance could affect group comparisons, differences in sex distribution between participants with and without IGD were assessed using a chi-square test of independence. The Pearson correlation test was applied to evaluate correlations between quantitative variables. Finally, a forward selection binary logistic regression analysis using the LR method was performed to identify key predictors of IGD (Silva and Barroso, 2004). Variables that were found statistically significantly correlated with IGD were included as independent variables. To analyze the fit of the logistic regression model, different tests were used (Hahs-Vaughn & Lomax, 2020): (1) for the overall model fit we used the χ^2 test for statistical significance of the model using the change in deviance ($-2LL$); (2) for the goodness of fit of the model we used the Hosmer-Lemeshow test and the substantive significance of the model or pseudovariance explained using Nagelkerke's R^2 index; and (3) to analyze the predictive ability of the model we used the correct classifications made by the model (measures of accuracy). To determine whether the regression coefficients of the independent variables were statistically significantly different from 0, the Wald statistic was used. In addition, the Odds Ratio (OR) index and its 95% confidence interval were estimated as a measure of the effect size, which tests the hypothesis that the effect of the independent variable at the population level is different from the null effect ($OR = 1$). A priori sample size calculation was estimated using G*Power, which yielded a minimum sample size of $n = 269$ ($\alpha = 0.05$, power = 0.80, event probability = 0.1). IBM SPSS Statistics 28.0 was used to calculate all the analyses.

Results

Estimated prevalence of Internet gaming disorder in university students

The estimated prevalence of IGD among Spanish ($n = 798$) and Italian university students ($n = 717$) was 2.1% and 2.4%, respectively, based on IGDS scores (Lemmens et al., 2015). Individuals were classified as having IGD if they responded (4) "once or more a week" or (5) "every day" to at least five of nine items from the DSM-5 criteria. Among current gamers ($n = 275$ for Spain, and $n = 402$ for Italy), the prevalence was higher: 6.1% in Spain and 4.0% in Italy. When considering those who answered (3) "once to three times a month," the prevalence increased to 3.5% in the Spanish general sample (10.2% in gamers) and 3.9% in the Italian sample (6.5% in gamers). Statistically significant differences in gaming modes were observed between IGD and non-IGD gamers, but varied across samples and IGD approaches. Non-significant differences in gender and current activity were found between non-IGD and probable IGD gamers in both countries.

Potential risk factors of Internet gaming disorder

Sociodemographic and gaming-related factors in Spanish university students

Age was not significantly correlated with IGD ($r = -.019$, $p = .749$). Statistically significant differences were found in gaming modes: playing with acquaintances ($\chi^2(1) = 16.813$, $p < .001$, $z_{IGD} = -4.1$, *Cramer's V* = .247), and playing with strangers ($\chi^2(1) = 26.382$, $p < .001$, $z_{IGD} = -5.1$, *Cramer's V* = .310). Higher scores on IGDS were statistically significantly correlated with more gaming hours per week ($r = .389$, $p < .001$), and playing in toxic communities ($r = .309$, $p < .001$; Table 2). Regarding motivations, IGDS scores were significantly correlated with Violent Gratification ($r = .245$, $p < .001$), Coping ($r = .336$, $p < .001$), Cognitive challenge ($r = .142$, $p = .019$), Competition ($r = .247$, $p < .001$), and Social interaction ($r = .234$, $p < .001$; Table 3).

Table 1

Characteristics of the Spanish gamer subgroups based on IGD criteria (n = 275)

	Answers 4/5 as criterion met					Answers 3/4/5 as criterion met				
	Non-IGD (n=258)	IGD (n=17)	χ^2	df	V	Non-IGD (n=247)	IGD (n=28)	χ^2	df	V
M Age (SD)	21.70 (2.95)	20.82 (2.48)				21.64 (2.94)	21.64 (2.83)			
Gender (% female)	37.6	47.1	.71	1	.05	38.9	32.1	.54	1	.04
Current act. (% study and work)	24.0	17.6	3.36	3	.11	24.7	14.1	2.15	3	.08
Mode Gaming										
Alone	70.5	64.7	.26	2	.03	70.9	64.3	.51	1	.04
Family/Friends	58.5	64.7	.25	1	.03	58.7	60.7	.04	1	.01
Acquaintances	11.6	47.1	16.81*	1	.24	11.7	32.1	8.7*	1	.17
Strangers	10.1	52.9	26.38*	1	.31	10.1	35.7	14.8*	1	.23
M(SD) H/w gaming	3.93 (1.82)	5.12 (1.53)				3.93 (1.84)	4.64 (1.62)			

Note. M = Mean; SD = Standard deviation; χ^2 = chi-square test statistic; df = degrees of freedom; V = Cramer's V (effect size estimate); Current act. = Current activity; H/w = hours per week. Statistically significant results ($p < .05$) are marked with an asterisk (*).

Table 2

Characteristics of the Italian gamer subgroups based on IGD criteria (n = 402)

	Answers 4/5 as criterion met					Answers 3/4/5 as criterion met				
	Non-IGD (n=385)	IGD (n=17)	χ^2	df	V	Non-IGD (n=376)	IGD (n=28)	χ^2	df	V
M Age (SD)	22.89 (3.67)	21.25 (2.76)				22.89 (3.69)	21.88 (3.02)			
Gender (% female)	31.3	12.5	2.57	1	.07	31.6	15.4	.46	1	.03
Current act. (% study and work)	18.4	37.5	3.96	3	.09	18.6	26.9	.81	3	.04
Mode Gaming										
Alone	53.9	43.8	.63	1	.04	54.0	46.2	.854	1	.04
Family/Friend	36.5	31.3	.18	1	.02	37.0	26.9	.588	1	.04
Acquaintances	6.7	18.8	3.31*	1	.09	6.4	19.2	.068	1	.01
Strangers	2.8	6.3	.61	1	.03	2.7	7.7	.027	1	.01
M(SD) H/w gaming	4.86 (1.93)	5.81 (1.55)				10.36 (9.30)	18.15 (12.7)			

Note. M = Mean; SD = Standard deviation; χ^2 = chi-square test statistic; df = degrees of freedom; V = Cramer's V (effect size estimate); Current act. = Current activity; H/w = hours per week. Statistically significant results ($p < .05$) are marked with an asterisk (*).

Sociodemographic and gaming-related factors in Italian university students

Age was not significantly correlated with IGD ($r = .027, p = .585$). Higher scores on IGDS were statistically significantly correlated with more gaming hours per week ($r = .386, p < .001$), and gaming with more toxic gamer communities ($r = .215, p < .001$). Regarding gaming motivations, IGDS scores were statistically significantly correlated with all gaming motivations: Immersion ($r = .260, p < .001$), Customization ($r = .136, p = .006$), Violent Gratification ($r = .240, p < .001$), Coping ($r = .391, p < .001$), Fun ($r = .138, p = .006$), Cognitive challenge ($r = .261, p < .001$), Competition ($r = .262, p < .001$), and Social interaction ($r = .208, p < .001$; Table 3).

Table 3

Correlations between IGD and gaming-related factors

		HG	TOX	IMM	CUS	VIO	COP	FUN	CHAL	COMP	SOC
Spanish sample ($N = 275$)											
IGDS	r	.389*	.309*	.094	-.027	.245*	.336*	-.054	.142*	.247*	.234*
Italian sample ($N = 402$)											
IGDS	r	.386*	.215*	.260*	.136*	.240*	.391*	.138*	.261*	.262*	.208*

Note. IGDS = Internet Gaming Disorder Scale; HG = Gaming hours/week; TOX = Toxicity; IMM = Immersion; CUS = Customization; VIO = Violent Gratification; COP = Coping; FUN = Fun; CHAL = Cognitive Challenge; COMP = Competition; SOC = Social Interaction. Statistically significant results ($p < .05$) are marked with an asterisk (*).

Psychological risk factors in Spanish university students

Non-statistically significant correlations were found between higher scores on IGDS and higher general impulsivity. Regarding impulsivity dimensions, higher levels of lack of premeditation ($r = .162, p = .007$) and lack of perseverance ($r = .120, p = .047$) statistically significantly correlated with higher IGD scores (Table 4). Thus, only specific impulsive tendencies —acting without thinking and difficulties persisting in tasks— showed meaningful associations with IGD in the Spanish sample.

Psychological risk factors in Italian university students

Statistically significant correlations were found between IGDS scores and impulsivity levels ($r = .277, p < .001$). Regarding impulsivity dimensions, higher levels of negative urgency ($r = .184, p < .001$), lack of perseverance ($r = .152, p = .002$), sensation seeking ($r = .110, p = .028$), and positive urgency ($r = .334, p < .001$) statistically significantly correlated with IGD scores. Non-statistically significant differences were found between lack of premeditation and IGD scores ($r = .027, p = .587$; see Table 4). Thus, impulsivity correlates with IGD among Italian gamers, particularly emotion-driven impulsivity.

Table 4

Correlations between IGD and psychological factors

Variables	Correlation with IGDS in the Spanish sample ($n = 275$)	Correlation with IGDS in the Italian sample ($n = 402$)
Emotional Intelligence	-.183*	-.033
SEA	-.122*	-.042
OEA	-.187*	-.018
EA	-.094	-.057
ER	-.157*	-.009
Impulsivity	.117	.277*
NU	.026	.184*
LPM	.162*	.027
LPS	-.120*	.152*
SS	-.028	.110*
PU	.040	.208*
Perceived Social Support	-.194*	-.142*
FA	-.120*	-.120*
PE	-.168*	-.157*
OS	-.194*	-.118*

Note. IGDS = Internet Gaming Disorder Scale; SEA = appraisal of one's own emotions; OEA = appraisal of others' emotions; EA = emotion awareness; ER = Emotion regulation; NU = Negative urgency; LPM = Lack of premeditation; LPS = Lack of perseverance; SS = Sensation seeking; PU = Positive urgency; FA = Perceived family support; PE = Perceived peer support; OS = Perceived support of significant others.

Potential psychosocial protective factors of Internet gaming disorder in Spanish university students

Statistically significant correlations were found between IGDS scores and perceived social support ($r = -.194, p = .001$) and emotional intelligence ($r = -.183, p = .002$). Regarding emotional intelligence dimensions, negative statistically significant correlations were found between IGDS and SEA scores ($r = -.122, p = .043$), OEA ($r = -.187, p = .002$), and ER ($r = -.157, p = .009$; Table 3). Thus, stronger emotional abilities and higher perceived support may protect against IGD in Spanish students.

Potential psychosocial protective factors of Internet gaming disorder in Italian university students

Statistically significant correlations were found between higher scores on IGDS and perceived social support ($r = -.142, p = .004$). Regarding emotional intelligence, no statistically significant correlations were found between IGDS scores ($r = -.033, p = .514$) and any specific dimensions or general emotional intelligence (SEA: $r = -.042, p = .404$; OEA: $r = -.018, p = .719$; EA: $r = -.057, p = .255$; ER: $r = -.009, p = .854$). Thus, emotional abilities do not play a substantial role in IGD among Italian students, although lower perceived social support appears to contribute modestly to IGD.

Predictors of IGD in university students

To summarize, in the Spanish sample, IGD was associated with higher gaming time, participation in toxic gaming communities, playing with acquaintances and strangers, several gaming motivations, specific impulsivity dimensions, and lower emotional intelligence and perceived social support. In the Italian sample, IGD was associated with higher gaming time, toxic community involvement, all gaming motivations, multiple impulsivity dimensions, and lower perceived social support.

Since statistically significant differences were found between the Spanish and Italian non-IGD and probable IGD gamers, two binomial logistic regression analyses were performed using the Forward Selection: LR method to evaluate the relationship between the predictor variables and the probability of developing IGD. Tables 5 and 6 display the results of the model fit measurements for both samples.

Table 5

Variable selection process: Measures of global adjustment of the models in Spanish gamers (n = 275)

	-2LL	χ^2	df	R^2 Cox y Snell	R^2 Nagelkerke	Accuracy
Model 0	147.217	-	-	-	-	93.8
Model 1	109.985	17.455**	1	.062	.166	93.8
Model 2	101.333	26.106**	2	.091	.244	93.4
Model 3	97.411	30.029**	3	.104	.279	93.4

Note. df = degrees of freedom of χ^2 . ** $p < .001$

Model 0 (Intercept-only model) = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \varepsilon$

Model 1 (Model 0 + play with strangers) = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \beta_1 \text{Play with strangers} + \varepsilon$

Model 2 (Model 1 + Emotional Intelligence) = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \beta_1 \text{Play with strangers} + \beta_2 \text{Emotional Intelligence} + \varepsilon$

Model 3 (Model 2 + Impulsivity dimension) = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \beta_1 \text{Play with strangers} + \beta_2 \text{Emotional Intelligence} + \beta_3 \text{Lack of forethought} + \varepsilon$

Table 6

Variable selection process: Measures of global adjustment of the models in Italian gamers (n = 402)

	-2LL	χ^2	df	R^2 Cox y Snell	R^2 Nagelkerke	Accuracy
Model 0	177.327	-	-	-	-	96.0
Model 1	119.788	14.730**	1	.036	.127	96.0
Model 2	113.381	21.137**	2	.051	.180	96.0

Note. Df = degrees of freedom of χ^2 . ** $p < .001$.

Model 0 (Intercept-only model) = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \varepsilon$.

Model 1 (Model 0 + Impulsivity dim) = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \beta_1 \text{Positive Urgency} + \varepsilon$.

Model 2 (Model 1 + Perceived Social Support dimension) = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \beta_1 \text{Positive Urgency} + \beta_2 \text{Hours of Gaming} + \varepsilon$.

Spanish predictors of IGD

For the first step of the regression analysis, playing with strangers (model 1) was selected; its incorporation in the model entailed a statistically significant reduction in the misfit of the null model ($\chi^2(1) = 17.455, p < .001$). In the second step, the variable general emotional intelligence (model 2) was selected and led to a statistically significant reduction in misfit concerning model 1 ($\chi^2(2) = 26.106, p < .001$). In the third and final step, the variable lack of premeditation (model 3) was selected and led to a statistically significant reduction in misfit regarding model 2 ($\chi^2(3) = 30.029, p < .001$). These improvements in model fit were also seen in the increase in the pseudovariance statistics explained by the models (R^2) and in the accuracy of the models (total percentage of cases correctly classified in each model). This better fit was verified by Hosmer and Lemeshow's test, which was not statistically significant (model 1: $\chi^2(8) = 7.009, p = .536$; model 2: $\chi^2(8) = 10.480, p = .233$). The Nagelkerke R^2 coefficient indicated that the independent variables included in the model explain approximately 27.9% of the variability in the probability of having IGD.

Table 7 shows regression coefficients. For playing with strangers, the regression coefficient ($\beta = 2.30$) and odds ratio ($OR = 9.95, 95\% \text{ CI: } 3.30, 29.99$) indicate that gamers who play with strangers are 9.95 times more likely to develop IGD compared to those who do not. Playing with strangers was the strongest predictor of IGD in the Spanish sample. For lack of premeditation, controlling for the influence of playing with strangers, the regression coefficient ($\beta = .18$) and odds ratio ($OR = 1.20, 95\% \text{ CI: } 0.997, 1.436$), suggesting that each unit increase raises the odds of IGD by 1.19%. Thus, lack of premeditation showed only a marginal effect. For emotional intelligence, controlling for the influence of playing with strangers and lack of premeditation, the regression coefficient ($\beta = -.064$) and odds ratio ($OR = 0.94, 95\% \text{ CI: } 0.901, .978$) indicate that each

unit decrease increases the odds of IGD by 0.64%. Lower emotional intelligence has also been associated with an increased risk of IGD in the Spanish sample, suggesting that difficulties in understanding and regulating emotions may contribute to greater vulnerability.

Table 7

Results of the final binary logistic regression model for predicting IGD in Spanish gamers (n = 275)

	β	<i>SE</i>	<i>df</i>	<i>Wald</i>	<i>p-value</i>	<i>OR</i>	95% CI for <i>OR</i>	
							LL	UL
Play with strangers	2.298	0.563	1	16.671	<.001	9.954	3.303	29.998
Lack of premeditation	.179	0.093	1	3.713	.054	1.196	0.997	1.436
Emotional Intelligence	-.064	0.021		9.251	.002	0.938	0.901	0.978
Intercept	-.287	1.680	1	0.029	.011	0.751		

Note. β = regression coefficient. *SE* = Standard Error. *df* = degrees of freedom of Wald test. *p* = probability value associated with the Wald test. *OR* = Odds Ratio. 95% CI = 95% Confidence Interval for *OR*. LL = Lower limit. UL = Upper limit.

Italian predictors of IGD

In the first step of the regression analysis, Positive Urgency (model 1) was selected; its incorporation in the model entailed a statistically significant reduction in the misfit of the null model ($\chi^2(1) = 14.730, p < .001$). In the second and final step, the variable hours of gaming per week (model 2) was selected, leading to a statistically significant reduction in misfit concerning model 1 ($\chi^2(2) = 21.137, p < .001$). These improvements in model fit were also reflected in the increase in the pseudovariance statistics explained by the models (R^2). This better fit was verified by Hosmer and Lemeshow's test, which was not statistically significant (model 1: $\chi^2(7) = 5.040, p = .655$; model 2: $\chi^2(8) = 4.689, p = .790$). The Nagelkerke R^2 showed the model explained about 18% of the variability in IGD probability.

Table 8 includes regression coefficients. For each additional hour of gaming, the odds of developing IGD increase by 5.3% ($\beta = .052$, $OR = 1.053$, 95% CI: 1.013, 1.095). In the Italian sample, IGD risk increased with greater daily gaming time, with each additional hour contributing to a higher likelihood of IGD. Each unit increase in positive urgency raises the odds by 40.4% ($\beta = .339$, $OR = 1.404$, 95% CI: 1.150, 1.714). Positive urgency was also a strong predictor, indicating that individuals who act impulsively when experiencing positive emotions are substantially more likely to develop IGD in the Italian sample.

Table 8

Results of the final binary logistic regression model for predicting IGD in Italian gamers (n = 402)

	β	SE	df	Wald	p-value	OR	95% CI for OR	
							LL	UL
Hours of gaming	.052	0.020	6.877	1	.009	1.053	1.013	1.095
Positive Urgency	.339	0.102	11.118	1	<.001	1.404	1.150	1.714
Intercept	-7.624	1.280	35.505	1	<.001	0.000		

Note. β = regression coefficient. *SE* = Standard Error. *df* = degrees of freedom of Wald test. *p* = probability value associated with the Wald test. *OR* = Odds Ratio. 95% CI = 95% Confidence Interval for *OR*. LL = Lower limit. UL = Upper limit.

Summary of results

IGD prevalence was similarly low in both countries, yet the pattern of associated factors differed. While intensive gaming behavior appeared relevant in both groups, the strongest predictors varied by country. Playing with strangers, lower emotional intelligence, and low premeditation characterized Spanish IGD risk, whereas positive urgency and gaming time were the most salient predictors among Italian students. These cross-national differences suggest that IGD may involve shared behavioral risks but distinct psychological mechanisms.

Discussion

This study aims to explore the prevalence of gaming disorder in the Spanish and Italian university population, to compare risk and protective factors, and to examine which factors are shown to predict IGD in both countries.

The first objective of this study was to explore the prevalence of IGD in both samples. Contrary to H1, results estimated a 2.1% and 2.4% IGD prevalence in the Spanish and Italian university samples. These results are low compared to previous studies (3.3-4.18% in Spanish samples, and 15% in an Italian sample; De Pasquale et al., 2020; Mora-Salgueiro et al., 2022; Jiménez Tallón et al., 2011). IGD is more prevalent among males than females (Fam, 2018). This Spanish sample had a higher percentage of females (67%), which may have influenced the lower IGD rates. The estimated prevalence was also lower compared to studies using similar samples from other countries, such as among Chinese university students (5.5% and 6.4%, respectively; Shi et al., 2020; Li et al., 2020). However, when considering only current gamers, the prevalence increased to 6.1% and 4%, which aligns with findings from other research indicating higher IGD rates among active gamers (Borges et al., 2019). In this line, Varchetta et al. (2024) showed lower levels of IGD in Italy compared to Spain. These differences underscore the importance of considering sample characteristics such as geographic location, the proportion of gamers, and gender distribution.

The second objective was to compare the relationship between IGD and potential risk and protective factors in both countries. First, gaming time emerged as an important predictor. In both groups, gaming time was positively correlated with IGD, supporting H2. This aligns with King et al. (2017), who found that high-risk IGD adolescents spent significantly more time gaming with strangers than general gamers (32.6% vs. 7.9%). Meta-analyses have similarly shown that gaming time is one of the strongest predictors

of IGD (Ji et al., 2022; Zhuang et al., 2023). Second, some gaming patterns were also correlated in both samples. Playing with acquaintances and participating in more toxic gaming communities were significant risk factors in both samples, supporting H2 and partially rejecting H3. These findings are consistent with previous literature on adolescents and young adults. On one hand, young people may use video games to socialize anonymously with strangers to avoid the perceived risks of interacting with real-world peers (e.g., bullying or exclusion; Lo et al., 2005), and games can satisfy affiliation needs (Cole et al., 2007). Social elements of gaming may also encourage prolonged gaming sessions, contributing to excessive use (Longman et al., 2009). On the other hand, earlier research indicates that exposure to toxicity in gaming environments predicts IGD (Gandolfi et al., 2023). Intensive gaming may be associated with lower social skills and more disruptive behaviours (Prescott et al., 2018), although the direction of this relationship remains unclear. Greater exposure to toxic communities may foster higher toxicity and poorer social skills, leading to increased reliance on in-game social interactions (Bandura, 2001; Gandolfi et al., 2023). However, one cross-national difference in gaming mode emerged, partially confirming H3. While gaming-related risk patterns were similar across the two samples, playing with strangers was a significant predictor only in the Spanish sample. This suggests that social gaming dynamics may differ between countries and that this pattern may require specific preventive attention in Spain.

As expected in H3, differences were found in the relationship between gaming motivations and IGD across samples. Several gaming motivations—such as violent gratification, competition, coping, cognitive challenge, and social interaction—were significantly correlated with higher IGD scores in both samples, suggesting that specific motivations can increase the risk of developing IGD. However, all gaming motivations

were statistically significantly related to IGD in the Italian sample. Meta-analytic evidence indicates that while various motives are statistically associated with gaming disorder, most effect sizes are small to moderate and show significant variability across different populations and settings (Bäcklund et al., 2022). This underscores the importance of being cautious when interpreting any single motive as a strong standalone risk factor. Understanding motivational patterns is valuable in clinical and preventive settings, as identifying students driven by specific motivations can help detect early vulnerabilities to IGD. Additionally, this highlights the need to consider how combinations of motives, rather than isolated ones, influence risk profiles in different contexts (Bäcklund et al., 2022; López-Fernández et al., 2020).

Competitiveness was significantly linked to IGD, similar to gambling disorder (Bäcklund et al., 2022). Gamblers with higher competitiveness are less accepting of defeats and exhibit recurrent gambling patterns. Similarly, competitive gamers may struggle to accept defeat and prioritize gaming over other responsibilities. Recent research indicates that competitive game modes are associated with increased gaming disorder symptoms, highlighting a potential interaction between personal competitiveness and design-game features such as ranking systems and leaderboards (Flayelle et al., 2025). Therefore, competitiveness should be considered as part of a broader risk configuration.

Emotional escape motivation was associated with IGD. Research indicates that coping motivations may mediate the link between psychiatric distress, social anxiety, loneliness, and IGD symptoms (Bäcklund et al., 2022; Maroney et al., 2019). This suggests individuals using gaming to avoid negative emotions often struggle with effective coping strategies, leading to gaming as a maladaptive coping mechanism (Di Blasi et al., 2019; Bäcklund et al., 2022). Systematic reviews indicate that escapism and avoidance coping are linked to problematic gaming (Melodia et al., 2022; Sinha et al.,

2024), but there is a lack of longitudinal evidence, leaving causality unclear. Therefore, high emotional escape motivations may increase vulnerability to IGD or result from existing emotional difficulties.

Cognitive-challenge motivation was linked to IGD in this study. Previous studies did not identify it as a factor directly related to IGD (López-Fernandez et al., 2019), although achievement- and performance-oriented motives (e.g., mastery, progression) have shown consistent associations with IGD symptoms (Bäcklund et al., 2022; Wang & Cheng, 2022). Games that present mastery challenges can encourage cognitively challenged gamers to continue playing by fostering feelings of accomplishment. However, this pattern may indicate intense engagement rather than pathology in some gamers.

Social interaction motivations were also associated with IGD. Previous literature showed that social gaming motivations are associated with gaming time (Wu et al., 2017) and IGD symptomatology (Männikkö et al., 2016). Gamers may find social acceptance in gaming communities, leading to increased gaming habits (King et al., 2014). Complementarily, social support seems to be a protective factor against IGD (Zhuang et al., 2023). Thus, people with less perceived social support in real life may use gaming to meet people, spending more time on these activities than on other social activities. Narrative evidence highlights that the social context surrounding gaming —such as the norms, expectations, and dynamics within gaming groups —plays a crucial role in the development and maintenance of problematic gaming (Gelūnas et al., 2025). Social motives can be protective when part of supportive offline networks, but may pose risks when gaming communities are the primary social connection.

Fun, immersion, and customization motives have also been linked to IGD in the present Italian sample. In the case of fun motivation, it has been linked to a higher

frequency of gaming (López-Fernández et al., 2020), which can generate excessive gaming patterns (Bäcklund et al., 2022). In the case of immersion and customization, they are related to game elements itself, and their relationship with IGD is weaker compared to coping motives (Deleuze et al., 2015; Wang & Cheng, 2022). Consistent with this, recent meta-analytic work indicates that achievement and escape motives tend to show stronger associations with IGD than purely hedonic or customization-related motives (Bäcklund et al., 2022). The fact that fun, immersion, and customization emerged only in the Italian sample may reflect cultural or contextual differences in how students engage with games or sample-specific characteristics, and should therefore be interpreted cautiously rather than as universal risk factors. Results support the view that IGD is influenced by gaming-related, individual, and environmental factors (Wang & Cheng, 2022).

According to H4, differences in psychological variables related to IGD were observed between samples. In the Spanish sample, emotional intelligence and perceived social support were found to be protective factors against IGD, while in the Italian sample, only perceived social support played this role.

Previous research indicated that emotional intelligence and social competence are negatively associated with IGD (Gisbert-Perez et al., 2024). Difficulties in emotional regulation may increase IGD risk, as gaming can be a way to escape emotional distress (Kircaburun et al., 2019). Evidence suggests that individuals who struggle to identify, express, or modulate their emotional states may rely on gaming as an avoidant coping strategy. Studies on emotion regulation have shown that players with IGD tend to use more maladaptive strategies (e.g., emotional suppression), and that these deficits are associated with higher depression and hostility, which in turn relate to IGD severity (Estupiñá et al., 2024). These findings suggest a possible maintenance cycle whereby

emotional dysregulation promotes escapist gaming, and excessive gaming further limits opportunities to develop adaptive emotional skills, reinforcing vulnerability to IGD.

Similarly, perceived social support was previously identified as a protective factor against IGD (Malak et al., 2023; Meng et al., 2024). Among university students, lower perceived support is associated with greater IGD severity, and social support has been shown to mediate the impact of psychological distress on gaming-related problems (Malak et al., 2023). Evidence in adolescents also indicate that lower perceived support co-occurs with problematic gaming and emotional dysregulation (Uçur & Dönmez, 2021). Moreover, research comparing different gamer profiles suggests that perceived offline support (e.g., family, friends, and significant others) functions as a protective factor against behavioral addictions (Durak et al., 2023). However, the association may also operate in the opposite direction: Teng et al. (2020) propose that excessive gaming may erode offline social networks over time, thereby reducing perceived support. Consistent with this, individuals with IGD often report lower perceived support and greater loneliness (Liao et al., 2020). Together, these findings suggest that perceived social support may not only buffer against IGD development but may also be negatively affected by it, pointing to a potential bidirectional maintenance cycle.

However, the cross-country differences observed require a cautious interpretation. The lack of a protective effect of emotional intelligence in Italy may reflect sample-specific characteristics rather than structural cultural differences. For example, the Italian sample may display lower variability in emotional intelligence scores, reducing the power to detect associations. It is also possible that other unmeasured variables—such as stress, academic pressure or academic performance—moderate the relationship differently across countries (Gao et al., 2022). Considering this, strengthening emotional intelligence

in Spain and perceived social support in both countries may help prevent or reduce IGD symptoms.

A relationship between impulsivity and IGD was observed in both samples, partially rejecting H4. However, all impulsivity components correlated with IGD in Italy, while in Spain, only lack of premeditation and perseverance did. Previous studies suggest a dual relationship: higher impulsivity may result from reduced executive function linked to IGD, and IGD can lead to more impulsive decision-making (Kräplin et al., 2021; Şalvarlı & Griffiths, 2022; Zhuang et al., 2023). This suggests that individuals with higher impulsivity may struggle to control their gaming habits, particularly during IGD development (Ji et al., 2021). Recent conceptual models also indicate that impulsive traits may interact with game design characteristics, such as reward pacing or competitive structures, increasing vulnerability in certain player groups (Flayelle et al., 2025). These interactions could help explain why impulsivity showed a broader impact in Italy if participants there tended to engage more with fast-paced or competitive genres.

The third objective was to examine the predictors of IGD in both samples. Logistic regression analysis identified that playing with strangers, emotional intelligence, and lack of premeditation were key predictors in Spain, while positive urgency and hours of play were significant in Italy, supporting H5 cross-country expected differences. These findings suggest that cultural differences may influence the factors associated with IGD (O'Farrell et al., 2020; Wang & Cheng, 2022), despite both countries being individualistic cultures. Previous studies have noted differing correlates for Internet addiction between Spain and Italy, indicating that cultural attitudes towards gaming may affect IGD patterns (Varchetta et al., 2024). It should be noted that some predictors may reflect differences in gaming habits rather than true cultural contrasts. It is possible that sample composition, genre preferences, or contextual factors influenced the strength of these associations.

Overall, the results highlight that IGD predictors may differ across countries due to contextual rather than strictly cultural factors, underscoring the importance of examining risk profiles within specific national settings.

Limitations of the study

This study has several limitations. First, the sample consisted exclusively of university students obtained through convenience sampling, which may affect representativeness and introduce selection bias, limiting the generalizability of the findings. In addition, specific sample characteristics —such as the gender imbalance in the Spanish sample and the different proportions of active gamers in each country— may have influenced the observed IGD prevalence estimates. Given that IGD is more common among men and more likely to occur among regular gamers, these distributions should be considered when interpreting prevalence rates and extrapolating the findings to broader populations. Second, the cross-sectional design prevents establishing causal relationships between variables. Third, self-reported data may be influenced by biases like social desirability, impacting the accuracy of responses. In the context of IGD, a sensitive topic, respondents may feel inclined to provide socially acceptable answers or underestimate the presence of symptoms they find stigmatizing. This may result in a tendency to underreport the severity or frequency of problematic gaming behaviors. Additionally, cultural nuances in self-reporting (e.g., variations in response styles and comfort levels when discussing problematic behaviors) can differ across countries and should thus be considered when interpreting cross-national comparisons. In this study, participants were informed that anonymous questionnaires would be used and that their data would be treated confidentially, which may have mitigated some reporting concerns but does not eliminate potential bias.

Future research directions

Future research should aim to recruit gender-balanced samples to minimize sampling biases and enhance the external validity of prevalence estimates. Longitudinal and mixed-methods designs would help clarify temporal dynamics and mechanisms involved in IGD development (e.g., whether emotional dysregulation and social support deficits precede, result from, or mutually reinforce problematic gaming). Additionally, studies should incorporate techniques to detect or reduce self-report bias, ensuring more accurate self-reporting. Beyond gaming-related IGD, future work should examine other Internet or social network-related behavioral phenomena to obtain a more comprehensive picture of digital addictions. Finally, while translation of instruments was performed by native Italian and Spanish speakers, repeating the study with validated questionnaires for these populations could help determine a specific cut-off value.

Practical implications of the study

Several practical implications arise for educational and psychological contexts regarding IGD in the university context. First, student health and counselling services could incorporate brief screening components into mental health assessments that include psychosocial variables associated with IGD (e.g., emotional regulation abilities), together with gaming-related risk indicators (e.g., gaming intensity). Enhancing students' emotion regulation skills and strengthening their offline social support networks may reduce the possible cyclical dynamic of escapist gaming and social withdrawal, thereby reducing vulnerability to IGD. Students identified at higher risk could then be offered targeted counselling modules focused on emotion regulation and stress management, together with impulse-control strategies for those with urgency-driven gaming patterns. Second, universities could implement workshops to promote healthy gaming habits. These workshops would include weekly time-tracking logs, gaming–study balance plans, and

prioritizing supportive gaming social circles instead of anonymous or toxic environments. Third, strengthening social support through peer mentoring programmes or gaming clubs that emphasise cooperative play may also reduce reliance on solitary or anonymous online gaming. Universities can collaborate with student unions or gaming societies to organize gaming events that promote gaming as a socially shared activity. These targeted and context-specific strategies may support prevention and early intervention in university settings.

Conclusion

Differences in prevalence and predictors of IGD highlight the need for context-specific approaches to its prevention and treatment. Understanding these variations is crucial for accurately interpreting research findings and addressing IGD effectively. These insights also suggest that universities and campus mental health services could play a key role in implementing early screening, psychoeducation, and support initiatives targeting students at risk.

Study 11. Understanding Internet Gaming Disorder in Mexican University Students: Prevalence and Associated Factors

Gisbert-Pérez, J., Martí-Vilar, M., Chans, G. M., Badenes-Ribera, L. Understanding Internet Gaming Disorder in Mexican University Students: Prevalence and Associated Factors. (*Under review*)

Abstract

This study estimated the prevalence of Internet Gaming Disorder (IGD) among Mexican university students and identified key risk and protective factors. Using a quantitative cross-sectional design, data were collected from a convenience sample of 712 students ($M_{\text{age}} = 19.76$ years, $SD = 1.68$; 42.7% female). Pearson chi-squared tests, correlation analyses, and binomial logistic regression were employed to examine associations and predictors of IGD. The estimated prevalence of probable IGD was 2.1% in the overall sample and 5.4% among active gamers. Gaming-related factors, such as weekly gaming hours, exposure to toxic gaming communities, and motivations based on violent gratification or coping, were positively associated with IGD, as were specific impulsivity traits. Conversely, gaming for fun, perceived social support, and emotional intelligence were negatively associated with IGD. Logistic regression analysis revealed that lack of perseverance ($OR = 1.324$, 95% CI [1.056 to 1.660]) and lower perceived peer social support ($OR = 0.795$, 95% CI [0.647 to 0.977]) were statistically significantly associated with increased likelihood of IGD among Mexican gamers. These findings provide evidence for developing culturally tailored interventions in university settings to mitigate the risks associated with problematic gaming behaviors.

Keywords: Internet Gaming Disorder, Mexico, higher education, prevalence, risk factors, innovational education

Introduction

Video games have become one of the most popular forms of entertainment and social interaction worldwide. Recent global survey data indicate that approximately 79% of young adults aged 18–29 engage in gaming at least weekly, reflecting the widespread integration of gaming into daily life across regions such as North America, Europe, Asia-Pacific, and Latin America (Newzoo, 2023). Given this high level of engagement, concerns have emerged about the potential negative effects of excessive gaming, particularly the development of Internet Gaming Disorder (IGD; Saunders et al., 2017). IGD is characterized by a pattern of gaming behavior that causes significant impairment in personal, academic, or social functioning (WHO, 2019). While the gaming landscape provides new opportunities for learning, recreation, and socialization, it also poses challenges in managing the risks associated with problematic gaming behavior.

According to the Diagnostic and Statistical Manual of Mental Disorders, 5th ed., text Rev. (DSM-5-TR; APA, 2022), IGD is defined as a persistent and recurrent pattern of gaming that leads to clinically significant impairment or distress over 12 months. Diagnosis requires meeting at least five of nine criteria: (1) preoccupation with gaming; (2) withdrawal symptoms, such as irritability, anxiety, or sadness when gaming is unavailable; (3) tolerance, or the need to spend increasing amounts of time gaming; (4) unsuccessful attempts to control play; (5) loss of interest in other hobbies and activities; (6) continued excessive gaming despite awareness of psychosocial problems; (7) deception about the amount of time spent gaming; (8) using gaming to escape or relieve negative moods; and (9) jeopardizing or losing significant relationships, academic performance, or career opportunities due to gaming. IGD is included in Section III of the DSM-5-TR as a “Condition for Further Study”. Similarly, the International Classification of Diseases, 11th Revision (ICD-11; WHO, 2019) recognizes Gaming Disorder as a

behavioral pattern marked by impaired control over gaming, prioritization of gaming over other activities, and continuation despite adverse consequences. This condition may occur in both online and offline contexts and must result in substantial functional impairment.

A recent meta-analysis across 17 countries estimated the global prevalence of IGD at 3.05% (Stevens et al., 2021). Prevalence varies across regions, with higher rates reported in Asia (5.08%) and the United States (2.74%; Stevens et al., 2021; Warman, 2018). In Latin America, Mexico stands out as one of the fastest-growing gaming markets, underscoring the need to understand how IGD manifests in emerging digital contexts (Newzoo, 2024; Statista, 2024).

IGD also shows age-related variability. It commonly emerges during adolescence (Wang & Cheng, 2021), with approximately 4.6% affected (Fam, 2018), and more recent studies indicate rising prevalence among both adolescents and adults (8.8%–10.4%; Gao et al., 2022). University students represent a particularly vulnerable group (Ohayon & Roberts, 2021), as early adulthood is marked by socioemotional instability (Institute of Medicine & National Research Council, 2015), and intensive engagement with internet-connected technologies for academic, social, and leisure purposes (Adorjan et al., 2021; Sánchez-Fernández & Broda-Mas, 2023). IGD in this population has been linked to poorer academic performance and reduced social functioning (Benjet et al., 2023). Following the COVID-19 pandemic, increased screen time contributed to a rise in gaming-related problems (Saritepeci et al., 2023). Before the pandemic, IGD prevalence among Mexican university students was estimated at 5.2% (95% CI: 4.7%–5.8%; Borges et al., 2019), situated within the broader range reported internationally (3.8%–11%; Ohayon & Roberts, 2021; Chiang et al., 2022). Despite this growth, post-pandemic data on IGD in Mexico remain limited, highlighting the need for updated evidence in this population.

The pandemic also reinforced the use of video games as social tools, leading to a surge in online gaming (King et al., 2020). Although these spaces can foster social connection, popular titles such as League of Legends, Counter-Strike, and Call of Duty are often associated with toxic community dynamics. “Toxicity” encompasses antisocial and disruptive behavior directed at other players, including verbal abuse, trolling, and hateful communication in-game chats and social media (Gandolfi et al., 2023). The causes of such behavior remain uncertain but may involve increasing game difficulty and frustration (Lemercier-Dugarin et al., 2021). While early research primarily examined the role of violent content in fostering aggression, emerging evidence indicates that the social context of play may exert a stronger influence on players’ behavior than the content itself (Adachi & Willoughby, 2016). Because IGD criteria often involve manifestations of impulsivity, loss of control, and problematic social conduct (Starcevic et al., 2020), it is important to investigate how gaming community toxicity and individual gaming motivations may contribute to the development and maintenance of IGD.

Understanding how these psychosocial and motivational factors contribute to IGD can be further clarified through the Interaction of Person–Affect–Cognition–Execution (I-PACE) model (Brand et al., 2019, 2021). This model proposes that IGD results from the interplay between individual predispositions (e.g., impulsivity), affective responses (e.g., difficulties in emotion regulation, maladaptive beliefs, or coping motives), and deficits in executive control. Recent updates to the model highlight that low emotional intelligence, stress-reactive coping, and poor self-regulation increase susceptibility to problematic gaming, while reward sensitivity and habitual responding may reinforce excessive use (Frederick & Zhang, 2021).

Recent systematic reviews and meta-analyses have identified gaming motivations as significant predictors of IGD, alongside gaming time (Gao et al., 2022; Ji et al., 2021;

Wang & Cheng, 2022). In particular, coping and escapism motivations—using gaming to avoid negative emotions or to disengage from real-life stressors—are strongly associated with IGD symptoms (Bäcklund et al., 2022). Motivations related to satisfying basic psychosocial needs, such as social interaction, achievement, and the flow experience, have also shown significant correlations with IGD (Ropovik et al., 2023). Although the motivation to compete is positively linked to IGD, its association tends to be weaker than that of escapism motives (Wang & Cheng, 2022).

While the relationship between gaming motivations and IGD is well established (Kircaburun et al., 2020), psychological needs and life contexts differ considerably across developmental stages. For instance, escapism and competition motives exhibit stronger associations with IGD among adolescents than adults (Gisbert-Pérez et al., 2024). Because adolescents and university-aged individuals face distinct developmental tasks, social roles, and stressors, it is essential to identify which gaming motivations increase IGD risk within each age group.

Beyond motivational factors, several psychosocial characteristics, such as emotional intelligence, perceived social support, and impulsivity, play a key role in the onset and maintenance of behavioral addictions, including IGD. Emotional intelligence, defined as the ability to perceive, understand, and regulate one's emotions and those of others, appears to serve a protective function (Kircaburun et al., 2019). Individuals with lower emotional intelligence may experience greater psychological distress, heightening their vulnerability to maladaptive gaming behaviors (Gisbert-Pérez et al., 2024). Similarly, perceived social support is a buffer against IGD, as individuals with strong social networks are better equipped to manage daily challenges and satisfy their interpersonal needs (Ropovik et al., 2023; Wang & Cheng, 2022). Although gaming can promote new social connections (Frederik & Zhang, 2021), individuals with lower social

competence or limited offline support tend to be more susceptible to IGD (Paaßen et al., 2016).

Impulsivity has consistently shown a positive association with IGD, reflecting difficulties in inhibitory control and a preference for immediate rewards (Şalvarlı & Griffiths, 2022). Many video games provide instant feedback and gratification, which can reinforce maladaptive patterns among individuals with poor self-regulation. Moreover, deficits in executive functioning can impair impulse control and behavioral regulation, contributing to excessive gaming (Raybould et al., 2022).

Because executive functions and emotional regulation continue to mature across development, age likely moderates the relationship between psychosocial factors and IGD. Cultural context should also be considered: cross-national studies have revealed meaningful variations in the predictors of internet-related addictions (Varchetta et al., 2024). This highlights the need to examine how psychosocial and motivational correlates of IGD operate across different age groups and sociocultural settings.

Given the established association between psychosocial and gaming-related factors in the development of IGD and the particular vulnerability of university students in rapidly expanding gaming markets such as Mexico, it is crucial to examine how these variables interact in the post-pandemic context. Understanding these interactions within current sociocultural and temporal frameworks is essential for designing educational and mental health interventions tailored to local needs. Accordingly, this study was guided by the following research question: What is the prevalence of IGD among Mexican university students, and how do psychosocial and gaming-related factors associated with its presence? To address this question, the study pursued two main objectives: (1) to estimate the prevalence of IGD among Mexican university students and (2) to examine the associations between psychosocial and gaming-related factors and IGD, and to

evaluate their relative contribution to the likelihood of meeting IGD criteria. Based on prior evidence and the post-pandemic context of gaming in Mexico, we formulated the following hypotheses: (H0) the prevalence of IGD among Mexican university students would be higher than pre-pandemic estimates reported for this population; (H1) higher weekly gaming hours, greater exposure to toxic gaming communities, and playing primarily with acquaintances would be positively associated with IGD severity; (H2) coping/escapism and violent gratification motives would be positively associated with IGD, whereas (H3) gaming for fun would be negatively associated with IGD severity; (H4) higher levels of impulsivity would be associated with greater IGD severity; (H5) higher perceived social would be negatively associated with IGD; (H6) higher emotional intelligence across its components would be negatively associated with IGD; and (H7) these psychosocial and gaming-related factors would significantly predict the likelihood of meeting IGD criteria in this population.

Materials and Methods

Sample and procedure

A cross-sectional design with non-probabilistic sampling was employed. Data were collected through an online survey administered in university classrooms in Tecnológico de Monterrey (Mexico) between January and April 2025. The recruitment process began with on-site invitations during in-person classes for various undergraduate courses. A trained, standardized team researcher briefly presented the project to the students and invited them to participate voluntarily and individually. To avoid self-selection bias, no incentives were offered. To reduce social desirability bias, participants were guaranteed anonymity in their answers. Participants provided informed consent before data collection. The study followed the ethical principles of the Declaration of Helsinki (1964),

and subsequent amendments, and was approved by the Institutional Committee on Research Ethics of Tecnológico de Monterrey (protocol no. EHE-2023-08).

The target population consisted of Spanish-speaking university students aged 18 or older residing in Mexico. The final sample comprised 712 participants ($M_{\text{age}} = 19.76$, $SD_{\text{age}} = 1.68$; range: 18–30 years, 42.7% female). Regarding households' monthly income, half of the sample (49.2%) fell within the \$10,001–\$50,000 MXN range, 33.3% reported incomes above \$80,000 MXN, and 10.1% reported incomes below \$10,000 MXN. No missing data was found. To ensure data quality, cases showing invariant response patterns or straightlining, defined as responding with the same value on all items, were removed from the dataset, as such patterns are considered indicators of low response engagement.

Measures

Sociodemographic data. Participants reported their age, gender, and current activity (studying, working, or both).

Gaming data. Participants provided information on their average weekly gaming hours (number of hours), gaming mode (alone, with family/ friends, acquaintances, or strangers), and the perceived level of toxicity in their gaming communities (*On a scale of 1 to 5 (with 1 being no toxicity), how toxic do you consider the community or players to be in the games you usually play?*).

Gaming motivations. The *Motives in Video Game Use* scale (e-MUV; López-Fernández et al., 2020) assesses eight dimensions of gaming motivation through 32 items: Immersion (items 1–4), Customization (items 5–8), Violent gratification (items 9–12), Coping (items 13–16), Fun (items 17–20), Cognitive challenge (items 21–24), Competition (items 25–28), and Social interaction (items 29–32). Items are rated on a 5-

point Likert-type scale (1 = *strongly disagree*; 5 = *strongly agree*), with higher scores reflecting greater importance of each motivational domain. In the present study, internal consistency was satisfactory for all subscales, with Cronbach's α and McDonald's ω as follows: Immersion ($\alpha = .87$, $\omega = .88$), Customization (.83, .84), Violent gratification (.88, .88), Coping (.82, .81), Fun (.92, .92), Cognitive challenge (.82, .82), Competition (.74, .75), and Social interaction (.79, .79).

Internet gaming disorder. The *Internet Gaming Disorder Scale* (IGDS; Lemmens et al., 2015) assesses levels of Internet Gaming Disorder through nine items reflecting the DSM-5 diagnostic criteria. Responses are rated on a six-point Likert-type scale (0 = *never*, 1 = *one to four times in the past year*, 2 = *five to 11 times in the past year*, 3 = *once to three times per month*, 4 = *once or more per week*, and 5 = *every day or almost every day*). A criterion is considered met when a participant responds with a 4 or 5. Participants who meet at least five of the nine criteria are classified as disordered (Lemmens et al., 2015). An alternative scoring method proposed by Evren et al. (2017), in which responses from 3 to 5 are recognized as meeting the criterion, was also examined. The IGDS was translated into Spanish following the backward-forward translation procedure (Wild et al., 2005). A confirmatory factor analysis (CFA) using Diagonal Weighted Least Squares (DWLS) was conducted to assess the unidimensional structure of the IGDS, which exhibited adequate fit. The present study's internal consistency was excellent (Cronbach's $\alpha = .92$; McDonald's $\omega = 0.92$).

Impulsive behavior. The short version of the *UPPS-P Impulsive Behavior Scale* (Billieux et al., 2012; Spanish short version of Cándido et al., 2012) evaluates five impulsivity traits using 20 items: negative urgency (NU; items 4, 7, 12 and 17), lack of premeditation (LPM; items 1, 6, 13 and 19), lack of perseverance (LPS; items 5, 8, 11 and 16), sensation seeking (SS; items 3, 9, 14 and 18) and positive urgency (PU; items 2,

10, 15 and 20). Responses are rated on a 4-point Likert-type scale (1 = *strongly agree*; 4 = *strongly disagree*), with higher scores indicating greater impulsive behavior ($\alpha = .70$, $\omega = 0.70$), and subscale reliability values were satisfactory: NU (.76, .76), LPM (.78, .78), LPS (.85, .85), SS (.76, .76), and PU (.77, .77).

Perceived social support. The *Multidimensional Scale of Perceived Social Support* (MSPSS; Zimet et al., 1988; Spanish version of Santos-Vega et al., 2021) measures perceived support from three sources across 12 items: perceived family support (PFS; items 1–4), perceived peer support (PPS; items 5–8), and support from other significant others (POS; items 9–12). Responses are rated on a 4-point Likert scale (1 = *never or almost never*; 4 = *always or almost always*). Higher scores indicate stronger perceived social support. In this study, the total scale showed excellent reliability ($\alpha = .93$, $\omega = 0.93$). Subscale reliability coefficients were also high: PFS (.88, .88), PPS (.90, .90), and POS (.93, .93).

Emotional intelligence. The *Wong and Law Emotional Intelligence Scale* (WLEIS-S; Wong et al., 2002; Spanish version of Pacheco et al., 2019) assesses emotional intelligence across 16 items representing four dimensions: self-emotion appraisal (SEA, items 1, 5, 9, 13), others' emotions appraisal (OEA, items 2, 6, 10, 14), emotion awareness (EA, items 3, 7, 11, 15), and emotion regulation (ER, items 4, 8, 12, 16). Responses are rated on a 7-point Likert scale (1 = *totally disagree*, 7 = *totally agree*). Higher scores indicate greater emotional intelligence. The total scale demonstrated excellent reliability ($\alpha = .95$, $\omega = 0.95$), with subscale reliability coefficients as follows: (.84, .84), OEA (.83, .83), EA (.86, .86), and ER (.87, .87).

Statistical analysis

Categorical variables were summarized using frequencies and percentages, while continuous variables were described using means and standard deviations. The prevalence of IGD among gamers was calculated by dichotomizing IGDS scores according to DSM-5 criteria. Univariate skewness and kurtosis values for all variables fell within acceptable limits for normality (± 2 for skewness, ± 7 for kurtosis; George & Mallery, 2010; Hair et al., 2010). Two approaches were identified for transforming the ordinal IGDS scores into dichotomous scores to establish criteria fulfillment and IGD cutoff: one conservative (Lemmens et al., 2015) and one lenient (Evren et al., 2017). Thus, the proportions of IGD were calculated based on both methods.

Correlations between IGD scores and continuous variables were analyzed using Pearson's correlation coefficients, while chi-square (χ^2) tests were used to assess relationships between IGD and categorical variables. Effect sizes for chi-square tests were estimated using Cramer's V .

A binary logistic regression with forward (LR) selection was conducted to identify significant predictors of IGD (Silva & Barroso, 2004). Because IGD was a low-frequency outcome and multiple predictors were considered, forward (LR) selection was used to derive a parsimonious exploratory logistic model, noting that stepwise procedures may yield sample-dependent solutions. Given the low number of IGD cases and the relatively large set of candidate predictors, we applied an initial bivariate prescreening to reduce the number of variables entered into the forward (LR) logistic regression and to obtain a more parsimonious multivariable model, thereby limiting overfitting (Peduzzi et al., 1996). Variables significantly correlated with IGD were entered as predictors. Model fit was evaluated using several indices (Kim et al., 2021): (1) the χ^2 test for overall model significance (change in $-2LL$); (2) the Hosmer-Lemeshow test for goodness of fit and

Nagelkerke's R^2 for explained pseudo-variance; and (3) classification accuracy to assess predictive performance. The Wald statistic was used to test the significance of each regression coefficient. Odds ratios (ORs) and 95% confidence intervals were calculated as effect size estimates, testing the null hypothesis that $OR = 1$. Prior to conducting the regression analyses, multicollinearity among the predictor variables was examined. Tolerance values lower than 0.10 and Variance Inflation Factor (VIF) values exceeding 10 were considered indicative of serious multicollinearity (Tabachnick & Fidell, 2019). In the present data, all predictors exhibited tolerance values well above 0.20 and VIF values below 5. All analyses were performed using IBM SPSS Statistics (Version 28.0 for Windows).

Results

Sociodemographic characteristics

Table 1 presents the sociodemographic characteristics of the sample, categorized according to two IGD cutoff criteria. Most participants (73.5%, $n = 523$) reported studying exclusively, while 39.3% ($n = 280$) indicated that they currently play video games.

Estimated prevalence of Internet gaming disorder

Using the criterion of endorsing five or more items with response options 4 or 5 (Lemmens et al., 2015), the estimated prevalence of IGD in the total sample was 2.1% ($n = 15$). When considering only current gamers ($n = 280$), the prevalence increased to 5.4%. Applying the less restrictive cutoff, in which endorsement of response options 3, 4, or 5 on at least five items was considered positive (Evren et al., 2017), the estimated prevalence rose to 6.2% ($n = 44$) in the total sample and 15.7% among current gamers.

Regarding estimated prevalence by sex, the prevalence was 1.6% for females and 2.5% for males. With the less restrictive criterion, the estimated prevalence was 4.3% and 6.5%, respectively.

No significant differences in age, gender, or current activity were found between non-IGD and probable IGD gamers under either criterion (Table 1). However, a significant difference emerged for the variable playing with acquaintances under the more restrictive cutoff.

Potential risk factors of Internet Gaming Disorder

Gaming-related factors. Weekly gaming hours were positively associated with IGD severity ($r = .168, p = .005$), as were exposure to toxic gaming communities ($r = .177, p = .003$) and playing with acquaintances ($r = .148, p = .013$). Regarding gaming motivations, higher IGD scores were significantly associated with Violent Gratification ($r = .134, p = .025$) and Coping ($r = .146, p = .014$) motives, whereas Fun motives were negatively correlated with IGD ($r = -.155, p = .009$; Table 2).

Psychological factors. IGD severity was positively correlated with overall impulsivity ($r = .256, p < .001$). Among impulsivity dimensions, Negative urgency ($r = .133, p = .028$), Lack of premeditation ($r = .231, p < .001$), and Lack of perseverance ($r = .333, p < .001$) were statistically significantly correlated with higher IGD scores (Table 2).

Table 1

Characteristics of the Mexican gamer subgroups based on IGD criteria (n = 280)

	Answers 4/5 as criterion met						Answers 3/4/5 as criterion met					
	Non-IGD (n=265)	IGD (n=15)	χ^2	df	p	V	Non-IGD (n=236)	IGD (n=44)	χ^2	df	p	V
M_{age} (SD)	19.55 (1.70)	19.60 (1.18)					19.53 (1.73)	19.73 (1.31)				
Gender (% female)	23.0	33.3	.72	1	.39	.05	22.5	29.5	2.08	1	.15	.08
Current act. (% study and work)	19.6	26.7	.93	3	.81	.05	18.2	29.5	3.60	3	.30	.11
Mode Gaming												
Alone	70.2	53.3	1.89	1	.16	.08	71.2	59.1	2.55	1	.11	.09
Family/Friend	63.4	66.7	.06	1	.79	.01	64.8	56.8	1.02	1	.31	.06
Acquaintances	14.3	33.3	3.94	1	.04	.12	14.0	22.7	2.18	1	.14	.08
Strangers	10.9	26.7	3.37	1	.06	.11	11.0	15.9	.85	1	.36	.05
M(SD) H/w gaming	5.31 (4.01)	6.67 (4.45)					5.22 (4.09)	6.33 (3.64)				

Note. M = Mean; SD = Standard deviation; V = Cramer's V; Current act. = Current activity; df = degrees of freedom; H/w = hours per week.

Table 2

Correlations between IGD and gaming-related factors in Mexican gamers

	HG	TOX	IMM	CUS	VIO	COP	FUN	CHAL	COMP	SOC
IGDS <i>r</i>	.168	.177	.086	-.047	.134	.146	-.155	.067	.039	.030
<i>p-value</i>	.005	.003	.149	.434	.025	.014	.009	.261	.517	.614

Note. IGDS = Internet Gaming Disorder Scale; HG = Gaming hours/week; TOX = Toxicity; IMM = Immersion; CUST = Customization; VIO = Violent Gratification; COP = Coping; FUN = Fun; CHAL = Cognitive Challenge; COMP = Competition; SOC = Social Interaction.

Potential protective factors of Internet gaming disorder

Psychological factors. Lower IGD levels were significantly associated with higher perceived social support ($r = -.188, p = .002$) and higher emotional intelligence ($r = -.239, p < .001$). Specifically, perceived social support from family ($r = -.183, p = .002$), peers ($r = -.171, p = .004$), and significant others ($r = -.139, p = .020$) was inversely related to IGD. All four components of emotional intelligence were negatively correlated with IGD (SEA: $r = -.194, p = .001$; OEA: $r = -.158, p = .008$; EA: $r = -.258, p < .001$; ER: $r = -.252, p < .001$).

Table 3

Variable selection process: Measures of global adjustment of the models in Mexican gamers ($n = 280$)

	-2LL	χ^2	df	R^2 Cox y Snell	R^2 Nagelkerke	Accuracy
Model 0	132.406	—	—	—	—	94.9
Model 1	104.015	6.531*	1	.011	.071	94.9
Model 2	99.06	11.486*	2	.003	.124	94.9

Note. df = degrees of freedom of χ^2 . * $p < .05$.

Model 0 = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \varepsilon$.

Model 1 = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \beta_1 \text{Lack of perseverance} + \varepsilon$.

Model 2 = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \beta_1 \text{Lack of perseverance} + \beta_2 \text{Social Support of Peers} + \varepsilon$.

Predictors of IGD

Given the significant differences observed between levels of IGD, a binomial logistic regression analysis was conducted using the Forward Selection: LR method to examine the relationship between potential predictor variables and the likelihood of developing IGD.

In the first step, Lack of perseverance (Model 1) was included, resulting in a statistically significant improvement in model fit compared with the null model ($\chi^2(1) = 6.531, p = .011$). In the second step, Perceived social support of peers (Model 2) was

added, further improving the model fit relative to Model 1 ($\chi^2(2) = 11.486, p = .003$). This improvement was confirmed by the non-significant Hosmer–Lemeshow’s test, (Model 2: $\chi^2(8) = 9.863, p = .275$), indicating an adequate model fit. The Nagelkerke R^2 coefficient showed that the predictors accounted for approximately 12.4% of the variance in IGD probability (Table 4). However, compared with Model 1, Model 2 did not increase classification accuracy, likely due to the imbalance between IGD and non-IGD cases. Although the model exhibited high specificity, its sensitivity was limited in identifying individuals meeting IGD criteria.

Table 4

Results of the final binary logistic regression model for predicting IGD in Mexican gamers ($n = 280$)

	β	SE	Wald	df	p -value	OR	95% CI for OR	
							LL	UL
Lack of perseverance	.281	.115	5.932	1	.015	1.324	1.056	1.660
Peers social support	−.229	.105	4.761	1	.029	.795	.647	.977
Intercept	−2.730	1.520	3.223	1	.073	.065		

Note. β = regression coefficient. SE = Standard error. df = degrees of freedom of the Wald test. p = probability value associated with the Wald test. OR = Odds Ratio. 95% CI = 95% Confidence Interval for OR. LL = Lower limit. UL = Upper limit.

For Lack of perseverance, the regression coefficient ($\beta = 0.281$) and odds ratio ($OR = 1.324$, 95% CI [1.056, 1.660]) indicate that each one-unit increase in this variable raised the odds of IGD by 32.4%. Conversely, for Perceived social support from peers, after controlling for Lack of perseverance, the regression coefficient ($\beta = -0.229$) and odds ratio ($OR = 0.795$, 95% CI [0.647, 0.977]) suggest that each one-unit increase in perceived social support from friends reduced the likelihood of IGD by 20.5%.

Discussion

This study estimated the prevalence of IGD among Mexican university students, examined its association with psychosocial and gaming-related factors, and identified variables that contribute to explaining IGD.

Under the strict diagnostic criterion, the estimated prevalence of IGD was 2.1% among university students and 5.4% among current gamers. Both estimates are consistent with previously reported meta-analytic ranges for young adults (3.4%, 95% CI: 1.9–5.9; Kim et al., 2021), as our results fall within the confidence interval. Previous Mexican research using the same DSM-5 cut-off of five or more symptoms reported a prevalence estimate of 5.2% (95% CI: 4.7–5.8, Borges et al., 2019). Therefore, no statistically significant change in IGD prevalence can be inferred. While increases in IGD have been documented in other countries during the pandemic (Oka et al., 2021), the present study cannot reflect temporal changes, as comparisons must rely on equivalent diagnostic criteria and populations.

Meta-analytic estimates from Asia (10.3%, 95% CI: 8.6–11.9), Europe (9.2%, 95% CI: 6.4–12.1), and the Americas (11.5%, 95% CI: 4.6–18.3; Gao et al., 2022) show broader variability across regions. Notably, the present estimate among current gamers (5.4%) also falls within the confidence interval reported for the Americas, indicating compatibility with the range observed in that region.

Consistent with previous studies, our results showed that greater gaming time, exposure to toxic interactions, and playing mainly with acquaintances were all associated with higher IGD levels. Previous meta-analyses have consistently shown that greater gaming time is associated with elevated IGD symptoms (Adachi & Willoughby, 2016; Zhuang et al., 2023). However, not only the quantity but also the quality of the gaming

environment appears to play a critical role in IGD development. Gandolfi et al. (2023) demonstrated that exposure to toxic behaviors within gaming communities predicts higher IGD scores. Such toxic environments are often linked to poor social skills and frustration, traits that—when combined with competitiveness and intense social interaction—may reinforce excessive gaming behavior and increase IGD risk (Fox & Tang, 2017; Gandolfi et al., 2021).

Similarly, playing primarily with acquaintances may create greater social pressure or a stronger sense of obligation to perform well, compared with playing with friends (where trust mitigates competitiveness) or strangers (where expectations are minimal; Kaye et al., 2017). As a hypothesis-generating idea, these social dynamics could heighten players' engagement and desire to continue gaming, potentially contributing to excessive play (Longman et al., 2009).

Motivational factors also play a critical role. Coping and escapism motives were positively associated with IGD, whereas gaming for fun or recreation showed a negative relationship. However, these findings should be interpreted with caution, as only three motives showed statistically significant correlations with IGD, but with small effect sizes. Prior research identifies coping and competition motives as key risk factors for IGD (Moudiab & Spada, 2019; Wang & Cheng, 2022). Network analyses suggest that escapism and competition motives are particularly central among players with IGD (Chen et al., 2025). While recreational motives generally provide protection, they may lead to problematic gaming when combined with coping or avoidance strategies. Nonetheless, the current results suggest that such interpretations are still tentative and require further empirical research.

Impulsivity emerged as another significant risk factor for IGD in this study. Among the impulsivity dimensions, those related to acting without forethought and

difficulties sustaining effort were the most strongly associated with IGD in our study. Specifically, negative urgency, lack of premeditation, and lack of perseverance showed the clearest patterns, suggesting that students who struggle to manage emotional impulses, think ahead before acting, or maintain focus on effortful tasks may be more vulnerable to excessive gaming (Şalvarlı & Griffiths, 2022).

These results align with theoretical accounts proposing that impaired self-regulation and urgency-driven behaviors heighten vulnerability to problematic gaming. Elevated impulsivity reflects deficits in executive control and behavioral inhibition, both associated with addictive behaviors (Zhuang et al., 2023). However, this relationship may also be bidirectional: individuals with high IGD scores often display greater impulsive decision-making (Kräplin et al., 2020), suggesting that prolonged problematic gaming can further impair self-regulation. Consequently, individuals with heightened impulsivity may fail to control their gaming habits, which can be exacerbated by the reinforcing nature of IGD itself (Ji et al., 2021).

The results suggest that emotional intelligence may protect against IGD among Mexican university students. This pattern is reflected in the specific EI components examined in the study. All four subdimensions—self-emotion appraisal (SEA), others' emotion appraisal (OEA), use of emotion (EA), and emotion regulation (ER)—showed small but statistically significant negative correlations with IGD. Previous studies have consistently identified an inverse association between emotional intelligence and IGD in the general adult population (Kircaburun et al., 2019; Gisbert-Pérez et al., 2024).

Consistent with these findings, research has shown that young adults with IGD tend to score lower on measures of emotional intelligence compared to regular gamers and non-gamers (Ko et al., 2021). Within IGD groups, individuals who experience emotional comorbidities such as anxiety, depression, or social anxiety often exhibit even

lower levels of emotional intelligence. Difficulties in recognizing and managing emotions may lead to increased reliance on gaming as an unhealthy coping strategy, which aligns with the associations observed in this sample. Although the effect sizes were modest, these results reinforce the notion that emotional intelligence is negatively associated with IGD and may play a crucial role in understanding the emotional mechanisms underlying IGD.

All dimensions of perceived social support showed inverse associations with IGD. This pattern aligns with previous literature identifying perceived social support as a protective factor against IGD (Malak et al., 2023; Meng et al., 2024). Studies involving adolescents, emerging adults, and college students consistently report that individuals with IGD tend to perceive lower levels of social support (Teng et al., 2020; Zhang et al., 2019) and often demonstrate weaker social networks and interpersonal skills (Liao et al., 2020). Teng et al. (2020) argued that the interpersonal deterioration associated with IGD can further undermine psychosocial well-being. Moreover, Durak et al. (2023) highlighted that the relationship between perceived social support and IGD may vary depending on the source of support (online vs. offline) and the individual's gaming experience. In sum, these findings reinforce the view that social support can buffer against IGD, though its protective efficacy likely depends on personal, social, or contextual factors.

Finally, the logistic regression analysis identified lack of perseverance and perceived peer support as the most influential predictors of IGD in this sample of Mexican university students. Specifically, lower perseverance—reflecting difficulty maintaining sustained attention on extended tasks—was statistically significantly associated with a greater likelihood of developing IGD. This finding aligns with a systematic review by Dullur et al. (2021), which emphasized that attentional difficulties are strongly associated

with IGD. Conversely, greater perceived social support from friends or peers was associated with a reduced risk of IGD. In the Mexican context, where peer relationships often constitute a key source of social integration and coping, strengthening peer-support networks may be an effective strategy for preventing problematic gaming behaviors.

It should be noted that certain dimensions of emotional intelligence, like emotional awareness and regulation, correlated strongly with IGD but were not included in the model due to shared variance with other predictors. Instead, peers' social support was retained for its unique contribution, despite a lower correlation. Stepwise procedures may exclude variables whose predictive variance overlaps substantially with other predictors (Babyak, 2004). Moreover, multicollinearity diagnostics indicated that VIF and tolerance values were within acceptable ranges, maybe suggesting redundancy among predictors, but no severe multicollinearity that would compromise coefficient stability.

Several context-specific patterns emerged that distinguish Mexican university gamers from those in European samples (Gisbert-Pérez et al., 2025). Mexican students consistently exhibited negative associations across all EI dimensions. These findings contrast with those observed in Italian students, where emotional intelligence showed no correlation with IGD, and differ from Spanish students, for whom only certain EI components were correlated with IGD. This suggests that emotional competencies may play a more central protective role in the Mexican context. Peer support also appeared to be a stronger protective factor in Mexico than in Spain or Italy, underscoring the importance of peer-based social integration in Mexican university life. Regarding impulsivity, Mexican students exhibited difficulties with perseverance and planning, a pattern partly similar to Spain but differing from Italy, where urgency was the primary correlate of IGD. In terms of social gaming, playing with acquaintances was relevant in Mexico, aligning with Spanish findings but less evident in Italy.

In summary, although IGD prevalence levels were similar across Mexico, Spain and Italy, the Mexican pattern appeared more strongly influenced by socioemotional vulnerability and peer-based interactions. These findings indicate several specific needs among Mexican university students: strengthening emotional regulation skills, reinforcing peer-support networks, and providing targeted strategies for managing stress and coping without relying on gaming. Additionally, difficulties in perseverance and planning underscore the need for interventions that support academic self-regulation. Together, these needs point to culturally informed priorities for prevention and early intervention in this population.

Limitations of the study

This study has several limitations. First, the sample consisted exclusively of Mexican university students recruited through convenience sampling at Tecnológico de Monterrey with middle- to upper-middle socioeconomic backgrounds, which limits representativeness. Although this approach facilitated data collection, the absence of random selection introduces potential selection bias, reducing the generalizability of the findings to the broader population of young adults in Mexico. Likewise, no data was collected on whether any of the participants were Spanish-speaking international students. Second, the cross-sectional design precludes causal inferences regarding the relationships among variables. Moreover, while some correlations achieved statistical significance, their effect sizes were small, so interpretations should be made cautiously since statistical significance does not guarantee practical importance. Third, the reliance on self-reported measures may have introduced biases such as social desirability, potentially affecting the accuracy of the results. Fourth, the use of a forward stepwise approach introduces certain methodological limitations. This procedure may yield models sensitive to sample fluctuations, which can affect the stability and generalizability of the

results. In addition, the initial bivariate prescreening used to reduce the set of candidate predictors may have excluded theoretically relevant variables that did not show significant zero-order associations but could become relevant after multivariable adjustment; therefore, the multivariable findings should be interpreted as exploratory and warrant replication/validation in independent samples. Fifth, the study focused solely on IGD and did not assess other technology-related behavioral addictions. Finally, although the instruments were translated and reviewed by native Spanish speakers following standard forward-backward translation procedures (Wild et al., 2005), full psychometric validation within the Mexican university population is still needed.

Future research should address several directions derived from the study's limitations. Longitudinal designs are needed to clarify causal relationships and examine the development of IGD over time. Studies should also expand the scope beyond IGD to include broader technology-related behavioral addictions and continue validating the instruments within Mexican university populations to establish culturally appropriate cut-off scores. In addition, improving sampling procedures to enhance representativeness and reduce potential bias remains an important methodological priority.

Beyond these directions, future research should examine psychosocial predictors of regular (non-pathological) gaming, explore potential gender differences in the associations identified, and test the moderating role of perceived social support—an approach highlighted in previous work (López-Fernández et al., 2020, 2021, 2024)—to provide a more comprehensive understanding of gaming behavior and IGD.

Practical implications of the study

This study offers several practical implications for educational and psychological contexts in Mexican universities. When assessing IGD, cultural, psychological, and

gaming-related variables must be considered to understand their relationship with IGD symptoms and their influence on problematic gaming behaviors. Such insights can guide the design of targeted intervention strategies that address the specific needs of Mexican university students. Insights from the findings suggest that prevention strategies should focus on online social environments and peer norms, especially given the links between increased gaming time, toxic gaming experiences, and higher IGD scores among students.

Preventative initiatives, such as workshops or seminars, could promote healthy gaming habits and strengthen personal and social competencies. For example, gaming-focused modules might include strategies for managing gaming time, reinforcing fun and cooperative motives for play, and fostering positive peer relationships. Since coping and escapism were linked to IGD, interventions should focus on teaching adaptive emotion regulation and stress management strategies.

Modules focused on personal development should prioritize self-awareness, emotional regulation, goal-setting, and impulsivity management. Given the links between IGD and impulsivity, programs enhancing planning and attentional control may benefit at-risk students. Social skills programs can promote empathy and collaboration, utilizing recreational gaming to build connections. Furthermore, improving students' emotional intelligence is crucial, as it serves as a protective measure against IGD. Finally, since peer support is linked to IGD risk, universities should consider implementing peer mentoring or social integration initiatives to enhance supportive networks.

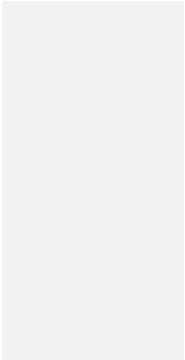
Although the overall prevalence of IGD appears relatively low, estimates vary depending on the diagnostic threshold applied. Therefore, it is crucial to develop culturally and contextually tailored prevention and intervention programs that address both protective and risk factors associated with IGD, ensuring the psychological well-being of Mexican university students. Overall, these programs should address both

protective and risk factors to support psychological well-being, based on empirical patterns observed in this study among Mexican university students.

Conclusions

This study highlights the relevance of addressing IGD among Mexican university students, with an estimated prevalence of 2.1% in this sample. Significant risk factors included the amount of time spent gaming, interactions with acquaintances, competitive and coping motivations, exposure to toxic gaming communities, and higher impulsivity. In contrast, gaming for fun, greater emotional intelligence, and stronger perceived social support emerged as protective factors.

To prevent IGD within this population, fostering peer relationships and developing interventions that strengthen perseverance and emotional regulation may be particularly effective. These findings underscore the importance of implementing emotional education initiatives and campaigns that promote responsible and balanced gaming practices in university settings.



New methodological approaches to IGD

Study 12. Factor structure of the Internet Gaming Disorder Scale: an Exploratory Graph Analysis approach in Spanish university gamers

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Abstract

Internet gaming disorder (IGD) has emerged as a growing concern, particularly among adolescents and young adults. This concern has prompted the development of standardized tools for IGD assessment, such as the Internet Gaming Disorder Scale (IGDS). IGDS is based on the DSM-V diagnostic criteria, and has been mainly used as a unidimensional measure of IGD. This study aimed to translate and validate the Spanish version of the IGDS in a sample of university students ($N = 274$, $M_{\text{age}} = 21.64$ years, $SD_{\text{age}} = 2.93$, % male = 59.7%). Exploratory Graph Analysis (EGA) followed by Confirmatory Factor Analysis (CFA) were conducted, and internal consistency and convergent validity were assessed. EGA identified a bidimensional structure comprising (1) cognitive-emotional symptoms and (2) relational-problem outcomes, which was confirmed through CFA. Both dimensions demonstrated excellent reliability and adequate convergent validity. The Spanish IGDS is a psychometrically valid instrument for assessing IGD, allowing for an accurate distinction between gaming intensity and functional impairment. These findings challenge the traditional unidimensional perspective and support a biaxial conceptualization of IGD.

Keywords: EGA, Factor structure, IGDS, Validity.

Introduction

Internet gaming disorder (IGD) is a growing health concern. While gaming is often associated with cognitive, psychological, and social benefits, such as recreation and building social connections (Halbrook et al., 2019; von der Heiden et al., 2019), excessive gaming can lead to negative symptoms that impact both physical and mental health (Király et al., 2023). Excessive gaming can result in a gaming disorder, which shares characteristics with other addictions, such as gambling disorder (Saunders et al., 2017). The World Health Organization (2019; section 6C51, p.1) formally recognized gaming disorder in ICD-11 as “a pattern of gaming behavior characterized by impaired control over gaming, increasing priority given to gaming over other activities to the extent that gaming takes precedence over other interests and daily activities, and continuation or escalation of gaming despite the occurrence of negative consequences”.

The Diagnostic and Statistical Manual of Mental Disorders (5th ed., text rev.; DSM-V-TR, APA, 2022) includes IGD as a condition for further research. IGD is characterized by significant impairment or distress in several aspects of a person's life due to gaming behaviors. DSM-V-TR includes nine IGD symptoms, such as (1) preoccupation with gaming, (2) withdrawal symptoms when gaming is not possible (sadness, anxiety, irritability), (3) tolerance, (4) inability to reduce or quit gaming, (5) giving up other activities due to gaming, (6) continuing gaming despite problems, (7) deceiving family members or others about gaming time, (8) the use of gaming to relieve negative moods, and (9) risk, having jeopardized or lost a job or relationship due to gaming (APA, 2022). To be diagnosed with IGD, an individual must experience five or more of these symptoms related to gaming within one year.

Two meta-analyses of IGD prevalence estimated an overall prevalence of between 1.96–3.05 % (95 % CI: [2.38, 3.91]; Stevens et al., 2021) and 3.3 % (95 % CI: [2.6–

4.0]; Kim et al., 2022), with lower estimates with adjusted prevalence estimations (1.96 %, 95 % CI: [0.19, 17.12], Stevens et al., 2021; 1.4 %, 95 % CI: [0.9–1.9], King et al., 2022). Both studies identified countries of study, age group, and gender as sources of prevalence variability. IGD seems to be a more severe concern in early stages, with an estimated prevalence of 4.6 % in adolescence and young adults (Fam, 2018) and 6.1 % in young adults (Gisbert-Pérez et al., 2025). Moreover, males have a higher prevalence of IGD than females (6.8 % and 1.3 %, respectively; Wang and Cheng, 2021). As a result, mental health professionals face several controversies and opportunities when assessing and treating IGD (Carbonell et al., 2020).

The inclusion of IGD in the DSM-V (APA, 2013) and the increasing prevalence fostered the development of instruments to assess and diagnose IGD. Such instruments include the 10-item Internet Gaming Disorder Test (IGDT-10; Király et al., 2017), the 9-item short form of the Internet Gaming Disorder Scale (IGDS9-SF; Pontes and Griffiths, 2015), the Video Game Scale for Children (VGS-C; Donati et al., 2019), and the 27-item and 9-item Internet Gaming Disorder Scale (IGDS; Lemmens et al., 2015), among others. The systematic review of IGD instruments by King et al. (2020) highlighted five IGD instruments with better psychometric properties. One of these is the IGDS by Lemmens et al. (2015), which covers all nine DSM-5 IGD criteria (preoccupation, tolerance, withdrawal, persistence, escape, problems, deception, displacement, and conflict). IGDS has been validated in population between 13 and 40 years (Lemmens et al., 2015) and in children and adolescents (12–17 years; Paschke et al., 2021).

The IGDS scale has been translated and validated in several languages, including Arabic (Baiomy et al., 2018), Turkish (Evren et al., 2017), and Chinese (Lei et al., 2020). While there is a preliminary Spanish translation of the 27-item dichotomous IGDS scale (Hidalgo, 2022), there has not yet been a study that translates and validates the 9-item

IGDS scale into Spanish. This highlights a gap in the literature and emphasizes the need for a psychometrically validated Spanish version of the 9-item IGDS scale.

For this study, the 9-item IGDS with polytomous response (Likert 0–5) version was selected. Higher scores indicate more problematic gaming behavior. For the diagnosis of gaming disorder, the recommended cut-off point established by the researchers is the presentation of five or more criteria over 12 months, based on the DSM-5 recommendation (APA, 2013; Lemmens et al., 2015). This criterion, assumed from the DSM-5 (>5), showed high specificity and adequate sensitivity (Bernaldo-de-Quirós et al., 2020). Assuming this cut-off point, Lemmens et al. (2015) identified three types of players: normal, at-risk, and disordered. Regarding its structure, Lemmens et al. (2015) reported unidimensionality according to the fit indices of a Confirmatory Factor Analysis (CFA) and excellent consistency with a Cronbach's alpha of 0.93. IGDS has also been adequate in several reliability generalization meta-analyses (Gisbert-Pérez et al., 2022; Yoon et al., 2021). In the case of the shortened 9-item versions of the IGDS, the polytomous response option showed higher mean reliability scores. Convergent validity is supported by small to medium correlations of IGDS scores with psychological constructs such as impulsivity, antisocial behavior, anger control, hyperactivity, loneliness, emotional distress, low self-esteem, life satisfaction, and prosocial behavior (Lemmens et al., 2015; Schivinski et al., 2018; Wartberg et al., 2019).

Previous research has studied the psychometric properties of different IGDS versions, generally supporting the unidimensionality of the scale. Coşa et al. (2024) analyzed the measurement invariance of the one factor model proposed by the author of the IGDS in a sample of Romanian adolescents and their parents. Their results showed that the one-factor IGDS model fit well in both the self-reported and parent-reported versions. Lei et al. (2020) compared the performance of the IGDS Mandarin

Chinese version using binary and polytomous items, the one-factor structure was retained in both versions through EFA and CFA in a sample of adolescents and adults. It should be noted that most studies assumed the unidimensionality of the scale established by the authors, such as the measurement invariance carried out by Ali et al. (2022) which demonstrated an equal functioning of the scale across different countries. However, the unidimensionality reported in the original IGDS study has not always been consistently replicated across studies. Paschke et al. (2021) explored the psychometric properties of the IGDS in three samples of children and adolescents, where the results did not support unidimensionality using CFA. Ono et al. (2025) conducted a validation of the IGDS for the Chinese population. Although the overall sample showed adequate CFA fit indices, they were not acceptable in its clinical and healthy subsamples.

Given the inconsistent results found in the previous literature, further investigation of the IGDS factor structure is needed. The lack of consensus may be due to differences in the methodologies used to examine dimensionality, including both EFA and CFA. Simulation studies have shown that these techniques do not estimate well underlying dimensions (Garrido et al., 2013; Lubbe, 2019; Montoya and Edwards, 2020). For this reason, it is worth exploring alternative approaches to analyze the dimensionality of the IGDS.

A robust alternative for scale validation is Exploratory Graph Analysis (EGA). EGA is a technique derived from network psychometrics (Golino and Epskamp, 2017). Network psychometrics utilizes network modeling techniques to analyze scale dimensionality through the Gaussian graphical model (GGM; Lauritzen, 1996) and clustering techniques (Pons and Latapy, 2006). GGM estimates the joint distribution of random variables (Lauritzen, 1996; Epskamp et al., 2017). Based on partial correlation coefficients, EGA produces a network plot that depicts item clusters and their strength of

association (Golino et al., 2020). Simulation studies have shown that EGA is more accurate in dimensionality analysis compared to traditional methods used in (exploratory) factor and principal component analysis (Golino and Epskamp, 2017; Golino et al., 2020).

The main objective of this study is to translate and validate the 9-item IGDS in a Spanish young adult sample. To the best of our knowledge, this represents the first adaptation and validation of the 9-item IGDS into Spanish. Given the inconsistencies in the factorial study of the IGDS, and the evidence obtained from the use of EGA versus the usual methods of studying dimensionality, this study aims to explore the dimensionality of the IGDS with EGA and confirm this dimensionality using CFA. Additionally, internal consistency and convergent validity evidence is provided.

Method

Procedure

Study data were collected through a cross-sectional survey using LimeSurvey. Before the survey, all participants gave informed consent, and they were free to withdraw from the study at any time without giving any reason. The study adhered to the ethical standards of both the institutional and national research committee, the 1964 Declaration of Helsinki, and its subsequent amendments, or comparable ethical standards. The study was reviewed and approved by the Ethics Committee of the University of Valencia (code 2023-MAG- 2988759).

Participants

Data for this study was gathered by convenience sampling. The sample consisted of a total of 274 university students in Spain during the 2022–2024 academic years. Inclusion criteria were (1) current video game players, and (2) being 18 or older. Their mean age

was 21.64 years ($SD = 2.93$). Regarding gender, 38.1 % were female, 59.7 % were male and 2.2 % were non-binary. The sample was randomly split in two subsamples. Following the recommendations of Del Rey et al. (2021), we ensured that both subsamples were balanced based on sociodemographic characteristics through t -test for age and Pearson's Chi-squared test for gender and occupation. Sociodemographic data from both subsamples are displayed in Table 1.

Table 1

Means, percentages and standard deviations of the sociodemographic data for both subsamples

	Mean ($\pm SD$) or %		Statistic test	p
	Subsample 1	Subsample 2		
Age	21.46 (± 2.81)	21.82 (± 3.05)	$t(272) = -1.03$	.303
Gender			$\chi^2(3) = 2.12$	.548
Female	39.7%	36.5%		
Male	57.4%	62.0%		
Non-Binary	2.9%	1.5%		
Occupation			$\chi^2(3) = 0.975$	.807
Only study	63.5%	65.7%		
Only work	12.4%	8.8%		
Study and work	22.6%	24.1%		
None of the above	1.5%	1.5%		

Note. SD = Standard deviation. Missing data from sociodemographic were excluded for this analysis.

Instruments

Internet Gaming Disorder Scale (IGDS; Lemmens et al., 2015). IGDS is a nine-item self-reported scale developed to assess IGD based on DSM-V criteria (APA, 2013). IGDS was translated to Spanish and evaluated in eight steps (Wild et al., 2005): 1) Forward translation: two translators unfamiliar with the IGDS but knowledgeable about gaming disorder and fluent in English independently translated the English version into Spanish; 2) Reconciliation of items: a third native Spanish translator fluent in English reviewed the two translations to generate an optimal translation from them. He evaluated

the quality and clarity of the translation for the general public, selecting the best translation and suggesting alternatives when necessary to make it linguistically and culturally appropriate; 3) Backward translation: a fourth translator back-translated the reconciled version into English; 4) Back translation review: the original version was compared with the backward translated version; 5) Cognitive debriefing: a pilot test was conducted with 10 university students to evaluate intelligibility, interpretation, relevance and cognitive equivalence of the translation, as well as subsequent debriefing. During the debriefing, the interviewing researcher went through each item of the questionnaire asking the students if the translation was difficult to answer, confusing, difficult to understand, or offensive; 6) Finalization and proofreading: grammatical and spelling checking; 7) Validation of the final translated questionnaire and reliability assessment; 8) Inclusion of the final report (e.g., item 1 “*¿Ha habido ocasiones en las que solo pensabas en el momento de jugar a videojuegos?*”, item 2 “*¿Te has sentido insatisfecho porque querías jugar más?*”). The nine items are scored on a six-point Likert scale ranging from 0 (never) to 5 (every day or almost every day). In this study, higher scores indicate a greater presence of symptoms indicative of disordered gaming. In addition to the IGDS Spanish version, sociodemographic variables related to age, gender and educational level were collected.

Internet Gaming Disorder Scale-Short Form (IGDS9-SF; Pontes and Griffiths, 2015; Spanish version of Maldonado-Murciano et al., 2020). IGDS9-SF assesses IGD based on DSM-V criteria (APA, 2013). It consists of nine items scored on a five-point Likert scale ranging from 1 (never) to 5 (very often). In this study, higher scores indicate higher levels of disordered gaming symptoms.

Data analysis

We assessed structural validity, internal consistency and convergent validity of the Spanish version of the IGDS. Studying the structure of scales to determine the number of dimensions has typically been problematic, as it requires subjective decision-making on the part of the researcher (Sass and Schmitt, 2010). As noted by Haslbeck and Van Bork (2024), two classical and predominant strategies had been used for the selection of the number of dimensions when estimating (exploratory) factor and/or component analysis. The first one is based on the study of the pattern of eigenvalues of the covariance matrix. The second approach considers it a model selection problem, so several fit indexes are observed to select the number of dimensions. To overcome the subjectivity issues in this selection, we split the sample in two subsamples for cross-validation. Firstly, an Exploratory Graph Analysis (EGA) was performed in the first subsample ($n = 137$) to explore the number of clusters of items and their distribution. Secondly, two Confirmatory Factor Analysis (CFA) was performed in the second subsample ($n = 137$): a one-factor model reflecting the original theoretical structure and a second model to validate the structure found by EGA in the previous analysis.

The Exploratory Graph Analysis (EGA) model was estimated using a polychoric correlation matrix to account for the ordinal nature of the items. The estimation method was a variant of Least Absolute Shrinkage and Selection Operator (LASSO; Tibshirani, 1996), the Graphical LASSO (GLASSO; Friedman et al., 2007) which is one of the most commonly employed in networks psychometrics. The *Walktrap* algorithm was used for community detection, as it demonstrated to be the most accurate algorithm for small sample sizes and low number of nodes (Christensen et al., 2023). Consistency of structure was assessed through the bootstrapped version of EGA and it is operationalized as the proportion of occasions that each dimension is estimated equally across a set of replicate

samples (Christensen et al., 2020). Additionally, we employed variable redundancy analysis (UVA; Christensen et al., 2023) to address items' redundancy.

The estimation method employed for the two CFA models was DWLS (Diagonally Weighted Least Squares), due to is largely known to perform better than *ML* (Maximum Likelihood) when using categorical non-normal data (Li, 2016; Mîndrilă, 2010). We employed the chi-square statistic (χ^2), the Comparative Fit Index (*CFI*), Tucker-Lewis Index (*TLI*), the Standardized Root Mean Square Residual (*SRMR*), and the Root Mean Squared Error of Approximation (*RMSEA*) as measures of fit. Acceptable model fit is considered with values of *CFI* and *TLI* being equal or greater than 0.90, and *RMSEA* and *SRMR* values equal or lower than 0.08 (Hu and Bentler, 1999).

Analyses were carried out using the R packages *EGAnet* (Golino and Christensen, 2019) and *lavaan* (Rosseel, 2012), while descriptive statistics were calculated in SPSS 29. Regarding internal consistency, it was estimated using the Composite Reliability Index (*CRI*) in order to overcome some limitations of Cronbach's alpha (Hancock and An, 2018). Convergent validity was assessed by estimating the correlation coefficients among the dimensions extracted in our study and the scores calculated from the translation carried out by Maldonado-Murciano et al. (2020) from the scale developed by Pontes and Griffiths (2015). In addition, the Average Variance Extracted (*AVE*) was calculated as a measure of convergent validity. Average Variance Extracted (*AVE*) represents, for each latent factor *j*, the proportion of variance in its indicators that is captured by the factor relative to the variance attributable to measurement error. Following Fornell and Larcker (1981), *AVE* values ≥ 0.50 are typically taken as evidence of adequate convergent validity.

Results

Exploratory graph analysis

In this section, we explored the dimensionality of IGDS employing EGA. Unlike the theoretical structure of IGDS, the resulting network consisted in two moderate correlated clusters of items as can be observed in Fig. 1. Cluster 1 was composed of items 1, 2, 3 and 5, while the remaining items were classified on cluster 2. A qualitative evaluation of the items reveals that cluster 1 includes items related to cognitive and emotional symptoms. Conversely, the items in cluster 2 refer to relational aspects, such as family, friends and partners.

Then, we studied replicability within this sample of this structure using bootstrapped EGA. Over the 500 iterations, the two-dimensional solution was identified as the most likely model 41.8 % of the time. This was followed by one-dimensional solutions, which appeared 34 % of the time, and three-dimensional solutions, which appeared 23 % of the time. As shown in the specific results for each item, while the items in cluster 2 (except for item 8, which had a replicability percentage of 42 %) had a replicability frequency close to 50 %, the items in cluster 1 had replicability frequencies of 82 % or higher. The network loadings and the replicability ratio of each item in its dimension are shown in Table 2.

Lastly, we employed variable redundancy analysis (UVA; Christensen et al., 2023) to study the items redundancy based on weighted topological overlap (wTO, Zhang and Horvath, 2005). The results showed that items 6 and 9 present a high degree of redundancy ($wTO = 0.306$), this implies that both items reported very similar information. Additionally, two other pairs of items had wTO values greater than 0.25: items 4 and 7

(wTO = 0.291), as well as items 1 and 2 (wTO = 0.272). However, it was decided to maintain the number of items of the original scale, and none of the items were removed.

Figure 1

EGA estimated network for the data on subsample 1

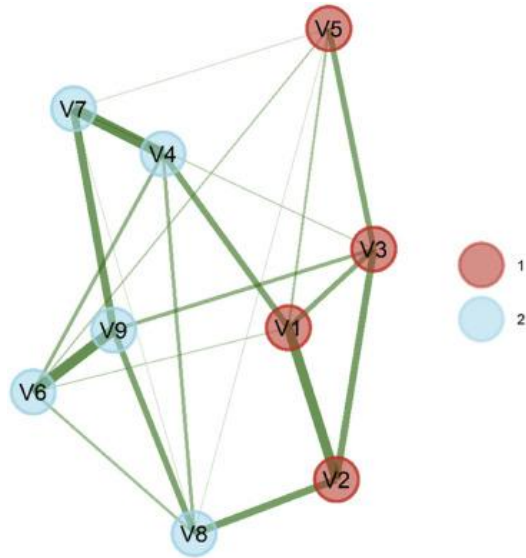


Table 2

Network loadings and percentage of replicability per item in dimensions on subsample 1

Items	Network loadings		Percentage of Replicability
	Cluster 1	Cluster 2	
Preoccupation	.513		98%
Tolerance	.495		97%
Withdrawal	.530		96.6%
Persistence		.453	49.4%
Escape	.247		81.8%
Problems		.430	54.2%
Deception		.487	54%
Displacement		.332	42%
Conflict		.613	55.4%

Confirmatory factor analysis

In order to verify whether the structure identified by the EGA was consistent with the data, two CFAs were conducted on the second subsample: a one-factor model reflecting the original theoretical structure, and a two-factor model based on the EGA clustering methodology. As shown in Table 3, the two-factor model exhibited a superior fit in comparison to the one-factor model. In this two-factor solution, correlation between factors was 0.794 ($p < .001$).

Table 3

Scaled fit indexes for the one-factor and two-factor models tested on subsample 2

Model	χ^2 (df)	p	CFI	TLI	RMSEA	90% CI	SRMR
One-factor	91.231 (27)	<.00 1	.964	.952	.132	.103- .163	.084
Two-factors	43.401 (26)	<.05	.990	.986	.070	.030- .106	.058

Note. Robust fit indices (scaled χ^2 , CFI, TLI, and RMSEA) are reported using the DWLS estimator.

Reliability and convergent validity

Internal consistency and convergent validity for the two-factor structure were assessed through different indices. To test reliability, Composite Reliability Index (*CRI*) was calculated for each latent factor. Both factors showed good reliability with *CRI* values near to 0.90. Regarding convergent validity, all standardized factor loadings were statistically significant and above 0.70. In addition, the Average Variance Extracted (*AVE*) for both factors were above 0.50, indicating adequate convergence among items. Also, correlation coefficients among dimensions from our scale and the translation by Maldonado-Murciano et al. (2020) were high and statistically significant. The coefficient between the scores for the cognitive and emotional symptoms dimension was $r = 0.65$ ($p < .001$) and between the scores for social related issues was $r = 0.74$ ($p < .001$). Standardized factor loadings, *CRI* and *AVE* are displayed on Table 4.

Table 4

*Factor loadings, Composite Reliability Index and Average Variance Extracted (AVE)
on subsample 2*

	Items	Factor 1	Factor 2
Standardized Factor Loadings	Preoccupation	.830	
	Tolerance	.904	
	Withdrawal	.893	
	Persistence		.890
	Escape	.708	
	Problems		.723
	Deception		.862
	Displacement		.806
	Conflict		.700
CRI		.903	.897
AVE		.701	.639
Correlation Between Factors			.794

Note. All factor loadings and the correlation coefficient were statistically significant ($p < .001$).
Composite Reliability Index (CRI). Average Variance Extracted (AVE).

Discussion

This study aimed to examine the psychometric properties of the Spanish version of the Internet Gaming Disorder Scale (IGDS). To our knowledge, this study is the first to validate the Spanish version of this scale, and also the first to employ network psychometrics to explore its structure, given that most studies assume unidimensionality of the IGDS as established by Lemmens et al. (2015). This is relevant, as the IGDS is one of the few screening measures for IGD based on DSM-V criteria and one of the most widely employed.

As aforementioned, we explored the structure employing Exploratory Graph Analysis technique in subsample 1, which suggested a bidimensional structure consisting of two moderately correlated clusters: one reflecting cognitive–emotional symptoms

(including items 1, 2, 3 and 5) and the second one representing relational difficulties (including items 4, 6, 7, 8 and 9). This structure was subsequently confirmed through Confirmatory Factor Analysis (CFA), where the two-factor model shown superior fit compared to the original one-factor solution in subsample 2.

The internal consistency of both dimensions was high, with composite reliability values approaching 0.90, indicating excellent reliability. Furthermore, the strong standardized factor loadings (all above 0.70) and average variance extracted (*AVE*) values exceeding 0.50 support adequate convergent validity. In addition, correlation coefficient with IGDS dimensions were high and statistically significant for both dimensions: cognitive and emotional symptoms ($r = 0.65, p < .001$) and social related issues ($r = 0.74, p < .001$). Taken together, these results suggest that the IGDS demonstrates robust psychometric properties, with a stable and interpretable two-factor structure in this Spanish sample.

Our results challenge the traditional assumption of unidimensionality, aligning with the results of Paschke et al. (2021). As established in the biaxial model of addictive behaviors (Kelly and Hoeppner, 2014; Wakefield, 2015), the combination of endogenous factors and contextual characteristics can lead to the onset and maintenance of addictive behavior disorders. This phenomenon is evidenced by the results obtained from the factor analysis of the IGDS, which reveals the presence of one factor associated with cognitive and emotional symptoms, and a second factor that consolidates items pertaining to relational issues derived by the gaming addictive patterns.

According to the biaxial model, our findings suggest that the presence of gaming-related symptoms alone does not necessarily indicate disordered gaming behavior in this sample. Instead, it is the combination of symptom-based indicators (such as preoccupation, tolerance, and withdrawal) alongside problem-related outcomes (like

conflict, deception, and social impairment) that may differentiate between high engagement and pathological gaming. This pattern aligns with the findings of the latent class analysis by Colder Carras and Kardefelt-Winther (2018), who showed that symptoms and life consequences vary among different groups of adolescent gamers. They suggested that individuals experiencing both dimensions should be classified as having IGD.

This bidimensional configuration is further supported by the network analysis conducted by Liu et al. (2022), who identified two distinct clusters of IGD symptoms: one comprising internalizing symptoms (withdrawal, tolerance, preoccupation, and escape), and another comprising externalizing behaviors (conflict, problems, deception, persistence, and displacement) that are directed toward the social environment. Taken together, the biaxial configuration supports the idea that internalized symptoms may precede externalized consequences, indicating a progression from intensive but non-pathological gaming to clinically significant impairment. Overall, this study contributes to a more nuanced understanding of IGD in Spanish university students, supporting the conceptualization of IGD as a multidimensional construct rather than a single continuum of severity.

Limitations and future directions

This study has several limitations. Firstly, the replicability of the findings appears to be limited, probably due to the relatively small sample size. Secondly, responses to the self-reported IGDS may be subject to a bias towards providing socially desirable answers, particularly among individuals with more severe symptoms, as has been observed in the case of gambling problems (Schell et al., 2021). People tend to minimize their symptoms, leading to less variability in the variables and potentially affecting the factor structure. Thirdly, items 6 and 9 demonstrate a high degree of redundancy ($wTO = 0.306$) and are

qualitatively similar, as they both address social conflicts arising from gaming behavior. Therefore, these items should be combined, or the better-performing item should be retained. In the present study, however, both items were retained in the subsequent analysis because the scale has a small number of items used for diagnosing IGD. Future studies could replicate the current analyses using a larger, more representative sample and include a measure of socially desirable responses to control for bias (Schell et al., 2021).

Practical implications

The multidimensional approach to the concept of IGD presented in this study has multiple practical implications. This study provides a psychometrically valid tool in Spanish to assess IGD, differentiating between gaming intensity and functional impact, which improves diagnosis, prevention, and the design of specific interventions.

At a clinical level, for example, it suggests that IGD may be more accurately understood as a bidimensional construct comprising internalized (cognitive–emotional) and externalized (problem-related) symptoms. In clinical practice, this suggests that professionals should assess both dimensions separately, rather than relying solely on the presence of five or more symptoms to make a diagnosis. Following the biaxial model of addiction, distinguishing between engaged/intensive and pathological gamers reduces the risk of misdiagnosing functional but engaged gamers.

In terms of preventive measures, early detection strategies and prevention programs can be improved by distinguishing between intensive gaming and problematic gaming. This differentiation allows for the identification of individuals who engage in intensive gaming, enabling the development of strategies to prevent these individuals from developing problematic gaming habits. This approach also may benefit guidelines for clinical intervention by focusing on internalized symptoms, which can be addressed

through cognitive-behavioral therapy, including emotional regulation, coping strategies, and psychoeducation (Stevens et al., 2019). On the other hand, social repercussions can be targeted by implementing psychosocial strategies that involve the individual's social environment in the program, such as family (Bonnaire et al., 2019).

Study 13. High engagement or disorder? A latent class analysis of Internet Gaming Disorder among university students in Spain, Italy, and Mexico

Gisbert-Pérez, J., García-Mollá, A., Longobardi, C., Chans, G. M., Martí-Vilar, M., Mastrokoulou, S., & Badenes-Ribera, L. High engagement or disorder? A latent class analysis of Internet Gaming Disorder among university students in Spain, Italy, and Mexico (*Under review*)

Abstract

There is ongoing debate regarding how to conceptualize and diagnose Internet Gaming Disorder (IGD), whether from a unidimensional, symptom-count perspective (e.g., DSM-5-TR) or from a bidimensional framework encompassing symptoms and negative consequences of gaming. The present study aimed to identify latent classes of gamers based on the Internet Gaming Disorder Scale (IGDS) in three university student samples from Spain, Italy, and Mexico. The sample comprised 1,327 university students ($M = 21.10$ years, $SD = 2.98$) who provided sociodemographic information, gaming characteristics, and responses to the IGDS and a gaming motivations scale. A latent class analysis (LCA) of IGD symptoms identified four distinct classes: Casual, Normative, High-engaged, and Problematic gamers. Casual and Normative gamers reported low and low-to-moderate symptom levels, respectively, while Problematic gamers exhibited high scores across all symptoms. High-engaged gamers showed elevated scores on preoccupation, tolerance, and escape, but low scores on negative consequences. Covariate analyses revealed that gaming hours, age of gaming onset, perceived toxicity, specific gaming motivations (coping, immersion, violent gratification, and fun) and country were associated with differential probabilities of membership across the latent classes. These findings support a bidimensional conceptualization of IGD, distinguishing high engagement from negative consequences, while also highlighting gaming similarities

between High-engaged and Problematic gamers. The results have practical implications for the assessment, prevention, and intervention of IGD in university populations.

Keywords: Internet Gaming Disorder, high engagement, problematic gaming, university students, latent class analysis.

Introduction

In the revised fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR), Internet Gaming Disorder (IGD) is included as a condition for further study. IGD is defined as a persistent and recurrent engagement in online gaming that leads to clinically significant impairment or distress (APA, 2022). Following its initial inclusion in the DSM-5 in 2015, the World Health Organization subsequently recognized Gaming Disorder as a diagnosable condition in the eleventh revision of the International Classification of Diseases (ICD-11; World Health Organization, 2019).

Since its inclusion in diagnostic manuals, a growing body of research has examined how IGD should be operationalized. Although the DSM-5-TR distinguishes between mild, moderate, and severe levels of IGD (APA, 2022), this classification is primarily based on the number of endorsed symptoms and the degree of life disruption. This severity-based approach implicitly assumes a unidimensional structure, whereby increasing levels of gaming involvement are associated with greater impairment. At the same time, empirical evidence suggests that high levels of gaming involvement may occur without functional impairment (Billieux et al., 2019; Kardefelt-Winther et al., 2017). These findings have motivated further discussion regarding how gaming-related behaviors and associated difficulties are best operationalized.

In this context, several studies have examined the initially proposed unidimensionality of IGD scales derived from DSM-5 criteria. Early psychometric validations indicated that unidimensional models could achieve acceptable overall fit, supporting the use of total scores to evaluate IGD severity (Lemmens et al., 2015; Pontes & Griffiths, 2015). However, these studies also reported variability in the functioning of individual criteria, such as differences in factor loadings and in their associations with external variables. Item response theory analyses reported that IGD criteria differ

substantially in their severity and discrimination parameters, with some symptoms emerging at lower levels of the latent trait and others appearing primarily at higher levels (Gómez et al., 2019). In addition, some studies have reported that bidimensional solutions may offer improved model fit or greater interpretability than unidimensional models, distinguishing between symptoms related to gaming involvement and negative consequences of these gaming patterns (Stavropoulos et al., 2018; Gisbert-Pérez et al., 2026). Taken together, psychometric evidence suggests that, while unidimensional scoring approaches may be practically useful, IGD criteria may not necessarily represent a single homogeneous continuum of severity.

Complementarily, other research has suggested that not all IGD-related symptoms reflect pathological processes to the same extent. For example, a longitudinal study by Billieux et al. (2013) demonstrated that high gaming involvement, measured by rapid in-game progression, was predicted by specific gaming motives rather than by addiction-related symptoms. Similarly, studies have reported low-to-moderate associations between gaming time and Internet Gaming Disorder (IGD) (Deleuze et al., 2018; Demetrovics & Király, 2016; Lemmens et al., 2015), suggesting that intensive gaming does not always lead to negative outcomes. Moreover, it has been noted that DSM-5 criteria encompass indicators of both high involvement and pathological processes (Billieux et al., 2019), implying that individuals endorsing the same number of IGD criteria may exhibit qualitatively different patterns of gaming behavior.

If IGD symptoms capture different aspects of gaming behavior, an important question concerns how these symptoms co-occur within individuals. Person-centered approaches have therefore been increasingly used to identify subgroups of gamers based on their patterns of IGD symptom endorsement. Latent class analysis (LCA) is a statistical method that allows the identification of heterogeneous subgroups within a population by

modeling individuals' response patterns to symptom indicators. Previous LCA and latent profile studies (LPA) have commonly identified between three and five gamer classes, often reflecting increasing levels of IGD severity or risk among adolescents and young adults (Chang et al., 2023; Mordeno et al., 2022; Siste et al., 2022).

Beyond severity-based classifications, some person-centered studies have also reported more differentiated patterns of symptom co-occurrence. For instance, Colder Carras and Kardefelt-Winther (2018) identified distinct subgroups of European adolescent gamers, including individuals characterized by high gaming engagement accompanied by limited functional problems, as well as individuals reporting substantial gaming-related problems despite relatively low levels of addiction-related symptom endorsement. These findings illustrate that IGD-related symptoms and gaming-related problems may combine in different ways across individuals, pointing to the presence of heterogeneous symptom profiles that extend beyond overall severity levels.

The mixed evidence on IGD conceptualization and findings from the person-centered literature point to several remaining gaps. Most latent class studies have been conducted within single-country samples, limiting cross-cultural generalizations. In addition, previous LCA and LPA have employed different IGD instruments, including scales derived from both DSM-IV and DSM-5 IGD criteria. Meta-analytic evidence indicates statistically significant heterogeneity across IGD instruments, with moderator analyses revealing that the instrument used accounts for a substantial proportion of between-study variability in IGD estimates (Kim et al., 2022). Thus, these findings underscore the need for greater consistency in measurement when comparing findings across studies.

Additionally, person-centered research on IGD has primarily focused on adolescent populations. Although some studies have included young adults, to our

knowledge, no studies have specifically examined latent symptom classes within university student populations. University students commonly undergo a transitional developmental stage known as emerging adulthood (Arnett, 2015). This stage is characterized by greater autonomy, increased flexibility in daily responsibilities, and less parental supervision. This population generally has broad access to digital technologies and exhibits heterogeneous patterns of gaming engagement (García-Cabrera et al., 2025). Importantly, IGD is relatively prevalent in university samples, with a pooled prevalence estimate of 6.02% (95% CI: 4.83–7.49) and substantial heterogeneity across studies (Gisbert-Pérez et al., 2026). Examining latent classes in university samples may therefore extend person-centered research by exploring how IGD-related symptoms co-occur beyond late adolescence and early adulthood.

The current study aimed to identify latent subtypes of gamers based on responses to the Internet Gaming Disorder Scale (IGDS) in three university student samples from Spain, Italy, and Mexico. Specifically, we sought to examine whether distinct latent classes of gamers could be identified based on varying degrees of severity, or whether some classes could be better explained through a bidimensional framework of IGD. By applying LCA, this study also aimed to explore whether person-centered symptom profiles provide additional insight into the structural validity of a bidimensional conceptualization of IGD, and whether this framework holds across different cultural contexts.

Method

Participants and procedure

Quantitative cross-sectional research was conducted through an online survey administered in college classes in Spain and Italy during 2022–24 and in Mexico during 2024–25. A non-probabilistic convenience sampling approach was applied based on the accessibility and availability of participants within the university context. Students from various undergraduate programs were personally invited to take part in the study. All students who met the inclusion criteria participated voluntarily, without incentives to avoid self-selection bias, and were informed that their responses would remain anonymous to reduce social desirability bias. All participants gave their informed consent prior to the start of data collection. The research adhered to the Declaration of Helsinki and its subsequent amendments and received approval from the Institutional Review Board of the University of Valencia (protocol no. 2023-MAG-2988759; Spain), the University of Turin (protocol no. 0592473; Italy), and the Tecnológico de Monterrey (protocol no. EHE-2023-08; Mexico).

Measures

The Internet Gaming Disorder Scale (IGDS; Lemmens et al., 2015) is a 9-item self-reported scale developed according to the DSM-5 diagnostic criteria of IGD. The scale uses a 6-point Likert-type format to assess the frequency of occurrences over the past 12 months: (0) *never*, (1) *one to four times in the last year*, (2) *five to 11 times in the last year*, (3) *about once to three times a month*, (4) *once or more a week*, and (5) *every day or almost every day*. In the current study, Cronbach's α and McDonald's ω were both .86 (Spain), .85 (Italy), and .92 (Mexico).

The e-MUV instrument (López Fernández et al., 2019) is a 32-item scale that assess eight dimensions of gaming motivations: Immersion (e.g., “I feel immersed in a fantasy/fictional world”), Customization (e.g., “I enjoy designing things in-game”), Violent gratification (e.g., “I enjoy violence in games; the more, the better”), Coping (e.g., “I forget my worries when I play”), Fun (e.g., “I enjoy gaming”), Cognitive challenge (e.g., “The games challenge me mentally”), Competition (e.g., “I like to win”), and Social interaction (e.g., “I make new friends”). The scale uses a 5-point Likert-type format ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores in each dimension indicate greater specific motivation for gaming. In the current study, both Cronbach’s α and McDonald’s ω of e-MUV dimensions ranged from .83 to .89 (Spain), .83 to .93 (Italy), and .74 to .92 (Mexico).

Sociodemographic data. Age, gender, and country of residence, were collected. Additionally, gaming variables (age of gaming onset, hours of gaming per week, level of perceived toxicity in the gaming community, and gaming motivations (e-MUV instrument) have been used as covariates.

Statistical Analysis

We estimated a Latent Class Analysis (LCA) with covariates following the three-step method described by Bakker and Kuha (2020) for this study. This approach consists of first estimating the measurement model. The second step entails the assignment of individuals to each latent class once the number of latent classes is decided. Finally, covariates are included in the retained model by fixing the measurement parameters and the assignment of individuals from first and second step.

In order to select and retain the final model, seven models were estimated and compare on the basis of the following commonly used criteria: firstly, model fit indexes,

such as Akaike's Information Criteria (AIC) and Bayesian Information Criterion (BIC), were taken into account. These criteria allow models to be compared indicating that the lower value, the better fit to the data. Secondly, Entropy was considered as an indicator of the adequacy of the classification. This is reported in a range of values from 0 to 1, where values close to 1 indicate a perfect distinction between classes. Values close to .80 are considered adequate. Lastly, interpretability of classes was also considered for the selection. Analysis were performed using LatentGOLD version 6.1 (Vermunt & Magidson, 2025) and data management was carried out using SPSS v29 and R.

Results

Sample descriptives

The final sample comprised 1,327 participants with complete data on every IGDS item (n Spain = 275; n Italy = 401, n Mexico = 651). The mean age of the sample was 21.10 years ($SD = 2.98$), with a range from 17 to 34 years. With respect to the study's variables, frequency analyses indicated that the majority of participants selected the lowest response category ("never") for the majority of symptoms, particularly conflict (79.6%), deception (71.2%), displacement (69.9%), problems (66.7%), and persistence (65.3%). Withdrawal (51%) and preoccupation (33.5%) exhibited a significant proportion of "never" responses, though with greater dispersion across intermediate categories. As indicated by the data, a comparatively higher percentage of individuals reported experiencing escape in moderate frequency categories. Specifically, 18.7% of the surveyed population indicated that they had experienced escape five to eleven times in the previous year, while 16.1% reported experiencing it once to three times a month. Response frequencies on each item of IGDS are displayed on Table 1.

Table 1

Response frequencies of each category for the 9 IGDS items

	Preoccupat ion	Toleran ce	Withdra wal	Persiste nce	Escape	Proble ms	Decept ion	Displace ment	Confli ct
(0)	33.5%	33.6%	51%	65.3%	26.4%	66.7%	71.2%	69.9%	79.6%
(1)	26.1%	27.1%	24.6%	14.6%	22.8%	17.2%	13.4%	14.6%	10.4%
(2)	12.1%	14.7%	9.6%	8.3%	18.7%	5.7%	6.3%	7%	3.5%
(3)	12.7%	12.2%	8.9%	5.9%	16.1%	5.2%	4.3%	4.1%	3.3%
(4)	12%	9.8%	4.5%	4%	12.2%	3.3%	3.4%	3.3%	2.3%
(5)	3.6%	2.6%	1.4%	1.9%	3.8%	1.9%	1.4%	1%	0.8%

Note. Response options were (0) *never*, (1) *one to four times in the last year*, (2) *five to 11 times in the last year*, (3) *about once to three times a month*, (4) *once or more a week*, (5) *every day or almost every day*.

Model selection

Models from one to seven latent classes were estimated to ascertain the optimal solution for the latent classes model based on IGDS scores. While the information criteria (BIC and AIC) continued declining with the incorporation of additional classes, the rate of improvement showed a substantial decline after the 4-class solution. While the 5- and 6-class models yielded marginally lower BIC and AIC values, they resulted in a substantial decline in Entropy, suggesting a loss of classification precision. Also bearing in mind the interpretability of classes, the 5- and 6-class models only add redundant classes to the 4-class model. Consequently, the 4-class model was retained. Fit indexes are displayed on Table 2.

Table 2

Fit indexes for models from 1 to 7 latent classes

Model	BIC(LL)	AIC(LL)	df	p-value	Entropy R ²
1-Cluster	300.186.104	29785.03	1282	< .001	1
2-Cluster	270.407.936	267.553.064	1272	< .001	0.8527
3-Cluster	262.667.314	259.293.375	1262	< .001	0.8125
4-Cluster	260.802.314	256.909.307	1252	< .001	0.7926
5-Cluster	259.478.227	255.066.152	1242	< .001	0.7646
6-Cluster	259.081.197	254.150.055	1232	< .001	0.741
7-Cluster	25.913.065	25.368.044	1222	< .001	0.7293

Regarding the characterization of the classes, reviewing the expected response probability graph in Figure 1, it can be observed that classes 1 and 2 correspond to patterns of medium and low scores, respectively. However, class 3 shows high scores across all items, while class 4 shows high scores on the items of Preoccupation, Tolerance, and Escape, and low scores on the rest. Latent class 1 had the highest proportion of subjects, accounting for 41.22% of the total sample, followed by class 2 with 34.13% of individuals. Classes 3 and 4 had the lowest prevalence rates, at 12.86% and 11.79%.

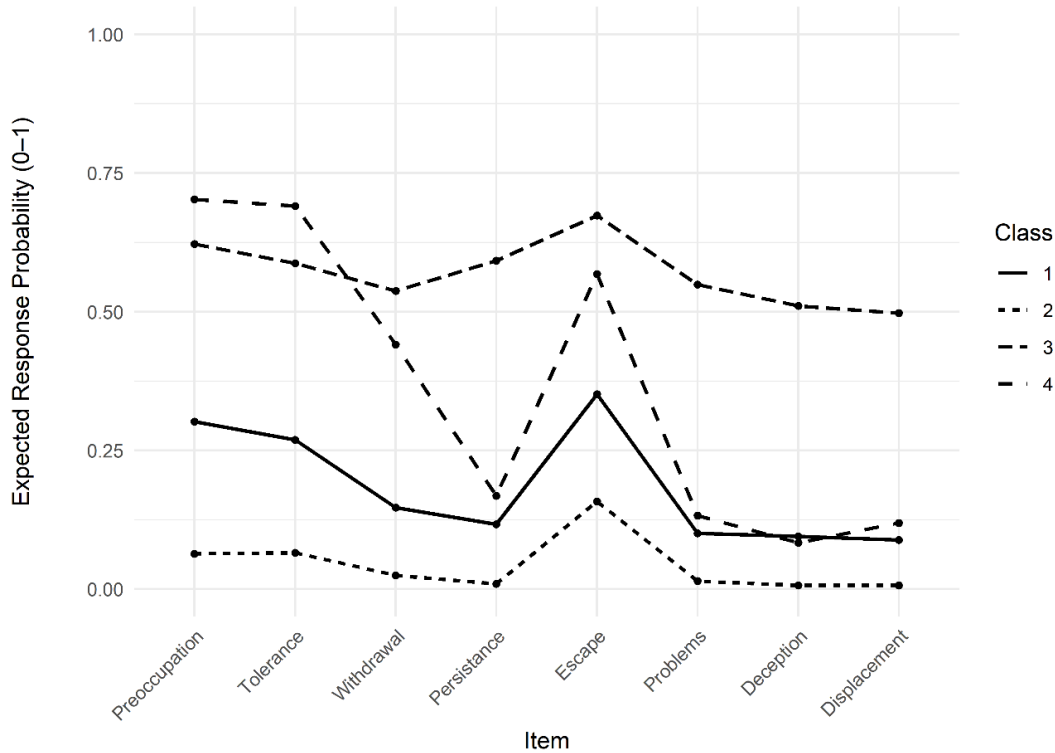
Covariates

Following the selection of the final model with four latent classes, the parameters were fixed and the classification generated by the model was taken. Subsequently, a multinomial regression model was estimated, with the process of elimination of covariates with insignificant effects being undertaken sequentially. After the first estimation, sociodemographic indicators such as gender and age of onset of the game, and

variables regarding motivation toward the game, such as customization, cognitive challenge and competition showed not statistically significant effects.

Figure 1

Expected response probability per class on each item



Regarding the significant indicator effects, hours of gaming was positively related to classes 1, 3 and 4, however, the most notable effect was that it reduced the probability of belonging to class 2. Later ages of onset were associated with higher probabilities of belonging to classes 3 and 4. Regarding motivational factors, toxicity, immersion, violence, and coping showed to reduce the probability of being at classes 1 and 2. For its part, playing games for fun showed to reduce the probability of being at class 3. Lastly, the dummy variable contrasting Italy (coded 1) with Spain and Mexico (coded 0) demonstrated a differentiated pattern of effects across clusters. Specifically, being from Italy was associated with a higher probability of membership in classes 1 and 2, and a

lower probability of membership in classes 3 and 4. Regression parameters are presented on Table 3.

Table 3

Effects of the covariates on the probability of belonging to each class

Covariates	Class 1	Class 2	Class 3	Class 4	Wald	<i>p</i> -value
Constant	0.867	5.036	-0.462	-5.442	63.117	< .001
Gaming hours	0.011	-0.154	0.063	0.081	51.087	< .001
Age of gaming onset	-0.022	0.006	0.063	-0.046	8.372	0.039
Toxicity	-0.045	-0.232	0.294	-0.018	27.044	< .001
Immersion	-0.071	-0.047	0.02	0.099	16.263	0.001
Violent gratification	-0.011	-0.089	0.071	0.029	26.144	< .001
Coping	-0.048	-0.216	0.153	0.111	79.766	< .001
Fun	0.101	0.075	-0.309	0.134	64.9	< .001
Social	0.025	0.031	0.014	-0.069	7.827	0.05
Italy vs. other nationality	0.673	0.42	-0.307	-0.786	21.341	< .001

Discussion

This study aimed to identify latent classes of gamers based on responses to the IGDS in three university student samples from Spain, Italy, and Mexico, exploring whether these classes better represent a unidimensional or bidimensional IGD framework.

The LCA results indicate that the four-class solution captures heterogeneity in IGD symptom patterns within the sample. Three classes, labeled Casual, Normative, and Problematic, were identified, with generally low, medium-low, and higher scores across IGD symptoms, supporting the conceptualization of these symptoms along a severity continuum. In contrast, the High-engaged class did not appear to follow a simple severity-

based pattern. Instead, it exhibited elevated scores on specific criteria such as preoccupation, tolerance, and escape, but low scores on the remaining symptoms. This differential pattern suggests that this class may be better explained by a bidimensional conceptualization of IGD, in which some symptoms reflect high gaming involvement, while others correspond to negative relational consequences.

Previous latent class studies have reported similar findings in adolescent samples. In China, a four-class solution was identified, including normative, occasional, problematic, and addictive gamers (Chang et al., 2023). The problematic class resembled our high-engaged class, exhibiting elevated scores on preoccupation, tolerance, and escape (as well as withdrawal and loss of control), but low scores on deception, relational and opportunity loss, and reduced interest in other activities. In European adolescents, Colder-Carras and Kardefelt-Winther (2018) identified a five-class model, showing that in groups such as the Engaged class, participants scored high on cognitive-emotional symptoms but low on negative consequences associated with gaming. Additionally, Deleuze et al. (2018) identified that both addiction and high engagement correlated with IGD. However, IGD criteria did not necessarily reflect problematic use, which could lead to the pathologization of highly engaged gamers.

Additionally, evidence from both factor-analytic and network approaches suggests that IGD may be more accurately represented as a bidimensional construct rather than a unidimensional one. In the Spanish version of the IGDS, an exploratory graph analysis and confirmatory factor analysis revealed a two-factor structure, distinguishing between cognitive-emotional symptoms and relational-problem outcomes (Gisbert-Pérez et al., 2026). Network analysis by Liu et al. (2022) identified two distinct clusters of IGD symptoms: internalizing (tolerance, withdrawal, preoccupation, and escape) and externalizing ones (conflict, deception, persistence, problems, and displacement). These,

along with the present findings, support a biaxial conceptualization of IGD. Moreover, internalized symptoms may develop before externalized consequences, indicating a potential progression from intensive, yet nonpathological, gaming to clinically significant impairment.

Covariate analyses of the four-class model further clarify the factors associated with class membership. Hours of gaming per week positively predicted membership in the normative, problematic, and high-engaged groups, while reducing the probability of belonging to the casual group. This highlights the expected gaming intensity in these classes, indicating that more hours increase the probability of belonging primarily to the high-engaged or problematic groups. This relationship has been confirmed, with gaming hours frequently linked to high involvement in gaming, even more than to gaming-related problems (Deleuze et al., 2018).

Age of gaming onset was positively associated with the probability of belonging to the Problematic group, as well as with a lower probability of belonging to the normative or high-engaged groups. Although its effect was small, starting gaming at an earlier age appears to be linked to more problematic gaming patterns. These results are consistent with those reported by Nakayama et al. (2020), who indicated that gaming at earlier ages was associated with a greater risk of problematic gaming.

Perceived toxicity was positively associated with the probability of belonging to the problematic group and negatively associated with the other groups. Previous research has shown that toxicity in gaming communities is positively linked to IGD symptoms (Díaz-Moreno et al., 2025). Previous studies indicate that frustration in gameplay can lead to toxic behaviors, especially in competitive gaming communities (Przybylski et al., 2014). Experienced players often express hostility toward newcomers, viewing them as threats to performance or team objectives (Fox & Tang, 2017). Moreover, some players

engage in toxic behavior as a form of emotional catharsis, using the gaming environment to vent negative emotions or personal frustrations (Liu & Agur, 2022). These dynamics suggest that community norms, competitiveness, and frustration-related processes foster toxic behaviors in gaming environments, which may increase the likelihood of problematic gaming patterns such as IGD.

Regarding gaming motivations, higher levels of immersion, coping, and violent gratification were associated with a greater probability of belonging to the problematic or high-engaged groups. Notably, higher levels of immersion were associated with a greater magnitude in the high-engaged groups, whereas coping and violent gratification were more strongly associated with the problematic group. In line with these findings, According to Slack et al. (2022), the desire to escape from reality was identified as the sole predictor of problematic gaming. Additionally, the meta-analysis by Wang and Cheng (2022) highlighted that coping motivation was the factor most closely linked to IGD. However, immersion can be considered a way of escaping into the virtual world of a game, representing a form of basic needs satisfaction, and should be differentiated from escaping from reality or an avoidant coping strategy, which is considered a way to avoid uncomfortable feelings or real-world problems (Giardina et al., 2023). Thus, while immersion may represent deep engagement with the virtual environment, coping motives seem to reflect a more maladaptive use of gaming aimed at regulating negative emotions. Regarding violent gratification, this motivation may stem from the desire for immediate satisfaction through aggressive gameplay and the swift achievement of in-game objectives. The frustration–aggression hypothesis suggests that frustration can trigger aggressive responses (Przybylski et al., 2014). Therefore, players who feel frustrated in their daily lives (whether due to gaming or other circumstances) or while playing may

turn to violent games to regain a sense of control and express their negative emotions. Thus, they might perceive aggressive gameplay as a means of emotional release.

Playing for fun was negatively associated with the probability of belonging to the problematic group. This finding suggests that when gaming is primarily motivated by enjoyment, it is more likely to remain a recreational activity rather than develop into problematic use. Previous research has similarly shown that hedonic motives such as playing for entertainment are less strongly associated with IGD symptoms than affect-regulatory motives such as escapism or coping (Demetrovics et al., 2011; Wang & Cheng, 2022).

The covariate results also showed differences across countries. Participants from Italy were more likely to belong to the lower-severity classes and less likely to belong to the problematic and high-engaged groups. These findings suggest that cultural or contextual factors may influence gaming patterns and the expression of IGD symptoms (Stevens et al., 2021). Thus, cross-national differences in gaming habits, social norms or cultural aspects, and gaming environments may contribute to the distribution of gaming profiles across countries.

Limitations and future research

This study has several limitations. First, the use of a convenience sample of university students limits the generalizability of the results to other populations. Second, the cross-sectional design prevents establishing causal relationships between IGD symptoms and the variables under study. Third, all measures relied on self-report instruments, which may be subject to recall bias or social desirability effects. Fourth, due to differences between the IGD diagnostic criteria established by the WHO and those of the APA, the

present study may benefit from replication using assessment tools that incorporate both frameworks.

Future research could replicate these findings using longitudinal designs to examine the stability and developmental trajectories of IGD symptom classes. Studies with more diverse and representative samples, including non-student populations and different cultural contexts, would help clarify the generalizability of the latent classes. Moreover, future studies could employ other IGD instruments to test whether these classes replicate across instruments.

Practical Implications

Several practical implications for the assessment, prevention, and intervention of IGD in university populations can be derived from the present study. First, the identification of distinct latent classes (particularly, the highly engaged and problematic gamers) underscores the importance of differentiating between intensive gaming without negative consequences and with clinically significant impairment. Accordingly, IGD assessment instruments should consider the presence of functional impairment or negative consequences as a core diagnostic criterion, rather than relying solely on the number of symptoms endorsed. Second, the associations of coping, immersion, and violent gratification motives, along with specific gaming behaviors, with increased likelihood of being in the problematic group suggest that interventions should target affect-regulatory motives and promote healthier gaming practices. Third, the finding that perceived toxicity in gaming environments is positively related to the probability of being in the problematic group highlights the need to foster supportive online communities and to address social factors that may exacerbate IGD risk. Finally, cross-national differences suggest that contextual and cultural factors influence gaming patterns, emphasizing that preventive

strategies and intervention programs should be tailored to the specific social and cultural contexts of the target population.

Conclusions

This study supports that IGD in university students is best conceptualized as a bidimensional construct comprising internalized (cognitive-emotional) and externalized (problem-related) symptoms. Latent class analysis identified four gamer groups: Casual, Normative, High-engaged, and Problematic, highlighting that high gaming involvement does not necessarily imply problem-related consequences. Specific gaming motives, such as coping and violent gratification, as well as perceived toxicity in gaming environments, were more strongly associated with a higher probability of being in the problematic gaming group, underscoring the relevance of affect-regulatory and social factors. These findings have practical implications for assessment, prevention, and intervention, emphasizing the need to differentiate high engagement from functional impairment and to tailor strategies to individual motivations and contextual factors.

OVERALL FINDINGS

In this section, the main results of the studies that compose the present doctoral thesis are summarized. Each study corresponds to an independent article that has been published, accepted, or submitted to a scientific journal.

Theoretical and methodological update of IGD

The first three studies of this doctoral thesis aim to meta-analytically synthesize the available evidence on the current state of research on video game addiction, providing a theoretical and methodological foundation for the subsequent empirical studies. Through this approach, four central dimensions of the phenomenon are addressed: what it is (IGD), how it manifests (prevalence), what it is associated with (correlate), and how it is assessed (instrument).

Study 1 focused on estimating the prevalence of IGD in young adult populations (18-35 years) through a systematic review and meta-analysis, using the proportion of participants meeting IGD diagnostic criteria as the effect size (Obj. 1.1). The results showed a pooled IGD prevalence of 6.1% (95 % CI: 5.03%, 7.4%) among young adults. However, prevalence estimates varied substantially depending on sample composition (gamer-only samples versus mixed samples of gamers and non-gamers). Specifically, prevalence was significantly higher in gamer-only samples (8.1%; 95% CI: 5.91%, 11.01%) compared to mixed samples (5.4%; 95 % CI: 4.33%, 6.90%), confirming that including non-gamers substantially lowers prevalence estimates and may obscure the true clinical burden among active gamers. Regarding university students, the pooled IGD prevalence was 6.04% (95 CI: 4.78%, 7.61%). Additionally, moderator analyses were conducted to explore possible sources of heterogeneity across studies. Moderator

analyses indicated that variability was influenced by factors such as assessment instruments, diagnostic criteria, and sample characteristics, highlighting the importance of methodological consistency in epidemiological research. In this way, the study contributes to a better understanding of the current state of IGD and the variability in its epidemiological estimates.

Study 2 focused on quantifying the empirical relationship between IGD and emotional intelligence through a systematic review and meta-analysis, using correlation coefficients as the measure of effect size (Obj. 1.2). Emotional intelligence is a construct that has been negatively associated with various forms of addiction; however, there had previously been no comprehensive narrative or quantitative synthesis of this relationship specifically in the context of IGD. To synthesize the relationship between emotional intelligence and IGD symptomatology, several independent meta-analyses were conducted based on different conceptualizations or types of emotional intelligence. The findings indicated a significant negative small-to-moderate association between IGD and various aspects of emotional intelligence: emotional regulation (-0.24 ; 95% CI: -0.28 , -0.18), socio-emotional competence (-0.23 ; 95% CI: -0.33 , -0.12), and emotional intelligence measured as an ability (-0.25 ; 95% CI: -0.38 , -0.10). Additionally, moderator analyses were performed to explore potential sources of variability among the studies. The research design of the studies, the geographical location, and the instruments used to measure emotional intelligence were found to influence the association between IGD and emotional intelligence. In summary, deficits in emotional regulation and social competence may serve as risk factors for developing IGD.

Study 3 aimed to evaluate whether the IGDS instrument, used to measure IGD in this doctoral thesis, demonstrates adequate reliability values to justify its use. This was achieved through a reliability generalization meta-analysis (Objective 1.3). For this

analysis, reliability coefficients reported in primary studies were utilized as the effect size. The instrument has four versions: the original, a short form, and two response formats (dichotomous and ordinal). Therefore, an independent meta-analysis was conducted for each version. The results indicated reliability levels exceeding 0.80 for the ordinal versions (IGDS9P and IGDS27P) and for the dichotomous 27-item version (IGDS27D). The dichotomous 9-item version (IGDS9D) showed reliability levels higher than 0.70. This study thereby provides accumulated evidence supporting the psychometric quality of the IGDS versions, including the IGDS9P used in this thesis.

Characterization of gaming among university students in Spain, Italy, and Mexico

This section focuses on characterizing the phenomenon of gaming among university students in the three countries, considering gender and gaming status. **Studies 4, 5 and 6** examined gender differences in gaming patterns in university students (Obj. 2.1). **Studies 7, 8 and 9** examined differences in sociodemographic and psychosocial variables among university students classified according to their current relationship with gaming (current gamers, non-current gamers, and non-gamers; Obj. 2.2). These comparisons were conducted using three independent samples from Spain, Italy, and Mexico following the same methodological design, allowing for the analysis of both common patterns and potential cross-cultural differences (Obj. 2.3).

Regarding the results of **Studies 4, 5 and 6**, similarities and differences have been found between variables related to gaming, such as weekly gaming hours, age of gaming onset, perceived gaming community toxicity, and specific gaming motivations.

In the Spanish sample, statistically significant gender differences were observed in age of gaming onset, weekly gaming hours, perceived community toxicity, and several motivations (customization, cognitive challenge, violent gratification, and social

interaction and competition). Men began gaming earlier, played more hours per week, and reported higher levels of gaming community toxicity. Regarding motivations, men scored higher in violent gratification, cognitive challenge, competition, and social interaction, whereas women scored higher in customization. The linear discriminant analysis indicated that the strongest combination of predictors distinguishing gender was earlier age of gaming onset and higher violent gratification motives, summed to higher perceived community toxicity and lower customization. Age of gaming onset and violent gratification motivation were key gender discriminating variables in Spanish university gamers.

In the Italian sample, statistically significant gender differences were found in age, age of gaming onset, weekly gaming hours, and perceived community toxicity. Men were older, began gaming earlier, played more hours per week, and reported higher levels of gaming community toxicity. Regarding motivations, men scored higher in violent gratification, coping, cognitive challenge, and social interaction. The linear discriminant analysis revealed that gaming hours and violent gratification were the strongest gaming predictors distinguishing men and women.

In the Mexican sample, statistically significant gender differences were found in age of gaming onset, weekly gaming hours, and perceived community toxicity. As in the other countries, men began gaming earlier and played more hours per week in communities with greater perceived toxicity. Regarding motivations, statistically significant differences were observed in violent gratification, customization, cognitive challenge, competition, and social interaction. The linear discriminant analysis showed that the best combination of predictors distinguishing gender included higher violent gratification motivations, earlier gaming onset, gaming in communities with greater

perceived toxicity, more gaming hours per week, and higher social interaction motivations.

Regarding the results of **Studies 7, 8 and 9**, similarities and differences have been found in demographic and psychosocial variables across Spain, Italy and Mexico.

In the Spanish sample, statistically significant differences were observed between current gamers, non-current gamers, and non-gamers in variables such as sex, prosocial behaviors, a component of emotional intelligence (appraisal of others' emotions), and perceived family social support. Marginally significant differences were found in perceived social support. A binomial logistic regression analysis showed that male sex and lower levels of prosociality were significantly associated with a higher likelihood of having initiated gaming.

In the Italian sample, statistically significant differences among the three groups were found in sex, age, prosocial behaviors, overall emotional intelligence, and perceived social support. Moreover, statistically significant differences were identified in specific components of emotional intelligence: appraisal of one's own and others' emotions differed between current and non-current gamers, while emotional awareness and emotional regulation differed between current gamers and non-gamers. Regarding components of perceived social support, statistically significant differences were found in perceived family support, friends' support, and support from significant others between current gamers and non-gamers; in the latter case, differences were also observed between non-current gamers and non-gamers. Given the presence of differences among the three groups, two binomial logistic regression analyses were conducted to identify which variables were associated with a higher probability of initiating gaming and which were associated with a higher probability of maintaining gaming. The results indicated that male sex, older age, and lower levels of prosociality were significantly associated with

having initiated gaming, whereas male sex, older age, and higher levels of one component of emotional intelligence (appraisal of others' emotions) were significantly associated with maintaining gaming.

In the Mexican sample, differences among the three groups were observed in sex, prosocial behaviors, and overall emotional intelligence. Regarding emotional intelligence components, post hoc tests showed that current gamers scored lower than both non-current gamers and non-gamers in appraisal of others' emotions, and also scored lower than non-current gamers in emotional awareness and emotional regulation. Binomial logistic regression analyses revealed that male sex was the only variable significantly associated with a higher likelihood of having initiated gaming, while male sex and lower levels of one component of emotional intelligence (emotional awareness) were significantly associated with maintaining gaming.

Overall, the findings indicate that gaming among university students shows consistent patterns across the three countries, particularly concerning gender differences: men tend to start earlier, play more hours, and more frequently report motivations related to violent gratification, as well as participation in gaming contexts perceived as more toxic. At the same time, both initiation and maintenance of gaming appear to be strongly linked to sex, while also being associated with psychosocial factors such as lower prosociality and specific components of emotional intelligence, with variations depending on the cultural context. Finally, it should be noted that overall mental health was not a differentiating factor between gaming groups.

Characterization of IGD among university students in Spain, Italy, and Mexico

This section focuses on the manifestation of IGD symptomatology among university students in the three countries, estimating the proportion of students who meet IGD criteria and identifying sociodemographic and psychosocial differences between students with and without symptomatology.

Studies 10 and 11 investigated the presence of IGD among university students in Spain, Italy, and Mexico, examining the psychosocial differences between gamers who meet IGD criteria and those who do not (Obj. 3.1). In each country, the proportion of students meeting IGD criteria was estimated, and sociodemographic, gaming patterns, and psychological variables were compared between those with IGD and those without. By applying the same analytical methods across the three samples, the researchers were able to assess the consistency of results and identify potential cross-cultural differences (Obj. 3.2). Using the polythetic cutoff proposed by Lemmens et al. (2015)—that is, endorsing at least five of the nine DSM-5 criteria at a level of (4) “often” or (5) “very often”—the findings revealed that the estimated prevalence of IGD in university populations of approximately 2.1% in both Spain and Mexico, and 2.4% in Italy. However, when focusing only on active gamers, the prevalence significantly increased, reaching around 4% to 6%. Furthermore, if response option (3) “one to three times a month” were considered as meeting the criterion (Evren et al., 2017), the prevalence increased to 3.5% in the general Spanish sample (10.2% in gamers), 3.9% in the Italian sample (6.5% in gamers) and 6.2% in the Mexican sample (15.7% in gamers).

Regarding the relationship between IGD and gaming variables, statistically significant and positive correlations were found between hours of gaming, playing with acquaintances, and level of toxicity in all three countries (and playing with strangers also

in Spain). However, differences emerged across countries in IGD-related motivations, with the strongest correlation in Spain and Italy, driven by competition. In contrast, motivation for fun was negatively correlated in Mexico. Likewise, in all three countries, IGD correlates positively with violent gratification and coping.

In examining the relationship between IGD and various psychosocial factors, a negative statistically significant correlation was observed in all three countries between IGD and perceived social support. Conversely, a positive correlation was found with impulsivity, but only statistically significant in Italy and Mexico. Additionally, in Spain and Mexico, there was a statistically significant negative association between IGD and emotional intelligence.

Across Spain, Italy, and Mexico, higher scores in impulsivity components emerged as a common predictor of increased risk of IGD among university students. However, the specific impulsivity dimensions differed by country: lack of premeditation in Spanish sample, positive urgency in Italian sample and lack of perseverance in Mexican sample. Additionally, each country also showed specific associated factors. In Spain, gaming with strangers and lower emotional intelligence were linked to IGD, while in Italy was spending a greater number of hours gaming and in Mexico was lower perceived social.

All these findings suggest that, although impulsivity may represent a shared vulnerability factor, additional behavioral and psychosocial variables may correlate with IGD depending on the context.

New methodological approaches to IGD

This section responds to a need identified in previous blocks: both current IGD instruments and diagnostic models may present structural and clinical classification limitations. Specifically, the predominant use of unidimensional models and approaches based exclusively on summing diagnostic criteria may limit the ability to capture the complexity of IGD.

Study 12 focused on translating and estimating psychometric properties of the Spanish version of the IGDS using an emerging psychometric network approach, Exploratory Graph Analysis (Obj. 4.1). This technique allows for the exploration of the dimensionality of the IGDS through network models, which provide a graphical representation of both item associations and the latent structure of the instrument. The findings suggested that the symptoms of IGD may present a bidimensional structure, encompassing cognitive-emotional symptoms (preoccupation, tolerance, withdrawal, and escape) and relational-problem outcomes (persistence, problems, deception, displacement, and conflict). This structure was confirmed using Confirmatory Factor Analysis (CFA), where bidimensional model exhibit better fit indices ($\chi^2(df)$: 43.401(26), CFI: .990, TLI: .986, RMSEA: .070, SRMR: .058) than the unidimensional one ($\chi^2(df)$: 91.231(27), CFI: .963, TLI: .952, RMSEA: .132, SRMR: .084). Moreover, internal consistency of both dimensions was excellent, standardized factor loadings were strong (above .70) and average variance extracted (AVE) values exceeding 0.50 support adequate convergent validity. Therefore, this study offers evidence on how IGD symptoms are structurally organized, contributing to a more precise understanding of IGD in university populations.

Study 13 focused on identifying latent classes of IGD symptomatology based on responses from the three samples to the IGDS (Obj. 4.2). Using a person-centered approach, this study examined whether distinct latent subtypes of gamers could be identified based on different levels of symptom severity or whether some classes could be better interpreted within a bidimensional framework of IGD. After testing models with 1 to 7 latent classes, the 4-class model was ultimately retained due to its entropy and interpretability. Classes 1 (*Normative gamers*) and 2 (*Casual gamers*) showed patterns of medium and low scores, respectively. Class 3 (*Problematic gamers*) exhibited high scores across all items, whereas Class 4 (*High-engaged gamers*) combined high scores in Preoccupation, Tolerance, and Escape, and low scores in the remaining items. Class 1 was the most prevalent (41.22%), followed by Class 2 (34.13%), while Classes 3 and 4 showed lower prevalence rates (12.86% and 11.79%, respectively).

The covariates that significantly differentiated the classes were weekly gaming hours, age of gaming onset, perceived toxicity in gaming communities, and the motivations of immersion, violent gratification, coping, fun, and social interaction. Additionally, being Italian (compared to being Spanish or Mexican) was associated with a higher probability of belonging to casual and normative gamers, and a lower probability of belonging to high-engaged and problematic gamers.

DISCUSSION

This doctoral thesis aims to strengthen the theoretical and methodological foundations of research on video game use and IGD among university students in Spain, Italy, and Mexico. This section highlights the most significant findings from the four thematic areas, along with limitations, suggestions for future research and practical implications.

Theoretical and methodological update of IGD

This section analyzes the findings from the first three studies, which aim to synthesize existing evidence on the current state of research regarding IGD through a meta-analytical approach. This method establishes a theoretical and methodological foundation for future empirical studies. **Study 1** focused on estimating the prevalence of IGD among young adults. **Study 2** examined the empirical relationship between IGD and emotional intelligence. **Study 3** evaluated whether the IGD Scale (IGDS) demonstrates adequate reliability values to justify its use.

The estimated prevalence of IGD in young adult populations was 6.1% (95% CI: 5.03% to 7.4%), similar to the prevalence found in university populations (6.04%; 95% CI: 4.78% to 7.61%). These figures appear higher than those reported in meta-analyses of the general population, which found prevalence estimates ranging from 3.05% to 6.7% (Kim et al., 2022; Stevens et al., 2021; Zhou et al., 2024). However, they are lower compared to the findings from Gao et al. (2022) in young adults. One possible reason for this discrepancy is that Gao et al. (2022) study focused exclusively on young adults up to 28 years old, capturing a narrower age range that is concentrated in late adolescence and emerging adulthood—periods typically associated with increased gaming engagement and a greater risk of IGD. These results suggest that both young adults and university

students represent groups with higher estimated prevalences of IGD compared to the general population, with notable variability between studies.

Consistent with previous meta-analyses (Kim et al., 2022; Stevens et al., 2021; Zhou et al., 2024), the high heterogeneity found ($I^2 > .95$) indicates that pooled estimates should be interpreted cautiously, as true prevalence likely varies substantially depending on contextual and methodological factors. Prevalence estimates of IGD varied by sample composition, with gamer-only samples showing a significantly higher rate (8.1%) compared to mixed samples (5.4%). Thus, sample composition is a key factor to consider in order to avoid overestimating the prevalence of IGD. Moderator analyses indicated that differences in assessment instruments, diagnostic criteria, and sample characteristics significantly contributed to the observed variability, underscoring the critical role of methodological consistency in epidemiological research.

A small-to-moderate negative association between different measures of emotional intelligence and IGD severity was found, according to Cohen's (1988) criteria. These findings align with prior reviews by Marchica et al. (2019) and Estupiñá et al. (2024), which consistently reported that greater difficulties in emotional regulation are associated with increased symptomatology of behavioral addictions, including IGD. Furthermore, similar to earlier meta-analyses conducted in certain Asian contexts (Ji et al., 2022; Koo & Kwon, 2014), this inverse relationship between emotional intelligence and gaming-related issues was also observed across broader sociocultural settings. This suggests that the association may be general rather than limited to specific cultures.

Based on the I-PACE model, emotional intelligence can be considered a dispositional person variable that influences individuals' vulnerability to IGD by affecting their affective and cognitive responses to stressors. Within this framework, higher emotional intelligence may reduce susceptibility to IGD by facilitating adaptive emotion

regulation, limiting maladaptive coping strategies (e.g., gaming as emotional escape), and supporting more effective executive control over behavior (Dang et al., 2019). Conversely, deficits in emotional clarity and regulation may intensify negative affect, reinforce dysfunctional gaming-related expectancies, and weaken inhibitory processes, thereby increasing risk (Estévez et al., 2019; 2021).

Taken together, these results support the hypothesis that emotional intelligence may function as a protective factor against the development or maintenance of IGD. Higher levels of emotional regulation, socioemotional competence, and emotional abilities are associated with lower IGD symptomatology, whereas deficits in these domains may constitute vulnerability factors. These findings highlight the relevance of incorporating socioemotional competence training in prevention and intervention programs targeting IGD (Henning et al., 2021).

Importantly, moderator analyses from Studies 1 and 2 indicated that sociodemographic and methodological features—including study quality, geographical location, and assessment instruments—represent significant sources of variability in meta-analytic estimates. In particular, the finding that assessment tools significantly influence both prevalence rates and correlation magnitudes justifies the systematic examination of their psychometric properties, especially reliability, to ensure more precise and comparable interpretations across studies.

Finally, all versions of Internet Gaming Disorder Scale (IGDS; Lemmens et al., 2015) demonstrated adequate reliability. Meta-analytic findings indicated reliability coefficients exceeding .80 for the ordinal versions and for the dichotomous 27-item version, while the dichotomous 9-item version showed coefficients above .70. These results provide evidence that all IGDS versions demonstrate acceptable reliability for research purposes. Nevertheless, considering both its strong psychometric performance

and its greater efficiency in administration, the 9-item ordinal version was selected as the primary instrument for the empirical analyses conducted in this dissertation.

In summary, **Studies 1–3** provide an integrated update of the epidemiological landscape of IGD while strengthening the methodological foundations necessary for its rigorous assessment. By identifying young adulthood as a period of increased vulnerability, highlighting emotional intelligence as a potential protective factor, and supporting the reliable use of standardized assessment tools such as the IGDS, these findings contribute to improving IGD research. Together, these studies offer a framework that enhances both theoretical advancement and the development of more precise and evidence-based empirical research on IGD.

Characterization of gaming among university students in Spain, Italy, and Mexico

This section analyzes the findings from **Studies 4–9**, which aim to characterize gaming behaviors among university students in Spain, Italy, and Mexico. This area examines gaming participation patterns, gender differences, and associated psychosocial variables within university populations. Given that prior moderator analyses indicated that contextual factors and measurement tools significantly influenced prevalence estimates and effect sizes, the present studies were designed to examine gaming behaviors across multiple countries while employing the same instruments. **Studies 4, 5 and 6** focused on gender differences in gaming characteristics and motivations across the three countries. **Studies 7, 8 and 9** examined sociodemographic and psychosocial differences according to gaming status (current gamers, former gamers, and non-gamers), allowing for the identification of common and culture-specific patterns in gaming engagement.

Gender is a key variable influencing gaming behavior. Research has shown that men are more likely to engage in gaming than women (Kuss & Griffiths, 2012; Stevens

et al., 2021). Results showed that men reported an earlier start to gaming and spending more time gaming each week across various countries. This earlier initiation among men aligns with findings that link early exposure to gaming with increased involvement later in life (Nakayama et al., 2020). This trend may contribute to more persistent gaming patterns during emerging adulthood. Additionally, men were more likely to engage in gaming communities that exhibit higher levels of toxicity and have a stronger inclination toward violent gratification, social interaction, and cognitive challenge compared to women.

These motivational differences can be better understood within broader sociocultural frameworks. Competitive and violent video games have traditionally been male-dominated spaces, often characterized by hostile or exclusionary dynamics, particularly toward women (Bopp et al., 2022; Kuss et al., 2022). Gender socialization theory (Bem, 1993) and social identity theory (Tajfel & Turner, 1979) provide explanatory models for why men may be more inclined to engage in environments that reinforce competitive and dominance-oriented identities, even when these contexts involve higher levels of toxicity. Consistent with this perspective, men also reported greater motivation for cognitive challenges, reflecting a stronger tendency to conceptualize gaming as a domain for achievement, skill development, and mastery (Liao et al., 2025).

In contrast, female gamers may strategically avoid highly competitive or toxic environments to reduce exposure to sexism or harassment, prioritizing psychological safety over participation in certain gaming spaces (Belskie et al., 2023; Kuss et al., 2022; McLean & Griffiths, 2019). Such avoidance may extend to socially interactive games that require identity disclosure, for example, through voice communication (Belskie et al., 2023). This pattern may also help explain higher customization motives observed among

women in some contexts, as these are typically associated with more creative and less competitive gaming experiences (López-Fernández et al., 2020).

In examining key predictors of gender differences across various countries, it was found that the motivation for violent gratification was a significant factor in all three contexts analyzed. Additionally, the age of gaming onset and the perception of toxicity were important discriminant predictors in Spain and Mexico, as well as weekly gaming hours in Italy and Mexico. These findings suggest that gender differences in gaming among university students reflect distinct gaming patterns shaped by gaming habits, motivations, and environmental factors. Overall, these results indicate a shared core motivational difference (violent gratification motivation) alongside context-dependent variability in other gaming-related predictors.

Beyond the gender differences, the studies conducted in Spain, Italy, and Mexico revealed sociodemographic and psychosocial differences between current university gamers, non-current gamers, and non-gamers. For example, sex, level of prosociality, and certain components of emotional intelligence showed differences between the three groups in Italy and Mexico, as well as between current gamers and the other groups in Spain. These results are particularly relevant given that prosociality and emotional intelligence are recognized as protective factors against behavioral addictions such as IGD (Dang et al., 2019; Esparza-Reig et al., 2021; Marchica et al., 2019).

Differences in perceived social support between gaming groups were statistically significant in the Italian sample and marginal in the Spanish sample, while no differences were observed in the Mexican sample. One possible explanation may relate to cultural differences in the role of social relationships. In more collectivistic contexts, social support networks tend to be relatively stable and embedded in family and close social ties (Hofstede et al., 2010). In contrast, in relatively more individualistic contexts such as

Italy—and to a lesser extent Spain—social interactions may be more closely linked to voluntary activities and how gaming is integrated into social life (Kaye et al., 2017).

It should be noted that no differences were found in overall mental health or healthy functioning between the gaming groups. These results support the idea that, for university students, gaming can be a normal recreational activity that does not necessarily serve to alleviate emotional distress. Previous studies have shown that most people play games for entertainment, leisure, and socialization without implying any psychological impairment (Griffiths, 2010; Przybylski & Weinstein, 2019). Rather, problematic trajectories appear to emerge under specific regulatory vulnerabilities or contextual conditions (Király et al., 2017). Recent studies distinguish between high engagement and problematic use, demonstrating that significant involvement in video games does not necessarily indicate psychopathology or dysfunction (Billieux et al., 2015). Therefore, the absence of differences in overall mental health suggests that gaming can be part of healthy and socially integrated lifestyles in non-clinical contexts.

Across the three countries, male sex emerged as the strongest predictor of both gaming initiation and maintenance. This pattern aligns with prior research showing higher gaming engagement among males (Kuss & Griffiths, 2012; Stevens et al., 2021), and suggests that sex is a robust determinant of gaming participation within university populations. However, this finding appears to contrast with industry reports indicating that women represent approximately 48% of gamers overall (ESA, 2025). This discrepancy may reflect age-related distribution effects, with female gamers potentially being underrepresented in university-based samples. In the case of Mexico, it was the only predictor of gaming onset, reflecting the relevance of sex as a characteristic linked to gaming.

Additionally, in Spain and Italy, prosociality emerged as a negative statistically significant predictor of gaming onset, indicating that lower levels of prosocial behavior were associated with a higher likelihood of having initiated gaming. This finding may be explained by differences in personal orientation (or an influence of more individualistic cultures), whereby individuals with lower prosocial tendencies may be more attracted to activities centered on individual achievement or challenge—characteristics inherent to many video games (Lobel et al., 2017). Alternatively, it may reflect a partial substitution of face-to-face social activities with gaming, which generally requires fewer direct social skills (Kardefelt-Winther, 2014; Soshani et al., 2021).

Regarding gaming maintenance, in addition to sex as a primary predictor, different components of emotional intelligence emerged as statistically significant across countries. Appraisal of one's emotions was positively associated with maintenance in Italy, whereas emotional awareness was negatively associated with maintenance in Mexico. The opposite directions observed across contexts may reflect distinct functional roles of gaming, ranging from emotionally integrated engagement to more avoidant patterns of involvement (Kardefelt-Winther, 2014; Snodgrass et al., 2014), as well as broader cross-cultural differences in emotional intelligence (Yang et al., 2025). Specifically, higher levels of trait EI have been reported in cultures characterized by individualism, suggesting that self-perceived emotional competencies may be shaped by cultural norms concerning emotional expression and emotion regulation (Yang et al., 2025). Therefore, cross-national differences observed in specific emotional intelligence components may not solely reflect individual-level associations with gaming behavior, but also wider cultural patterns that influence how individuals perceive and report their emotional capacities.

In summary, **Studies 4-9** indicate that gaming among university students in Spain, Italy, and Mexico displays both shared and context-specific patterns. Male sex consistently predicted initiation and maintenance, alongside distinct psychosocial correlates. Variables such as prosociality and emotional intelligence differentiated gaming status differently across countries, suggesting that individual differences and/or cultural influences may shape the configuration and relative salience of these psychosocial factors. However, the absence of differences in overall mental health indicates that, within university populations, gaming generally represents a normative recreational activity.

Characterization of IGD among university students in Spain, Italy, and Mexico

This section analyzes the findings from **Study 10** and **11**, which aim to characterize the manifestation of IGD symptomatology among university students in Spain, Italy, and Mexico. The analyses examine the proportion of students meeting the criteria for IGD, as well as the sociodemographic and psychosocial variables associated with IGD symptoms and predictors of IGD within university populations. **Study 10** focused on estimating IGD prevalence and identifying its main correlates across Spanish and Italian samples, while **Study 11** focused on the Mexican sample.

Across the three countries, IGD prevalence in the total university samples was low (2.1% in Spain and Mexico, and 2.4% in Italy) compared to previous meta-analytic estimates (6% and 10.4%, respectively; Gao et al., 2022; Gisbert-Pérez et al., 2025). However, when analyses were restricted to active gamers, prevalence rates increased to approximately 4–6%. This pattern highlights the importance of distinguishing between general population estimates and gamer-only samples, as previously noted in Study 1. Moreover, when applying a less stringent cutoff (e.g., Evren et al., 2017), prevalence estimates increased to 3.5% in the Spanish sample (10.2% among gamers) and 3.9% in

the Italian sample (6.5% among gamers). These findings showed how methodological decisions—particularly the choice of diagnostic thresholds and sample composition—can substantially influence prevalence estimates, potentially leading to overestimation.

Positive statistically significant associations were found between IGD and gaming-related variables (gaming hours per week, playing with acquaintances, and perceived toxicity) in all three countries. These results are consistent with previous research linking IGD with increased gaming time (King et al., 2017) and identifying it as a strong predictor of IGD (Zhuang et al., 2023). Regarding the relationship between playing with acquaintances and perceived toxicity in video games, previous studies have more frequently associated IGD with games featuring online multiplayer, competitive, and aggressive elements (Na et al., 2017). Video games with these characteristics tend to have more toxic communities, likely due to player anonymity or shared social identities that facilitate the spread of toxic behaviors within groups (Shen et al., 2020; Zsila et al., 2022). These findings are also consistent with the strongest correlations between gaming motivations and IGD being related to competition in Spain and Italy, and violent gratification across all three countries.

In addition to violent gratification, coping was another motivation that showed a statistically significant correlation with IGD. According to the meta-analysis by Bäcklund et al. (2022), motivations related to escape or emotional regulation are robustly associated with IGD. Thus, gaming can be used to avoid or improve emotional states and reality or manage emotions. Therefore, this relationship may indicate that coping motivations mediate the relationship between general psychiatric distress and IGD, turning gaming into a dysfunctional coping strategy (Moroney et al., 2019).

Beyond these shared motivations, differences between countries were also observed in the relationship between gaming motivations and IGD. A meta-analysis

conducted by Bäcklund et al. (2022) found that 23 out of 26 gaming motivations showed a statistically significant pooled correlation with IGD. However, some motivations—such as socialization or fun—showed small-to-moderate associations or estimates based on a limited number of studies. This pattern suggests that the presence of statistically significant associations between gaming motivations and IGD does not necessarily imply that all of them represent clinical risk factors. The cross-national differences found may indicate variations in gaming engagement linked to specific motivations rather than their clinical significance in developing IGD (Király, 2023).

Statistically significant associations were found between IGD and psychosocial protective variables, particularly perceived social support. Perceived social support has been identified as a protective factor in several behavioral addictions (Durak et al., 2023). Specifically, lower perceived support is associated with greater IGD severity, and social support has been shown to mediate the impact of psychological distress on gaming-related problems (Malak et al., 2023). However, a bidirectional relationship has also been proposed, whereby excessive gaming may negatively affect offline relationships and reduce perceived social support (Teng et al., 2020).

Emotional intelligence was only statistically significantly associated with IGD in the Spanish and Mexican samples. Although deficits in emotional intelligence may increase the risk of IGD by encouraging the use of gaming as an escape strategy (Kircaburun et al., 2019), the differential results may reflect sample-specific characteristics or broader cultural differences. Higher levels of trait emotional intelligence have been reported in more individualistic cultures, suggesting that self-perceived emotional competencies may be shaped by cultural norms related to emotional expression and regulation (Yang et al., 2025). Thus, in more individualistic contexts, such as Italy, reduced variability or culturally normative elevations in self-reported emotional

intelligence may limit its discriminative role in predicting IGD. Alternatively, other factors may moderate the relationship between emotional intelligence and problematic gaming, as suggested by previous research highlighting contextual moderators in IGD models (Gao et al., 2022).

Regarding IGD predictors, impulsivity components emerged as statistically significant predictors of IGD in all samples. However, the specific impulsivity dimensions that reached statistical significance varied by country, indicating that while impulsivity operates as a general vulnerability factor, its most salient facets—and their strength of association with IGD—may differ across sociocultural contexts. This supports theoretical models conceptualizing impulsivity as a transdiagnostic risk factor in behavioral addictions (Király et al., 2017).

Some psychosocial and gaming variables contributed to predicting IGD differently across countries. In Spain, lower emotional intelligence was associated with an increased likelihood of IGD. This aligns with previous evidence indicating that emotional regulation difficulties are linked to problematic gaming (Marchica et al., 2019; Estupiñá et al., 2024). In Mexico, lower perceived peer support suggests that IGD may be more closely linked to compensatory or substitutive social processes. In the Italian sample, weekly gaming hours were associated with higher odds of IGD.

The significance of intrapersonal resources (e.g., emotional intelligence) versus interpersonal resources (e.g., perceived social support) may be influenced by cultural individualistic or collectivistic orientation. This underscores the need for culturally sensitive models that consider risk factors within the social context. In Spain, which lies between individualistic and collectivistic considering the studied countries, the finding that gaming with strangers predicts IGD suggests that both gaming behavior intensity and social interactions are relevant in this context.

In summary, **Study 10** and **11** examined IGD among university students in Spain, Italy, and Mexico. The findings revealed a low overall prevalence of IGD, which increased when only gamers were considered. Across countries, IGD was consistently associated with gaming intensity, specific multiplayer interactions, and motivations related to coping and competition. However, psychosocial and gaming predictors varied across contexts. From the perspective of the I-PACE model (Brand et al., 2016; 2019), these findings suggest that while certain person-related vulnerabilities appeared broadly, sociocultural factors may influence how affective, cognitive, and behavioral processes interact, leading to different correlates with problematic gaming.

New methodological approaches to IGD

This section analyzes the findings from **Study 12** and **13**, which aimed to address methodological limitations identified in previous areas regarding structural and clinical conceptualization of IGD. Building on the epidemiological and psychosocial findings presented earlier, this section shifts the focus toward the internal organization of IGD symptomatology and the adequacy of prevailing measurement models. Specifically, it responds to the concern that the dominant reliance on unidimensional models and simple symptom-count approaches may insufficiently capture the multidimensional nature of IGD.

When exploring the dimensionality of the IGDS in the Spanish sample, the EGA results and CFA fit indices indicated that IGD symptoms were better represented by a bidimensional rather than a unidimensional structure. The two dimensions were labeled cognitive–emotional symptoms and relational–problem outcomes. This distinction suggests that a diagnostic approach based solely on the additive count of endorsed criteria may not adequately capture the nature of the disorder, as individuals who primarily

endorse cognitive–emotional symptoms with minimal functional consequences could meet diagnostic thresholds without necessarily presenting clinically significant impairment.

This bidimensional configuration aligns with prior research challenging the assumption of unidimensionality (Paschke et al., 2021) and is consistent with the biaxial model of addictive behaviors (Kelly & Hoeppner, 2014; Wakefield, 2015), which emphasizes the interplay between internal symptoms and functional impairment. It also converges with findings from latent class analyses (Colder Carras & Kardefelt-Winther, 2018) and network studies (Liu et al., 2022), showing that symptom expression and life consequences form distinct but related domains. Overall, these results support conceptualizing clinically relevant IGD as the co-occurrence of cognitive–emotional symptoms and relational or functional impairment, rather than as a single continuum defined by the total number of endorsed criteria.

The latent class analysis provides further support for a bidimensional conceptualization of IGD by identifying qualitatively distinct gamer classes rather than a single severity continuum. The four-class solution differentiates between normative, casual, high-engaged, and problematic, suggesting that high involvement does not necessarily equate to pathological gaming. In particular, the High-engaged class—characterized by elevated Preoccupation, Tolerance, and Escape but low scores on relational-problem items—closely mirrors the bidimensional structure previously identified, reinforcing the distinction between internal cognitive–emotional symptoms and externalized functional impairment. This profile appears to reflect intensive but not necessarily disordered engagement.

The covariate patterns further clarify the mechanisms underlying each class. Weekly gaming hours increased the likelihood of belonging to both problematic and high-

engaged classes, indicating that behavioral intensity is a shared feature of elevated involvement. However, intensity alone was insufficient to differentiate pathological from non-pathological classes, as only the problematic class showed generalized elevation across all items, including relational and functional consequences. This distinction supports theoretical perspectives differentiating high engagement from disorder (Billieux et al., 2015).

Early gaming onset was particularly associated with the high-engaged class, suggesting that earlier exposure may foster strong habitual involvement without necessarily progressing to dysfunction. In contrast, the problematic class was less defined by early onset and more by motivational and contextual factors. Higher immersion, coping, and violent gratification motivations increased the probability of belonging to both high-engaged and problematic classes, pointing to the relevance of affect-regulatory and experiential motives in more intense gaming trajectories. However, only the problematic class combined these motives with functional impairment, indicating that vulnerability may emerge when emotional or reinforcement-driven motivations co-occur with diminished self-regulation or adverse consequences.

The role of perceived toxicity also contributes to this differentiation. Greater perceived toxicity was associated with high-engaged gamers, suggesting that competitive or high-intensity environments may foster deep involvement without necessarily leading to full disorder. Conversely, social interaction motivation was negatively associated with the problematic class, implying that socially integrated gaming may serve a protective or normative function, whereas maladaptive gaming may be more internally driven.

Finally, the lower probability of Italian participants belonging to the problematic and high-engaged classes may reflect contextual or cultural differences in gaming

patterns, consistent with previous cross-national findings indicating variability in behavioral intensity and psychosocial correlates.

In summary, **Study 12** and **13** provide a Spanish translation of a short instrument for assessing IGD, which has been shown to have an adequate two-dimensional structure. Likewise, latent class findings support a nuanced interpretation of IGD symptomatology: pathological gaming appears to emerge from the convergence of cognitive–emotional symptoms and functional impairment. The person-centered approach thus complements the variable-centered analyses by clarifying that IGD risk is better understood as distinct risk classes rather than as a linear escalation of symptom severity.

Limitations and future research

The studies included in this doctoral thesis have limitations, which are outlined in each study. In this section, we will highlight some methodological limitations and generic ideas for future research identified throughout the thesis.

First, although the studies integrate meta-analytic and empirical approaches, the empirical analyses rely on cross-sectional designs, which prevent drawing causal conclusions about the relationships between gaming behavior, psychosocial variables, and IGD. Second, the samples were constituted by convenience sampling and were composed of university students from Spain, Italy, and Mexico, which may limit the generalizability of the findings to non-academic populations. Third, the use of self-report instruments may introduce potential biases related to social desirability, recall, or cultural differences in self-perception, particularly in variables such as emotional intelligence or perceived social support. Fourth, some of the exploratory models conducted in the empirical studies—such as logistic regression analyses examining differences between gaming status groups or predictors of IGD—explained relatively low proportions of

variance. This suggests that, although the purpose was to explore different gaming and psychosocial variables that contribute to understanding gaming behaviors and IGD, other relevant psychological, contextual, or environmental factors not included in the models may also play an important role. Fifthly, as it was not possible to conduct the sampling simultaneously in all three countries, it was not possible to carry out comparative studies. Instead, the same studies were conducted in each country. Furthermore, cross-national comparisons should be interpreted with caution, as differences between countries may reflect both genuine sociocultural influences and sample-specific characteristics. Sixthly, in analyses by gender and sex, these variables were considered as dichotomies due to insufficient data for other categories. Concerning the meta-analyses, some estimates were based on a limited number of studies and results showed substantial heterogeneity, which suggests that the pooled results should be interpreted cautiously and that further research is needed to provide more stable estimates.

Future research should consider using more representative and diverse samples of both university students and the broader young adult population. Further studies should examine measurement invariance across countries to determine whether the instruments used assess the same constructs in equivalent ways across cultural contexts. Establishing cross-cultural invariance would strengthen the comparability of results and help clarify whether the differences observed between countries reflect genuine sociocultural variations or potential measurement artifacts.

Another relevant direction for future research concerns the differentiation between highly engaged and problematic gamers. Although the latent class analysis identified distinct profiles, including high-engaged and problematic gamers, further research is needed to develop explanatory models capable of identifying the variables that best distinguish these groups. Examining psychological, motivational, and contextual factors

that differentiate high engagement from clinically relevant impairment could contribute to refining the conceptualization of IGD and improving the identification of individuals at risk of problematic gaming.

Finally, future research would benefit from longitudinal designs that allow for a better understanding of causal relationships and developmental trajectories in gaming behavior. Longitudinal studies could clarify how different gaming profiles evolve, particularly whether individuals classified as high-engaged remain highly involved without functional impairment or whether some of them transition into disordered gaming. Examining these trajectories would provide valuable insights into the stability of gaming profiles and the mechanisms that may lead from high engagement to clinically relevant impairment.

Practical Implications

Implications for the assessment and detection of IGD

The findings of this thesis highlight the need to refine current approaches to assess and detect IGD, especially in research and screening contexts. The identification of a bidimensional structure in the IGDS—distinguishing between cognitive–emotional symptoms and relational or functional consequences—suggests that evaluating gaming problems should not rely exclusively on the number of criteria endorsed over a 12-month period. Accordingly, a practical way to translate this recommendation into applied screening is to use a brief, stepped procedure that mirrors this symptom–impairment distinction. In a first stage, a short DSM-based measure such as the IGDS9 (polytomous) can be administered to efficiently identify individuals reporting elevated IGD symptomatology. However, instead of interpreting symptom endorsement alone as indicative of clinically meaningful problems, a second stage should explicitly assess

functional impact. Specifically, participants who screen positive on the IGDS9 can be asked a small set of targeted follow-up questions addressing whether gaming has produced measurable interference in core life domains (e.g., academic performance, sleep, social relationships, and daily responsibilities). This two-stage approach maintains the feasibility of brief screening in research and educational settings while anchoring detection to impairment, thereby improving specificity and reducing the likelihood of false positives among high-engaged gamers.

Implications for the prevention and intervention of IGD

The results also show that several psychosocial variables—such as emotional intelligence, perceived social support, and impulsivity—are related to IGD, although their role may vary depending on the sociocultural context. These findings suggest that prevention strategies aimed at young adults, particularly university students, could focus on strengthening everyday emotional and social skills rather than simply discouraging gaming. For instance, universities could implement short workshops or elective courses focused on emotional regulation, stress management during exam periods, and adaptive coping strategies. These programs could include practical activities such as learning how to identify emotional triggers that lead to excessive gaming, developing alternative leisure activities, or practicing time-management techniques that help students balance gaming with academic responsibilities.

At an intervention level, the results also suggest that it is important to differentiate between types of gamers. Not all individuals who spend many hours gaming necessarily require treatment. The identification of different classes of gamers (normative, casual, high-engaged, and problematic) indicates that interventions should be adapted accordingly. Individuals classified as problematic gamers may require structured psychological intervention. In contrast, high-engaged gamers do not necessarily require

clinical intervention, but they could be considered a group at potential risk. For these individuals, universities or student support services could provide preventive initiatives such as digital well-being workshops, psychoeducational sessions on healthy gaming habits, or guidance on balancing gaming with academic and personal responsibilities. These initiatives could help prevent highly engaged gaming patterns from developing into more problematic forms of use.

Implications for research and educational policies

Finally, the results underline the importance of considering sociocultural factors when studying gaming and IGD. The differences observed between countries suggest that prevention and digital education strategies should not be designed as one-size-fits-all programs. Instead, they should consider how gaming is integrated into the social and cultural context of each population. In university settings, this could translate into initiatives such as seminars on healthy gaming habits during orientation weeks or the inclusion of gaming and digital lifestyle topics within student support services. Importantly, these initiatives should also consider the specific stressors faced by university students—such as academic pressure, uncertainty about future careers, and periods of intense workload—which may increase the likelihood of using gaming as a coping strategy. Addressing gaming habits within broader programs focused on student well-being and stress management may therefore provide a more realistic and supportive approach to promoting healthy digital behaviors.

CONCLUSIONS

The results of this doctoral thesis highlight that gaming is a prevalent activity among university students in Spain, Italy, and Mexico. Gaming appears to remain a recreational activity more commonly associated with men, with gender differences also observed in gaming habits and motivations. Furthermore, certain differences were found between individuals who are currently gamers, those who previously played, and those who have never played in some psychosocial variables. However, no differences were observed in general mental health indicators, reinforcing the idea that, within university contexts, gaming primarily represents a recreational activity.

The meta-analytic prevalence estimate among young adults and university students was higher than the prevalence observed in the three empirical samples analyzed. In both cases, prevalence increased notably when only active gamers were considered. This finding emphasizes that estimates of IGD prevalence are highly dependent on methodological factors such as sample composition and the diagnostic criteria employed. Additionally, the results of the meta-analytic reliability analysis of IGDS (especially the 9-item polytomous version used in the empirical studies), supported its use as a reliable tool for assessing IGD in research contexts. Regarding IGD severity and emotional intelligence, meta-analytic results also indicated a small-to-moderate negative association. However, in empirical studies, emotional intelligence was associated with IGD differently across the three countries analyzed. One possible explanation is that the mechanisms associated with the development of IGD may be influenced by sociocultural context, although they may also reflect sample-specific characteristics.

Another possible explanation is that the conceptualization and measurement of IGD based on a criterion-count approach may not fully capture the the phenomenon,

potentially leading to false positives among individuals who show high engagement but little functional impairment. In this regard, the exploration of the internal structure of the IGDS revealed a better fit for a bidimensional structure compared to a unidimensional one. Distinguishing between cognitive–emotional symptoms and relational or functional consequences may help differentiate individuals with high levels of gaming involvement from those who experience gaming-related problems that generate dysfunction in different areas of their lives.

Consistent with this perspective, the latent class analysis identified four gamer profiles: normative, casual, high-engaged, and problematic. This classification suggests that some individuals may show high involvement in gaming while experiencing very low functional impairment, meaning that they could be classified as problematic if diagnosis relies solely on a criterion-count approach.

Overall, the results of this thesis contribute to improving the understanding of gaming and IGD among university populations, highlighting the need for more precise conceptual and methodological approaches capable of distinguishing between high engagement and problematic use. Additionally, the findings highlight the importance of considering individual, contextual, and sociocultural factors when studying IGD. This comprehensive perspective is essential for developing effective prevention and intervention strategies that address the complexities of the phenomenon.

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SUPPLEMENTARY MATERIALS⁶

⁶ The original numbering of appendices and supplementary materials in published studies will be preserved.

Supplementary Materials Study 1

Table S1

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Yes
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	2-5
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	5
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	6
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	5
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	5
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	6
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	6
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	6-7
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	6-7
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	7
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	8
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and	8

Section and Topic	Item #	Checklist item	Location where item is reported
		comparing against the planned groups for each synthesis (item #5)).	
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	7-8
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	8
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	8
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	8-9
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	9
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	9
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	7-9
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	9
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	9
Study characteristics	17	Cite each included study and present its characteristics.	10
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	11
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	11-13
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	11-13
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	11-13
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	12-15
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	11
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	11
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	11-13

Section and Topic	Item #	Checklist item	Location where item is reported
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	15-18
	23b	Discuss any limitations of the evidence included in the review.	18-19
	23c	Discuss any limitations of the review processes used.	18-19
	23d	Discuss implications of the results for practice, policy, and future research.	19-20
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	5
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	5
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	NA
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Funding Information
Competing interests	26	Declare any competing interests of review authors.	Competing interest's Information
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Supplementary Materials

Table S2

Risk of bias assessment with JBI checklist

Author	Was the sample frame appropriate to address the target population?	Were study participants sampled in an appropriate way?	Was the sample size adequate?	Were the study subjects and the setting described in detail?	Was the data analysis conducted with sufficient coverage of the identified sample?	Were valid methods used for the identification of the condition?	Was the condition measured in a standard, reliable way for all participants?	Was there appropriate statistical analysis?	Was the response rate adequate, and if not, was the low response rate managed appropriately?	% Yes	RoB Category
Aggarwal et al. (2024)	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	77,78%	Low
Al Asqah et al. (2020)	Yes	Yes	Unclear	Yes	Yes	Yes	Unclear	Yes	Yes	77,78%	Low
Almutairi et al. (2023)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Alshammari et al. (2024)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Alsunni & Latif (2022)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Ansari et al. (2022)	Yes	No	No	Yes	Unclear	Yes	Unclear	Yes	Unclear	44,44%	High
Aonso-Diego et al. (2024)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Bailey et al. (2024)	Yes	No	No	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Bailey et al. (2024)	Yes	No	No	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Balhara et al. (2020)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	88,89%	Low
Balhara et al. (2021)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Bansal et al. (2022)	Yes	Yes	Unclear	Yes	Unclear	Yes	Unclear	Yes	Unclear	55,56%	Mod
Bargerón et al. (2017)	Yes	No	Unclear	Yes	Unclear	Yes	Unclear	Yes	Unclear	44,44%	High
Bender & Gentile (2020)	Yes	No	Unclear	Yes	Yes	Yes	Unclear	Yes	Yes	66,67%	Mod

Bender & Gentile (2020)	Yes	No	Unclear	Yes	Yes	Yes	Unclear	Yes	Yes	66,67%	Mod
Bersani et al. (2022)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Bersani et al. (2021)	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	Unclear	66,67%	Mod
Bonnaire & Baptista (2019)	Yes	No	Unclear	Yes	Unclear	Yes	Unclear	Yes	Unclear	44,44%	High
Borges et al. (2020)	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	77,78%	Low
Borges et al. (2025)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	88,89%	Low
Bouna-Pyrrou et al. (2018)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Burén et al. (2023)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Chan et al. (2024)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Chandra et al. (2022)	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Unclear	77,78%	Low
Chen et al. (2021)	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	77,78%	Low
Chung et al. (2020)	Yes	No	Unclear	Yes	Unclear	Yes	Unclear	Yes	Unclear	44,44%	High
De Pasquale et al. (2020)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
De Pasquale et al. (2018)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Díaz-López et al. (2024)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Eichenbaum et al. (2015)	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	Unclear	66,67%	Mod
ElNahas et al. (2018)	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	Unclear	66,67%	Mod
Fekih-Romdhane et al. (2023)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Fenn et al. (2024)	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	Unclear	66,67%	Mod
Fung et al. (2025)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Garg et al. (2023)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	88,89%	Low
Gilbertson et al. (2019)	Yes	No	Unclear	Yes	Unclear	Yes	Unclear	Yes	Unclear	44,44%	High

Gilbertson et al. (2022)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Groves et al. (2015)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Guo et al. (2023)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Hakami et al. (2021)	Yes	No	No	Yes	Unclear	Yes	Unclear	Yes	No	44,44%	High
Hawi & Samaha (2025)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	No	55,56%	Mod
Henchoz et al. (2016)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	88,89%	Low
Hui et al. (2019)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	77,78%	Low
Idris et al. (2023)	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Imperatori et al. (2023)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Imran et al. (2024)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Ismail et al. (2021)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Kakul & Javed (2023)	Yes	No	Unclear	Yes	Unclear	Yes	Unclear	Yes	Unclear	44,44%	High
Kapoor & Subida (2023)	Yes	No	Unclear	Yes	Unclear	Yes	Unclear	Yes	Unclear	44,44%	High
Karasneh et al. (2021)	Yes	No	Unclear	Yes	Unclear	Yes	Unclear	Yes	Unclear	44,44%	High
Khazaal et al. (2016)	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	77,78%	Low
Khrad et al. (2022)	Yes	Yes	Yes	Yes	Unclear	Yes	Unclear	Yes	Unclear	66,67%	Mod
King & Wong-Padoongpatt (2022)	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	Unclear	66,67%	Mod
King et al. (2020)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Kotyuk et al. (2025)	Yes	No	Yes	Yes	Unclear	Yes	Unclear	Yes	Unclear	55,56%	Mod
Kumar et al. (2024)	Yes	No	Unclear	Yes	Unclear	Yes	Unclear	Yes	Yes	55,56%	Mod
Laconi et al. (2017)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Leino et al. (2024)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Li et al. (2016)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod

Malak et al. (2023)	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	88,89%	Low
Marchica et al. (2020)	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	Unclear	66,67%	Mod
Mills et al. (2018)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Mitchell et al. (2023)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Moreno et al. (2022)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Muyeed et al. (2025)	Yes	No	Yes	Yes	Unclear	Yes	Yes	Yes	Unclear	66,67%	Mod
Ohayon & Roberts (2021)	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Unclear	77,78%	Low
Oka et al. (2021)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	88,89%	Low
Olsen et al. (2021)	Yes	Yes	Unclear	Yes	Unclear	Yes	Yes	Yes	No	66,67%	Mod
Orsolini et al. (2024)	Yes	No	Yes	Yes	Unclear	Yes	Yes	Yes	Unclear	66,67%	Mod
Pearcy et al. (2017)	Yes	No	Unclear	Yes	Unclear	Yes	Unclear	Yes	Unclear	44,44%	High
Pontes et al. (2019)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Przybylski et al. (2016)	Yes	No	Yes	Yes	Unclear	Yes	Unclear	Yes	Unclear	55,56%	Mod
Raouf et al. (2022)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Ruckwongpatr et al. (2024)	Yes	No	Yes	Yes	Unclear	Yes	Unclear	Yes	Unclear	55,56%	Mod
Samaha & Hawi (2020)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Shahi et al. (2023)	Yes	No	Yes	Yes	Unclear	Yes	Unclear	Yes	Unclear	55,56%	Mod
Shi et al. (2020)	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	Unclear	66,67%	Mod
Shouman et al. (2023)	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	Unclear	66,67%	Mod
Siste et al. (2021)	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	Unclear	66,67%	Mod
Siste et al. (2022)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Soares et al. (2023)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Stavropoulos et al. (2019)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low

Stavropoulos et al. (2019)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Stockdale & Coyne (2018)	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	Unclear	66,67%	Mod
Taner et al. (2022)	Yes	No	Unclear	Yes	Yes	Yes	Yes	Yes	Unclear	66,67%	Mod
Tang et al. (2017)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Tang et al. (2024)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Throuvala et al. (2019)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Vahidi et al. (2021)	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Unclear	66,67%	Mod
Vally (2020)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Verlinden et al. (2021)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Vogel et al. (2018)	Yes	No	No	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Wang (2024)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Wang et al. (2022)	Yes	No	Unclear	Yes	Yes	Yes	Unclear	Yes	Unclear	55,56%	Mod
Wang et al. (2023)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	88,89%	Low
Weidberg et al. (2025)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Wong et al. (2020)	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Unclear	55,56%	Mod
Wu et al. (2023)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Yu et al. (2023)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low
Zhang et al. (2019)	Yes	No	Unclear	Yes	Yes	Yes	Yes	Yes	Unclear	66,67%	Mod
Zhao et al. (2021)	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Unclear	77,78%	Low

Note. Mod = Moderate.

Table S3

Study characteristics of the meta-analyzed studies

Autor (year)	Last year sampling	Fund	Country	Continent	Study design	N	N IGD	Gamer-only sample	Type of sample	Age group	Sampling	Female %	Mean age	SD Age	Age Range	IGD Scale	Items scale	Resp options	Mean scale	SD Scale	Manual
Aggarwal et al. (2024)	2021	No	India	Asia	CS	481	2	No	University	EA	NP	52,6	20,85	1,84	18–25	IGDS9-SF	9	5	NR	NR	DSM-5
Al Asqah et al. (2020)	2020	No	Saudi Arabia	Asia	CS	228	20	No	University	EA	P	35,1	21,15	1,57	18–25	IGDS9-SF	9	2	NR	NR	DSM-5
Almutairi et al. (2023)	2021	No	Jordan, Syria, Kuwait	Asia	CS	1332	26	No	General	YA	NP	25,5	24,51	7,44	18–35	IGD-20	20	5	NR	NR	DSM-5
Alshammari et al. (2024)	2022	No	Saudi Arabia	Asia	CS	263	6	No	University	EA	NP	67,7	22,83	1,37	18–30	IGDS9-SF	9	5	18,53	7,84	DSM-5
Alsunni & Latif (2022)	2020	No	Saudi Arabia	Asia	CS	843	181	No	University	NR	NP	54,7	20,68	1,55	NR	DSM-5 Criteria	9	2	NR	NR	DSM-5
Ansari et al. (2022)	2019	No	India	Asia	CS	239	2	No	University	EA	NP	49	21	2,28	18–28	IGDS9-SF	9	5	16,4	6,7	DSM-5
Aonso-Diego et al. (2024)	2021	Yes	Spain	Europe	CS	1186	92	Yes	Vocational	EA	NP	44,3	19,38	1,63	18–25	IGDS	9	5	NR	NR	DSM-5
Bailey et al. (2024)	2018	Yes	USA	America	CS	52	4	No	University	LA	NP	71,2	18,75	1,01	>18	IGDS	9	2	NR	NR	DSM-5
Bailey et al. (2024)	2020	Yes	USA	America	CS	89	13	No	University	LA	NP	72,7	20,66	1,73	>18	IGDS	9	2	NR	NR	DSM-5
Balhara et al. (2020)	NR	No	India	Asia	CS	84	20	Yes	University	EA	P	69,4	19,18	1,61	18–25	DSM-5 Criteria	9		NR	NR	DSM-5
Balhara et al. (2021)	NR	No	India	Asia	CS	306	11	No	University	EA	NP	53,3	22,73	3,97	20–25	IGDS9-SF	9	5	14,71	7,79	DSM-5
Bansal et al. (2022)	NR	No	India	Asia	CS	347	15	No	University	EA	P	36,5	19	1,34	18–25	IGDS9-SF	9	5	17,47	7,23	DSM-5
Bargeron et al. (2017)	NR	NR	USA	America	CS	177	13	No	University	NR	NP	NR	19,05	2,45	NR	DSM-5 Criteria	9	3	0,92	1,77	DSM-5
Bender & Gentile (2020)	NR	NR	USA	America	CS	720	65	Yes	University	NR	NP	36	19,74	2,43	NR	DSM-5 Criteria	8	2	1,74	1,81	DSM-5
Bender & Gentile (2020)	NR	NR	USA	America	CS	808	79	Yes	University	NR	NP	29,3	19,45	2,21	NR	DSM-5 Criteria	9	2	2,26	1,92	DSM-5
Bersani et al. (2021)	2021	No	Italy	Europe	CS	480	24	No	General	YA	NP	72,1	24,4	3,7	18–34	IGDS9-SF	9	5	11,71	4,53	DSM-5
Bersani et al. (2022)	2020	No	Italy	Europe	CS	623	37	No	General	LA	NP	73,1	21,76	1,92	18–24	IGDS9-SF	9	5	11,49	4,26	DSM-5
Bonnaire & Baptista (2019)	NR	No	France	Europe	CS	429	273	Yes	General	EA	NP	28,7	20,7	2,6	18–25	GAS	7	3	12,2	5,4	DSM-4
Borges et al. (2020)	2019	No	Mexico	America	CS	7022	367	No	University	NR	NP	55,1	NR	NR	18–>20	DSM-5 Criteria	23	2	NR	NR	DSM-5
Borges et al. (2025)	2022	No	Mexico	America	L	2144	123	Yes	University	NR	NP	69	NR	NR	18–>20	DSM-5 Criteria	23	2	NR	NR	DSM-5
Bouna-Pyrrou et al. (2018)	2017	Yes	Germany	Europe	L	192	11	No	General	EA	NP	51,2	22,5	NR	21–27	DSM-5 Criteria	9	2	NR	NR	DSM-5

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Burén et al. (2023)	NR	Yes	Sweden, Italy	Europe	CS	995	14	No	University	NR	NP	67,7	24,94	6,35	NR	GSMQ-9	9	5	0,34	0,56	DSM-5
Chan et al. (2024)	NR	Yes	Australia	Oceania	CS	408	34	Yes	University	EA	NP	43,13	19,4	2,45	<30	IGDT-10	10	3	NR	NR	DSM-5
Chandra et al. (2022)	2020	No	India	Asia	CS	453	124	Yes	University	LA	P	71,1	21,51	1,72	18-24	POGQ-SF	12	NR	NR	NR	NR
Chen et al. (2021)	2018	Yes	China	Asia	CS	1236	61	No	University	NR	NP	60,2	20,39	0,99	NR	IGDS	9	2	NR	NR	DSM-5
Chung et al. (2020)	NR	Yes	South Korea	Asia	CS	158	71	No	General	NR	NP	6,96	26,04	6,28	NR	DSM-5 Criteria	9	2	NR	NR	DSM-5
De Pasquale et al. (2018)	NR	Yes	Italy	Europe	CS	221	33	No	General	YA	NP	42,8	22,74	4,83	18-35	IGDS9-SF	9	5	11,9	4,6	DSM-5
De Pasquale et al. (2020)	2017	NR	Italy	Europe	CS	566	30	No	University	EA	NP	57,9	21,56	1,42	18-25	IGDS9-SF	9	5	NR	NR	DSM-5
Díaz-López et al. (2024)	2021	Yes	Spain	Europe	CS	815	25	No	General	LA	NP	24,7	21	NR	20-22	IGDS9-SF	9	5	NR	NR	DSM-5
Eichenbaum et al. (2015)	2014	No	USA	America	CS	4744	140	No	University	EA	NP	60,5	18,9	1,9	18-25	IGD scale	NR	NR	NR	NR	DSM-4
ElNahas et al. (2018)	NR	NR	Egypt	Africa	CS	996	93	No	University	LA	NP	55,9	19,6	1,6	18-24	IGDS	9	NR	2,5	2,4	DSM-5
Fekih-Romdhane et al. (2023)	2022	NR	Tunisia	Africa	CS	851	15	No	University	NR	NP	53,7	21,26	1,68	NR	IGD-20	20	5	41,7	13,55	DSM-5
Fenn et al. (2024)	2023	NR	India	Asia	CS	376	98	Yes	University	EA	NP	45,4	20,71	NR	18-28	GAS	7	5	15,68	6,9	DSM-4
Fung et al. (2025)	2023	Yes	Various (international sample)	Intercontinent	CS	283	66	No	General	LA	NP	91,2	20,04	1,88	18-24	IGDS9-SF	9	5	14,02	6,22	DSM-5
Garg et al. (2023)	2022	No	India	Asia	CS	348	53	Yes	University	YA	P	84,48	21,03	3,27	18-33	GDHGS	5	5	6,22	2,82	DSM-5
Gilbertson et al. (2019)	2019	Yes	USA	America	CS	71	12	No	University	EA	NP	NR	19,43	NR	18-27	IGDS	9	5	NR	NR	DSM-5
Gilbertson et al. (2022)	2021	Yes	USA	America	CS	73	10	Yes	University	EA	NP	41,1	18,84	1,25	18-26	IGDS	9	5	NR	NR	DSM-5
Groves et al. (2015)	2014	No	USA	America	CS	504	30	No	University	EA	NP	39	19,4	2,1	18-25	IGDS	9	5	NR	NR	DSM-5
Guo et al. (2023)	2023	Yes	China	Asia	CS	1231	353	No	University	EA	NP	45,5	19,77	1,3	18-25	IGDS9-SF	9	5	NR	NR	DSM-5
Hakami et al. (2021)	2020	Yes	Saudi Arabia	Asia	CS	225	5	No	University	YA	NP	39,6	21	NR	18-30	IGDS9-SF	9	5	12	NR	DSM-5
Hawi & Samaha (2025)	NR	NR	Lebanon	Asia	CS	345	15	No	University	YA	NP	30,4	19,9	2,1	19-31	IGD-20	20	5	41,83	14,35	DSM-5
Henchoz et al. (2016)	2013	Yes	Switzerland	Europe	L	4933	109	No	General	NR	P	0	19,95	1,2	NR	GAS	7	5	NR	NR	DSM-4
Hui et al. (2019)	2017	Yes	China	Asia	CS	1200	90	No	General	LA	NP	NR	19,48	1,21	18-24	DSM-5 Criteria	9	2	NR	NR	DSM-5
Idris et al. (2023)	2022	Yes	Malaysia	Asia	CS	213	21	No	University	EA	P	45,1	21,37	2,29	18-28	IGDS9-SF	9	5	NR	NR	DSM-5
Imperator et al. (2023)	2021	No	Italy	Europe	CS	633	37	No	General	YA	NP	72	24,46	3,77	18-34	IGDS9-SF	9	5	11,69	4,52	DSM-5
Imran et al. (2024)	2021	no	India	Asia	CS	170	18	Yes	University	EA	NP	34,12	21,1	0,8	19-25	IGD-20	20	5	NR	NR	DSM-5

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Ismail et al. (2021)	2020	yes	Malaysia	Asia	CS	237	6	No	University	EA	NP	69,6	21	NR	19–27	IGDS9-SF	9	5	NR	NR	DSM-5
Kakul & Javed (2023)	2022	no	India	Asia	CS	306	44	Yes	University	NR	NP	39,5	22,63	4,87	NR	IGDS9-SF	9	5	NR	NR	DSM-5
Kapoor & Subida (2023)	2022	no	Philippines	Asia	CS	399	82	Yes	General	LA	NP	28,82	21	NR	18–24	GAS	7	5	NR	NR	DSM-4
Karasneh et al. (2021)	2021	yes	Jordan	Asia	CS	504	96	Yes	General	NR	NP	31	21,6	3,9	NR	IGD-20	20	5	NR	NR	DSM-5
Khazaal et al. (2016)	2011	yes	Switzerland	Europe	CS	5983	138	No	General	NR	NP	0	20	1,2	NR	GAS	7	5	NR	NR	DSM-4
Khrad et al. (2022)	2021	No	Saudi Arabia	Asia	CS	306	31	No	University	EA	P	52	21	1,9	18–30	IGD-20 Test	20	5	48,5	14,6	DSM-5
King & Wong-Padoongpatt (2022)	2021	yes	USA	America	CS	797	73	No	University	NR	NP	62,9	20,3	4,54	NR	IGDS	9	2	NR	NR	DSM-5
King et al. (2020)	2020	yes	USA	America	CS	263	62	No	General	EA	NP	51	22,79	2	18–25	C-VAT 2.0	11	2	NR	NR	DSM-5
Kotyuk et al. (2025)	2023	Yes	Israel	Asia	CS	961	10	No	General	EA	NP	60,7	23,4	1,95	19–27	IGDS9-SF	9	5	NR	NR	DSM-5
Kumar et al. (2024)	2021	No	India	Asia	CS	675	14	Yes	University	NR	NP	36,1	21,85	1,56	≥18	IGDS9-SF	9	5	NR	NR	DSM-5
Laconi et al. (2017)	2015	NR	France	Europe	CS	418	8	Yes	General	YA	NP	49	21,9	3	18–30	IGDT-10	10	3	NR	NR	DSM-5
Leino et al. (2024)	2022	Yes	Norway	Europe	CS	5954 4	297	No	University	NR	NP	66,5	26,1	7,3	NR	GASA	7	5	NR	NR	DSM-4
Li et al. (2016)	NR	Yes	China	Asia	CS	654	31	No	University	LA	NP	54,4	20,29	1,39	18–22	OGCAS	16	5	22,92	9,22	DSM-4
Malak et al. (2023)	2022	No	Jordan	Asia	CS	1020	124	No	University	NR	P	44,1	21,38	2,12	NR	IGD-20	20	5	NR	NR	DSM-5
Marchica et al. (2020)	NR	Yes	Canada	America	CS	1536	101	Yes	General	EA	NP	54,75	20,45	NR	18–27	IGDS9-SF	9	2	NR	NR	DSM-5
Mills et al. (2018)	2017	No	USA, Canada	America	CS	922	68	No	University	YA	NP	59,1	23,53	6,84	18–35	PVGU	9	5	3,56	1,24	DSM-4
Mitchell et al. (2023)	NR	no	USA	America	CS	1054	50	No	University	LA	NP	73	19,25	1,32	18–24	CSAS	18	5	NR	NR	DSM-5
Moreno et al. (2022)	NR	Yes	USA	America	CS	6000	1460	No	General	EA	NP	51,03	21,7	2,4	18-25	IGDS	9	2	2,7	2,6	DSM-5
Muyeed et al. (2025)	2024	no	Bangladesh	Asia	CS	501	49	No	General	LA	NP	33,1	21,04	2,34	18–24	IGDS9-SF	9	5	17,06	8,59	DSM-5
Ohayon & Roberts (2021)	2015	Yes	United States	America	CS	2984	158	No	University	NR	P	42,1	22,9	5,7	NR	DSM-5 Criteria	9	6	NR	NR	DSM-5
Oka et al. (2021)	2020	Yes	Japan	Asia	L	3947	340	No	General	EA	P	NR	NR	NR	20–29	IGDS	9	2	0,62	NR	DSM-5
Olsen et al. (2021)	2014	Yes	Norway	Europe	L	1017	51	No	General	LA	P	19,7	19,5	1,01	18–24	GAS	7	5	0,86	1,35	DSM-4
Orsolini et al. (2024)	2022	no	Italy	Europe	CS	543	94	Yes	University	YA	NP	39,6	21,7	3,4	18–35	IGDS9-SF	9	5	15,3	5,7	DSM-5
Pearcy et al. (2017)	NR	No	Australia	Oceania	CS	119	12	Yes	University	YA	NP	30	23,8	7,2	18-34	PIE-9	9	5	NR	NR	DSM-5
Pontes et al. (2019)	NR	Yes	China	Asia	CS	236	4	Yes	University	LA	NP	53	19,22	1,57	18–24	GDT	4	5	6,17	2,91	NR
Przybylski et al. (2016)	NR	Yes	USA	America	CS	1247	13	No	General	LA	NP	NR	NR	NR	18–24	DSM-5 Criteria	9	2	NR	NR	DSM-5

Raouf et al. (2022)	2021	No	Egypt	Africa	CS	2364	447	No	University	LA	NP	47,8	20,2	1,38	18–22	IGD-20	20	5	NR	NR	DSM-5
Ruckwongpatr et al. (2024)	2022	Yes	Thailand	Asia	CS	801	17	No	University	NR	NP	66,9	20,69	3,78	NR	IGDS9-SF	9	5	16,35	7,47	DSM-5
Samaha & Hawi (2020)	NR	Yes	Lebanon	Asia	CS	345	15	Yes	University	NR	NP	26,1	19,93	2,08	NR	IGD-20	20	5	NR	NR	DSM-5
Shahi et al. (2023)	2020	No	Nepal	Asia	CS	412	21	No	University	EA	NP	80,6	21,45	2,11	18-25	IGDS9-SF	9	2	NR	NR	DSM-5
Shi et al. (2020)	2018	Yes	China	Asia	CS	922	51	No	University	LA	NP	51,5	NR	NR	18-19	IGDS9-SF	9	2	NR	NR	DSM-5
Shouman et al. (2023)	2022	NR	Egypt	Africa	CS	870	55	No	University	EA	NP	46,9	20,83	1,73	18-25	IGDS9-SF	9	6	NR	NR	DSM-5
Siste et al. (2021)	2019	Yes	Indonesia	Asia	CS	639	13	No	University	NR	NP	64,2	19,9	0,13	NR	IGDT-10	10	3	NR	NR	DSM-5
Siste et al. (2022)	2020	Yes	Indonesia	Asia	CS	1233	24	Yes	University	NR	NP	62,6	20,3	1,9	NR	IGDT-10	10	3	NR	NR	DSM-5
Soares et al. (2023)	NR	Yes	Italy, Sweden	Europe	CS	995	14	No	University	YA	NP	72,8	25	6,31	18-31	GSMQ-9	9	5	NR	NR	DSM-5
Stavropoulos et al. (2019)	2018	Yes	United States	America	CS	457	18	Yes	General	EA	NP	57,98	25,25	2,76	18-29	IGDS9-SF	9	5	NR	NR	DSM-5
Stavropoulos et al. (2019)	2018	Yes	Australia	Oceania	CS	164	3	Yes	General	YA	NP	73,8	23,01	3,35	18-31	IGDS9-SF	9	5	NR	NR	DSM-5
Stockdale & Coyne (2018)	NR	Sí	United States	America	CS	1205	87	No	University	YA	NP	50,15	20,32	4,17	18-31	IGDS	9	2	NR	NR	DSM-5
Taner et al. (2022)	2020	Yes	Turkey	Asia	CS	290	27	No	University	NR	NP	61,7	20	1,5	NR	CGAS	28	5	NR	NR	NR
Tang et al. (2017)	2015	No	China, Singapore, USA	Intercontinent	CS	3267	682	No	University	EA	NP	55,9	20,87	1,9	18–25	POGQ-SF	12	5	22,81	9,76	NR
Tang et al. (2024)	2022	Yes	Australia, Japan, Philippines, China	Intercontinent	CS	1134	49	No	University	EA	NP	46,2	18,9	NR	18-25	IGDS	9	5	NR	NR	DSM-5
Throuvala et al. (2019)	2018	No	Greece	Europe	CS	172	43	Yes	University	LA	NP	12,8	23,3	1,83	18–24	AICA-S	13	5	11,56	3,06	NR
Vahidi et al. (2021)	2018	Yes	Iran	Asia	CS	813	17	No	University	NR	NP	65,3	21,48	2,51	NR	IGD-20	20	5	45,47	13,93	DSM-5
Vally (2020)	2020	No	United Arab Emirates	Asia	CS	214	10	Yes	General	YA	NP	55,1	20,64	4,34	18–33	IGDS9-SF	9	5	22,49	7,59	DSM-5
Verlinden et al. (2021)	2019	Yes	United Arab Emirates	Asia	CS	412	6	No	University	NR	NP	88,1	21,89	3,8	NR	IGDS9-SF	9	5	15,85	6,4	DSM-5
Vogel et al. (2018)	2017	Yes	Germany	Europe	CS	66	14	No	University	YA	NP	65,2	23,82	3,12	18-32	s-LAT Gaming	12	NR	NR	NR	DSM-4
Wang (2024)	2021	Yes	China	Asia	CS	1118	40	No	University	YA	NP	41,4	25,3	3,6	18-30	IGDT-10	10	3	NR	NR	DSM-5
Wang et al. (2022)	2021	Yes	China	Europe	CS	789	57	No	University	EA	NP	65	20,78	3,72	18-25	IGDQ	9	5	NR	NR	DSM-5
Wang et al. (2023)	2022	Yes	Macao	Asia	CS	229	17	No	University	NR	NP	63,8	24,42	3,17	NR	IGDS	9	2	NR	NR	DSM-5
Weidberg et al. (2025)	2021	Yes	Spain	Europe	CS	1181	92	Yes	University	EA	NP	44,2	19,38	1,63	18-25	IGDS	9	5	22,59	5,25	DSM-5
Wong et al. (2020)	2019	Yes	Hong Kong	Asia	CS	300	77	No	University	LA	NP	40,67	20,89	1,48	18–24	IGDS9-SF	9	5	16,98	6,45	DSM-5

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Wu et al. (2023)	2022	Yes	Taiwan	Asia	CS	608	24	No	University	YA	NP	55	29,1	6,36	20-35	GADIS-A	10	5	NR	NR	NR
Yu et al. (2023)	2018	Yes	China	Asia	CS	305	39	No	University	YA	NP	0	21,1	2,8	18-30	DSM-5 Criteria	9	2	NR	NR	DSM-5
Zhang et al. (2019)	2016	Yes	China	Asia	L	469	42	Yes	University	EA	NP	58,4	19,29	1,1	18-27	DSM-5 Criteria	9	2	1,79	2,41	DSM-5
Zhao et al. (2021)	2020	Yes	China	Asia	CS	850	0	No	University	EA	P	58,47	NR	NR	18-27	IGA	11	5	NR	NR	NR

Note. NR = not reported; Fund = Funding; CS = cross-sectional; L = Longitudinal; LA = Late adolescence; EA = Emerging Adulthood; YA = Young adulthood; P = Probabilistic sampling; NP = Non-probabilistic sampling. All studies were written in English.

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Supplementary Materials Study 2

Appendix A

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Table A1

Studies' Characteristics

Author	Country	RD	Sampling method	Sample size	Mean Age	SD Age	% Man	Ethnicity	Sexual orientation	Marital Status	IGD Scale	EI Scale
Aksoy & Erol, 2021	Turkey	CS	Convenience sampling collected from three high schools	2001	16.5	1.07	66.6	NR	NR	NR	GASA	ALPS
Amendola et al., 2019	Italy	CS	Convenience sampling collected from secondary schools	280	13.31	2.33	51	NR	NR	NR	CSAS	DERS
Che et al., 2017	China	CS	Convenience sampling from two middle schools	931	16.18	0.95	100	NR	NR	NR	CIAS	Chinese Emotional Intelligence Scale
Dang et al., 2019	China	L	Convenience sampling from university	282	20.47	1.15	40	NR	NR	NR	DSM-5 Criteria	WLEIS
Di Blasi et al., 2019	Italy	CS	Convenience sampling from WoW forums	390	28.28	8.24	74.10	NR	NR	NR	IAT-WOW	DERS-18
Di Blasi et al., 2020	Italy	CS	Convenience sampling from WoW forums, Facebook groups and gaming pages	405	28.1	8	75.1	NR	NR	NR	IAT-WOW	DERS-18
Dieter et al., 2017	Germany	CS	Convenience sampling in a clinic and with advertisements on the websites of the Central Institute of Mental Health and Mannheim University	44 healthy controls and 51 internet addicts (30 IGD)	27.15	8.21	54.74	NR	NR	NR	AICA.30 subscale	EKF

Author	Country	RD	Sampling method	Sample size	Mean Age	SD Age	% Man	Ethnicity	Sexual orientation	Marital Status	IGD Scale	EI Scale
Efrati & Spada, 2023	Israel	L	Convenience sampling from institutes	1056	15.77	1.43	57,7	NR	NR	NR	IGDS9-SF	ERQ-CA
Estévez et al., 2014	Spain	CS	Convenience sampling from schools, universities and leisure time groups, and from associations and centers associated with FEJAR	1316	17.28	2.70	57.4	NR	NR	NR	MULTIC AGE CAD-4	DERS
Estévez et al., 2017	Spain	CS	Convenience sampling from nine high schools and vocational education centers	472	15.6	1.33	48.4	NR	NR	NR	MULTIC AGE CAD-4	DERS
Estévez et al., 2021	Spain	CS	Convenience sampling of a gambling disorder treatment clinic	95	41.8	13.2	93.5	NR	NR	43.2	MULTIC AGE CAD-4	DERS
Fumero et al., 2020	Spain	CS	Convenience sampling from private and public schools	946	14	1.52	51.5	NR	NR	NR	PVP	Social Skill Scale
Gentile et al., 2011	USA	L	Convenience sampling from grades 3,4,7,8 of 6 primary and secondary schools	2998	11.2	2.06	72.6	NR	NR	NR	DSM-5 Criteria	PSI-II
Giordano et al., 2022	USA	CS	Crowdsourcing from Qualtrics	350	15.23	1.35	48.6	44.9% White	NR	NR	IGDS9-SF	ERICA
Hollett & Harris, 2020	Canada	CS	Convenience sampling from social media advertisements	928	25.6	6.5	61.7	88% White	NR	33.8	PVP	DERS-36

Author	Country	RD	Sampling method	Sample size	Mean Age	SD Age	% Man	Ethnicity	Sexual orientation	Marital Status	IGD Scale	EI Scale
Hong et al., 2022	China	CS	Convenience sampling and online survey	780	14	de 7 a 18	49.9	NR	NR	NR	IGDS	DERS
Kim et al., 2023	Canada	CS	Convenience sampling from universities	1827	19.86	4.34	26.7	39.1% White	NR	78.4	SSBA Gaming	DERS-18
Kim et al., 2023	Canada	CS	Crowdsourcing from Prolific	528	29.12	9.24	43.7	40% White	NR	56.3	SSBA Gaming	DERS-18
King et al., 2013	Australia	CS	Convenience sampling from public and private schools	1287	14.8	1.5	50	NR	NR	NR	PTU Checklist	TISS
Kircaburun et al., 2019	Turkey	CS	Convenience sampling from a high school	470	16.29	1.17	40.4	NR	NR	NR	IGDT-10	TEIQue-SF
Kircaburun et al., 2020	Turkey	CS	Convenience sampling from gaming forums	478	20.88	4.79	96	NR	NR	NR	IGDT-10	TEIQue-SF
Kököneyi et al., 2019	Hungary	CS	Stratified random sampling	1646	15.4	2.19	62.9	NR	NR	NR	POGQ-SF	CERQ-short
Liau et al., 2015	Singapore	L	Convenience sampling from schools	2998	—	—	72.6	72.6% Chinese, 14.2% Malay, 8.8% Indian and 4.3% others	NR	NR	10 item scale DSM-IV	PSI-II

Author	Country	RD	Sampling method	Sample size	Mean Age	SD Age	% Man	Ethnicity	Sexual orientation	Marital Status	IGD Scale	EI Scale
Lin et al., 2023	China	CS	Convenience sampling from social networking sites and gaming forums	1768	17.96	3.04	64	NR	NR	NR	IGDS9-SF	DERS-16
Liu et al., 2017	China	CS	Convenience sampling from elementary schools	420	9.74	0.45	52.3	NR	NR	NR	PVGU	ERQ
Marchica et al., 2020	Canada	CS	Convenience sampling from colleges, universities and social media sites	753	20.77	2.73	45.82	NR	NR	NR	IGDS9-SF	DERS-36
Müller & Bonnaire, 2021	France	CS	Convenience sampling from a school and Facebook groups	201	19.02	4.2	63.18	NR	NR	NR	GAS	DERS
Mun & Lee, 2022	South Korea	L	Data from a longitudinal investigation (GUP)	336 dyads	NR	NR	7.1(fathers)/58(boys)	NR	NR	NR	GUP	Social Intelligence Scale
Nazari et al., 2023	Iran	CS	Convenience sampling from a web-based platform	933	15.08	0.82	58.6	NR	NR	NR	GADIS-A/IGDS9-SF	DERS-SF
Nugraha et al., 2021	Indonesia	CS	Convenience sampling from schools	136	16.02	0.69	63.2	NR	NR	NR	GAS	ICQ
Parker et al., 2008	Canada	CS	Convenience sampling from communities in Ontario	667	16.20	1.45	37.3	84% White	NR	NR	PVGS	EQ-i:YV
Parker et al., 2013	Canada	CS	Convenience sampling from a local pediatric clinic and special needs school	526(270 clinical outpatients + 256 special	15.22/16.27	1.63/1.21	64.4	91.5/79% White	NR	NR	PVGS	EQ-i:YV

Author	Country	RD	Sampling method	Sample size	Mean Age	SD Age	% Man	Ethnicity	Sexual orientation	Marital Status	IGD Scale	EI Scale
				need students								
Paschke et al., 2020	Germany	CS	Random sampling method from market research	1221	13.01	2.36	59.9	NR	NR	NR	GADIS-A/IGDS/P-IGDS	DERS-SF
Paschke et al., 2021	Germany	CS	Random sampling method from market research	800 dyads	46.38 (parents)/12.99(children)	0.93(parents)/2.37(children)	47.8(parents)/58.6(children)	NR	NR	NR	GADIS-P/GADIS-A/P-IGDS	DERS-SF
Paulus et al., 2021	Germany	L	Convenience sampling from a psychiatric clinic	80	9.2	2.03	63.7	NR	NR	NR	DSM-5 Criteria	DERS
Schettler et al., 2023	Germany	CS/L	Random sampling method from market research	1221/659	13.04/13.11	2.39/2.38	54/53	NR	NR	NR	IGDS/GADIS-A	DERS-SF
Seo et al., 2012	South Korea	CS	Convenience sampling from schools	2199	13.37	2.09	58.8	NR	NR	NR	KADO Scale	Emotional Intelligence Questionnaire
She et al., 2021	China	CS	Stratified random sampling from secondary schools	3136	13.6	1.3	48	NR	NR	NR	DSM-5 Criteria	CERQ-Short
Soares et al., 2023	Italy/Sweden	CS	Convenience sampling from social media and university campuses	995	25	6.31	31.3	NR	NR	NR	GSMQ-9	CERI (subscale Negative Impact)
Tang et al., 2022	Canada	CS	Convenience sampling from a university	287	19.8	3.01	47	43.6% White	NR	94.8 single, 2.4	GAIA	DERS-36

Author	Country	RD	Sampling method	Sample size	Mean Age	SD Age	% Man	Ethnicity	Sexual orientation	Marital Status	IGD Scale	EI Scale
										married, 2.8 common law		
Torres-Rodriguez et al., 2018	Spain	CS	Convenience sampling from two public mental health centers (clinical sample IGD +)	31	14.97	1.74	100	NR	NR	NR	IGD-20	TMMS-24
Tuncturk et al., 2023	Turkey	CS	Convenience sampling from an outpatient clinic specialized in GD	222 (111 IGD +)	14.39	2.18	NR	NR	NR	NR	IGDS9-SF/GADIS-A	DERS
Uçur and Dönmez, 2021	Turkey	CS	Convenience sampling from schools	1067	14.7	1.8	54.3	NR	NR	NR	GAS	DERS-36
Van Den Eijnden et al., 2018	The Netherlands	L	Convenience sampling from two secondary education schools	538	12.9	0.73	48.9	NR	NR	NR	IGDS	Hartners' Self Perception Profile of Adolescents
Wang et al., 2022a	China	CS	Convenience sampling from an online survey	789	20.78	3.72	34.9	NR	NR	NR	IGDQ	WLEIS
Wang et al., 2022b	China	CS	Convenience sampling from online advertisements and posters	109	21.7	2.26	49.5	NR	NR	NR	QSU-Brief Gaming	CERQ
Wichstrøm et al., 2019	Norway	L	Stratified sampling from 2003 and 2004 birth cohorts	740	10	0	51.4	91.7% White	NR	NR	DSM-5 Criteria	Emotion Regulation Checklist/

Author	Country	RD	Sampling method	Sample size	Mean Age	SD Age	% Man	Ethnicity	Sexual orientation	Marital Status	IGD Scale	EI Scale
												Social Skills Rating System
Wu et al., 2022	China	CS	Cluster random sampling method from schools	1,28	16.09	0.98	44	NR	NR	NR	PVGU	CERQ
Yen et al., 2018	Taiwan	CS	Convenience sampling from advertisements at universities	87	23.29	2.34	80.5	NR	NR	NR	DSM-5 Criteria	ERQ
Zahra et al., 2020	Pakistan	CS	Convenience sampling from universities	315	23.97	6.07	51.1	NR	NR	NR	IGD-20	WLEIS

Note. RD = Research Design. Note. AICA.30 = checklist for the Assessment of Internet and Computer game Addiction. ALPS = Adolescent Lifestyle Profile Scale. CBCL = Child Behavior Checklist. CERI = Comprehensive Emotion Regulation Inventory. CERQ = Cognitive Emotion Regulation Questionnaire. CIAS = Chinese Emotional Intelligence Scale. CSAS = Video Game Dependency Scale. DERS = Difficulties in Emotion Regulation Scale. EKF = Emotional Competence Questionnaire. EQ-i:YV = Emotional Quotient Inventory: Youth Version. ERICA: Emotion Regulation Index for Children and Adolescents. ERQ = Emotion Regulation Questionnaire. GADIS-A = Gaming Disorder Scale for Adolescents. GADIS-P = Gaming Disorder Scale for Parents. GAIA = Game Addiction Inventory for Adults. GAS = Gaming Addiction Scale. GASA = Game Addiction Scale for Adolescents. GSMQ-9 = Gaming and Social Media Questionnaire. IAT-Wow = Internet Addiction Test – Wow Version. ICQ = Interpersonal Competence Questionnaire. IGDS = Internet Gaming Disorder Scale. PSI II = Personal Strengths Inventory II. PTU = Pathological Technology Users. PVGS = Problematic Video Game Scale. PVGU = Pathological Video Game Use Questionnaire. PVP = Problematic Videogame Playing. QSU = Brief Questionnaire of Smoking Urges. TEIQue-SF = Trait Emotional Intelligence Questionnaire-Short Form. TISS = Teenage Inventory of Social Skills. TMMS-24 = Trait Meta Mood Scale. WLEIS = Wong and Law's Emotional Intelligence Scale.

Appendix B

Table B1

Publication Bias Analysis: Results of the Egger's Test

Outcome	<i>k</i>	<i>b</i> ₀	95% CI		<i>t</i>	<i>df</i>	<i>p</i>
			LL	UL			
Any measure of ER	36	−0.231	−0.342	−0.121	−0.227	34	.822
DERS							
Total score	18	0.318	0.130	0.206	−0.119	16	.907
Nonacceptance	13	0.205	0.010	0.401	−0.012	11	.991
(Lack of) Goals	12	0.220	0.028	0.413	−0.334	10	.745
Impulse	10	0.337	0.081	0.593	−0.301	8	.771
(Lack of) Awareness	13	0.004	−0.082	0.090	2.030	11	.067
(Lack of) Strategies	10	0.341	0.038	0.644	−0.351	8	.735
(Lack of) Clarity	15	0.244	0.104	0.384	−0.822	13	.426
CERQ							
Maladaptive cognitive strategies	5	0.203	0.007	0.400	−0.113	3	.918
Adaptive cognitive strategies	3	0.146	−0.111	0.403	−5.958	1	.106
ERQ							
Cognitive Reappraisal	3	−0.066	−2.563	2.432	−0.518	1	.696
Expressive Suppression	3	0.163	−4.479	4.805	0.289	1	.822
Any measure of SEC	13	0.065	−0.097	0.226	−4.2361	11	.001
EQ-i:YV							
Total score	4	−0.253	−2.070	1.565	−0.004	2	.997
Intrapersonal	4	−0.249	−2.090	1.593	0.209	2	.854
Interpersonal		−0.560	−1.884	0.763	0.858	2	.481
Adaptability		−0.161	−0.783	0.461	0.712	2	.550
Stress management	4	0.071	−1.142	1.285	−1.012	2	.418

Note. ER = Emotional Regulation. DERS = Difficulties Emotional Regulation Scale. CERQ = Cognitive Emotion Regulation Questionnaire. ERQ = Emotional Regulation Questionnaire. SEC = Social Emotional Competence. EQ-i:YV = Emotional Quotient Inventory: Young Version. *k* = number of independent samples. *b*₀ = intercept. LL and UL = lower and upper limits of the 95% confidence interval for *b*₀. *t* = *t*-test. *df* = degrees of freedom. *p* = *p*-value.

Supplementary Materials Study 3

Appendix A

The main difference between this study and Yoon et al. (2021) study is that Yoon et al. focus only on the nine-item dichotomous response version of the IGDS. In our study, the four original versions (Lemmens et al., 2015) are analyzed, including the 9-item and 27-item versions with polytomous and dichotomous response.

The election of this instrument by Yoon et al. (2021) is based on the results of the systematic review by King et al. (2020), in which only the 9-item dichotomous and 27-item dichotomous and polytomous versions (King et al., 2020) were included (p. 4, Table 1). Therefore, not considering the four versions could mean an error in the search, since our sample (made in 2021 and updated in June 2022, consulting Scopus, WoS, PsycInfo, and Dialnet databases) already contains articles that use the not-included version (when the review was conducted in these and other databases by King et al. (2020)).

All four versions of the IGDS report adequate reliability values in all four versions according to our systematic search. Although the nine-item dichotomous version is the most widely used in studies, some of them report inadequate reliability values, being the only version in which this occurs.

It should be noted that in our study, gray literature was included due to the small sample size. This fact can be both a strength, because it allows greater generalization of results by having a larger sample, and a weakness if it implies a reduction in quality. In the study by Yoon et al. (2021), the quality criterion used was that the journal of publication had peer review, and therefore, we reviewed our gray literature and concluded that it also met this criterion. All the articles that formed part of the gray literature were

published in peer-reviewed journals, thus providing a larger sample and more generalizable results.

Regarding the meta-analytic model used, Yoon et al. (2020) used the random effects model while we used two models: the random coefficients model and the varying coefficients model. These two models were employed because the former is the generally accepted and preferred model in research, and the latter was appropriate because of the characteristics of the sample (the unlikely fulfillment of the assumption of normality of the hypothetical population of α coefficients, the actual absence of random selection of the manuscripts, and the small number of the selected studies).

Regarding heterogeneity assessment, in the study by Yoon et al. (2020) Tau (τ), Tau-squared (τ^2), and I^2 were reported, whereas this study reported these measures plus the Q-statistic test and estimators of heterogeneity size R_b and CV_b and CV_w .

Regarding the sources of heterogeneity analyzed, Yoon et al. (2020) focus on sample type, study location, and instruments for measuring video game addiction. In our study, it is considered the language of the instrument, the mode of application, the type of sample, the total number of sample, and the presence of gamers/non-gamers in the sample. We also include a cluster analysis and a qualitative analysis of the significance of these clusters.

All of this highlights a greater rigor in conducting the meta-analysis and in assessing heterogeneity, as well as in exploring all versions of the IGDS. Thus, this study implies greater depth in the meta-analytic study of reliability with more focused generalizability.

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Appendix B

Table A1

Checklist for the corroboration of the meta-analytical report according to the REGEMA

SECTION	Yes	No	NA
TITLE			
1. Title	X		
ABSTRACT			
2. Abstract	X		
INTRODUCTION			
3. Background	X		
4. Objectives	X		
METHOD			
5. Selection criteria	X		
6. Search strategies	X		
7. Data extraction	X		
8. Reported reliability	X		
9. Estimating the reliability induction and other sources of bias	X		
10. Data extraction of inducing studies	X		
11. Reliability of data extraction	X		
12. Transformation method	X		
13. Statistical model	X		
14. Weighting method	X		
15. Heterogeneity assessment	X		
16. Moderator analyses	X		
17. Additional analyses	X		
18. Software	X		
RESULTS			
19. Results of the study selection process	X		
20. Mean reliability and heterogeneity	X		
21. Moderator analyses	X		
22. Sensitivity analyses	X		
23. Comparison of inducing and reporting studies			X

SECTION	Yes	No	NA
TITLE			
24. Data set	X		
DISCUSSION			
25. Summary of results	X		
26. Limitations	X		
27. Implications for practice	X		
28. Implications for future research	X		
FUNDING			
29. Funding	X		
PROTOCOL			
30. Protocol	X		

NA: not applicable. Source: Adapted and based on the REGEMA checklist of Sanchez-Meca et al. (2021).

Table A2

Characteristics of the selected studies

No.	Study	Version	Reported Reliability		Study Validity	Method	Reliability	Retest
			Available	Not Avail.				
1	Lemmens et al. (2015)	IGDS9D	X		Empirical	α	0.83	
2	Sioni et al. (2017)	IGDS9D	X		Induced	α	0.85	
3	Wartberg et al. (2017)	IGDS9D	X		Induced	α	0.82	
4	Baiumy et al. (2018)	IGDS9D	X		Induced	α	0.61	
5	Buiza-Aguado et al. (2018)	IGDS9D	X		Induced	ω	0.81	
6	Koning et al. (2018)	IGDS9D	X		Induced	α	0.74	
7	Van Den Eijnden et al. (2018)	IGDS9D	X		Induced	α	0.73	
8	Brooks and Clark (2019)	IGDS9D	X		Induced	α	0.82	
9	Dedeaux (2019)	IGDS9D	X		Induced	α	0.84	
10	Stockdale and Coyne (2019)	IGDS9D	X		Induced	α	0.81	
11	Grajewski et al. (2020)	IGDS9D	X		Induced	α	0.69	
12	Lei et al. (2020)	IGDS9D	X		Empirical	α	0.81	0.83
13	Wartberg et al. (2019)	IGDS9D	X		Induced	α	0.66	
14	Zendle (2020)	IGDS9D	X		Induced	α	0.79	
15	Booth et al. (2021)	IGDS9D	X		Induced	α	0.74	

No.	Study	Version	Reported Reliability		Study Validity	Method	Reliability	Retest
			Available	Not Avail.				
16	Liu et al. (2021)	IGDS9D	X		Induced	α	0.83	
17	Oka et al. (2021)	IGDS9D	X		Induced	α	0.84	
18	Paschke et al. (2021)	IGDS9D	X		Empirical	α	0.78	
19	Paschke et al. (2021)	IGDS9D	X		Empirical	α	0.72	
20	Paschke et al. (2021)	IGDS9D	X		Empirical	α	0.56	
1	Lemmens et al. (2015)	IGDS9P	X		Empirical	α	0.95	
2	Evren et al. (2017)	IGDS9P	X		Empirical	α	0.93	0.75
3	Mills et al. (2017)	IGDS9P	X		Induced	α	0.85	
4	Lei et al. (2020)	IGDS9P	X		Empirical	α	0.89	0.84
1	Lemmens et al. (2015)	IGDS27D	X		Empirical	α	0.93	
2	Reyes et al. (2019)	IGDS27D	X		Induced	α	0.9	
3	Ait Daoud (2020)	IGDS27D	X		Induced	α	0.93	
4	Zemestani et al. (2021)	IGDS27D	X		Induced	α	0.81	
1	Lemmens et al. (2015)	IGDS27P	X		Empirical	α	0.94	
2	Evren et al. (2017)	IGDS27P	X		Empirical	α	0.97	0.75
3	Allen and Anderson (2018)	IGDS27P	X		Induced	α	0.96	
4	Gibbons and Bouldin (2019)	IGDS27P	X		Induced	α	0.96	
5	Mills and Allen (2019)	IGDS27P	X		Induced	α	0.96	

Table A3

Characteristics of the selected studies

No.	Study	V	Lang	English Language	Application Mode	N Sample	Sample	Gamer Condition
1	Lemmens et al. (2015)	IGDS9D	Dutch	N	Self-report	989	Gen. Comm	Gamers
2	Sioni et al. (2017)	IGDS9D	English	Y	Self-report	394	Gen. Comm	Gamers
3	Wartberg et al. (2017)	IGDS9D	German	N	Interview	1020	Adolescents	Mixed
4	Baiumy et al. (2018)	IGDS9D	Arabic	N	Self-report	204	Young	Gamers
5	Buiza-Aguado et al. (2018)	IGDS9D	Spanish	N	Self-report	708	Adolescents	Mixed
6	Koning et al. (2018)	IGDS9D	Dutch	N	Self-report	354	Adolescents	NR
7	Van Den Eijnden et al. (2018)	IGDS9D	Dutch	N	Self-report	538	Adolescents	NR
8	Brooks and Clark (2019)	IGDS9D	English	Y	Self-report	257	Gen. Comm	Mixed
9	Dedeaux (2019)	IGDS9D	English	Y	Self-report	310	Gen. Comm	NR
10	Stockdale and Coyne (2019)	IGDS9D	English	N	Self-report	855	Adults	Mixed
11	Grajewski et al. (2020)	IGDS9D	Polish	N	Self-report	1306	Gen. Comm	Gamers
12	Lei et al. (2020)	IGDS9D	Chinese	N	Self-report	351	Gen. Comm	NR
13	Wartberg et al. (2019)	IGDS9D	German	N	Interview	1001	Adolescents	Mixed
14	Zendle (2020)	IGDS9D	English	Y	Self-report	1081	Gen. Comm	Mixed
15	Booth et al. (2021)	IGDS9D	English	Y	Self-report	2078	Adults	Mixed
16	Liu et al. (2021)	IGDS9D	Chinese	N	NR	1121	Adolescents	Mixed
17	Oka et al. (2021)	IGDS9D	Japanese	N	Self-report	3938	Gen. Comm	Mixed

No.	Study	V	Lang	English Language	Application Mode	N Sample	Sample	Gamer Condition
18	Paschke et al. (2021)	IGDS9D	German	N	Interview	762	Adolescents	Gamers
19	Paschke et al. (2021)	IGDS9D	German	N	Interview	777	Adolescents	Gamers
20	Paschke et al. (2021)	IGDS9D	German	N	Interview	784	Adolescents	Gamers
1	Lemmens et al. (2015)	IGDS9P	Dutch	N	Self-report	923	Gen. Comm	Gamers
2	Evren et al. (2017)	IGDS9P	Turkish	N	Self-report	457	Young	Mixed
3	Mills et al. (2017)	IGDS9P	English	Y	Self-report	1029	Gen. Comm	Gamers
4	Lei et al. (2020)	IGDS9P	Chinese	N	Self-report	378	Gen. Comm	NR
1	Lemmens et al. (2015)	IGDS27D	Dutch	N	Self-report	989	Gen. Comm	Gamers
2	Reyes et al. (2019)	IGDS27D	NR	NR	Self-report	1026	Gen. Comm	Gamers
3	Ait Daoud (2020)	IGDS27D	English	Y	Self-report	423	Gen. Comm	Gamers
4	Zemestani et al. (2021)	IGDS27D	Persian	N	Self-report	481	Gen. Comm	Mixed
1	Lemmens et al. (2015)	IGDS27P	Dutch	N	Self-report	923	Gen. Comm	Gamers
2	Evren et al. (2017)	IGDS27P	Turkish	N	Self-report	457	Young	Mixed
3	Allen and Anderson (2018)	IGDS27P	English	Y	Self-report	315	Young	Gamers
4	Gibbons and Bouldin (2019)	IGDS27P	English	Y	Self-report	272	Young	NR
5	Mills and Allen (2019)	IGDS27P	English	Y	Self-report	487	Gen. Comm	Gamers

Note. N: no; Y: yes; NR: not reported; V: version; Lang: language; Gen. Comm.: general community.

Supplementary Materials Study 4

Table S1

DIF analysis for e-MUV items

e-MUV Dimensions	M- χ^2	<i>p-value</i>	GMH- χ^2	<i>p-value</i>
Immersion				
Muv1	3.437	0.064	— ^a	—
Muv2	0.003	0.956	—	—
Muv3	2.837	0.092	—	—
Muv4	0.066	0.797	—	—
Customization				
Muv5	0.077	0.781	3.013	.556
Muv6	0.021	0.885	2.393	.664
Muv7	1.004	0.316	4.506	.342
Muv8	0.335	0.563	3.494	.479
Violent Gratification				
Muv9	2.928	0.087	3.463	.484
Muv10	2.648	0.104	4.793	.309
Muv11	0.159	0.690	1.744	.783
Muv12	8.161	0.004	8.354	.079
Coping				
Muv13	0.015	0.903	0.694	.952
Muv14	8.511	0.004	13.670	.008
Muv15	2.849	0.091	9.559	.049
Muv16	1.291	0.256	4.423	.352
Fun				
Muv17	0.022	0.882	—	—
Muv18	1.296	0.255	—	—
Muv19	0.141	0.707	—	—
Muv20	0.277	0.599	—	—
Cognitive Challenge				
Muv21	0.125	0.724	1.072	.899
Muv22	0.229	0.632	4.955	.292
Muv23	3.211	0.073	4.948	.293

Muv24	4.128	0.042	2.233	.693
Competition				
Muv25	0.125	0.724	—	—
Muv26	0.229	0.632	—	—
Muv27	3.211	0.073	—	—
Muv28	4.128	0.042	—	—
Social Interaction				
Muv29	2.693	0.101	3.648	.456
Muv30	0.747	0.387	1.541	.819
Muv31	0.228	0.633	2.751	.600
Muv32	0.361	0.548	1.762	.779

Note. $M-\chi^2$: Mantel test. $GMH-\chi^2$: generalized Mantel-Hanszel test. ^aEstimates not obtained due to insufficient data in one of the score strata.

Supplementary Materials Study 10

Table A1

Cronbach's alpha and McDonald's omega of study scales

		e-MUV								IGDS	UPPS-P						MSPSS				WLEIS-S				
		IMM	CUS	VIO	COP	FUN	CHAL	COMP	SOC		NU	LPM	LPS	SS	PU	T	FA	PE	OS	T	SEA	OEA	EA	ER	T
Spanish sample	α	.85	.86	.88	.84	.89	.85	.83	.83	.86	.76	.87	.85	.79	.55	.81	.92	.92	.97	.88	.82	.81	.79	.83	.89
	ω	.86	.88	.88	.83	.89	.85	.84	.83	.86	.76	.87	.85	.80	.59	.81	.92	.92	.97	.88	.83	.82	.80	.83	.89
Italian sample	α	.87	.83	.89	.89	.93	.89	.81	.85	.85	.83	.73	.88	.75	.71	.80	.77	.71	.70	.89	.70	.71	.65	.74	.92
	ω	.87	.85	.89	.89	.93	.90	.83	.85	.85	.84	.75	.88	.76	.73	.81	.78	.75	.74	.89	.70	.72	.67	.74	.92

Note. e-MUV = Motives in Video Game Use scale; IMM = Immersion; CUST = Customization; VIO = Violent Gratification; COP = Coping; FUN = Fun; CHAL = Cognitive Challenge; COMP = Competition; SOC = Social Interaction; IGDS = Internet Gaming Disorder Scale; UPPS-P = UPPS-P impulsive behavior scale; NU = Negative urgency; LPM = Lack of premeditation; LPS = Lack of perseverance; SS = Sensation seeking; PU = Positive urgency; T = Total score scale; MSPSS = Multidimensional scale of perceived social support; FA = Perceived family support; PE = Perceived peer support; OS = Perceived support of significant others; WLEIS-S = Wong and Law Emotional Intelligence Scale; SEA = appraisal of one's own emotions; OEA = appraisal of others' emotions; EA = emotion awareness; ER = Emotion regulation.

APPENDICES



Prevalence of Internet gaming disorder in young adults: a systematic review and meta-analysis

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ABSTRACT

Internet Gaming Disorder (IGD) is recognized as a condition for further study in DSM-5-TR and officially classified in ICD-11. Although gaming problems seem like an adolescent concern, growing evidence indicates that young adults are also vulnerable. This systematic review and meta-analysis aimed to estimate the global prevalence of IGD among young adults and identify sociodemographic and methodological moderators associated with its variability. Ninety-six analytical samples from 93 studies published (2015–2025) were included, comprising 149,601 participants aged 18–35 ($M_{age} = 23.53$ years, $SD_{age} = 6.28$; 51.22 % female). Generalized linear mixed models were applied to compute pooled prevalence estimates. The pooled prevalence of IGD was 6.1 % (95 % CI: 5.03–7.40). Prevalence was significantly higher in gamer-only samples (8.1 %, 95 % CI: 5.91–11.01) compared to mixed samples, including gamers and non-gamers (5.47 %, 95 % CI: 4.33–6.90). Moderator analyses showed that IGD prevalence differed by diagnostic instrument (IGDS and DSM-V criteria > IGDT-10) and by sample size, and a trend also emerged suggesting lower prevalence with higher proportions of women. In gamer-only samples, prevalence increased over time and in studies with a higher risk of bias. In mixed samples, prevalence differed by instrument (IGDS > GAS) and was negatively associated with sample size. These findings indicate that IGD is more prevalent among young adults than in the general population, especially among gamers. The variability observed across studies highlights the need for methodological consistency and the use of validated diagnostic tools to improve comparability and inform prevention and intervention strategies.

1. Introduction

To what extent can video games impact adult well-being? While the development of unhealthy gaming habits and Internet Gaming Disorder (IGD) has typically been associated with adolescence, the rising incidence of these issues in early adulthood is gaining attention from both academics and clinicians (Gao et al., 2022). Late adolescents and young adults tend to exhibit higher levels of depression, anxiety, and stress, along with lower self-esteem, compared to healthy regular gamers (Laconi et al., 2017; Rahul et al., 2025).

IGD is recognized in the DSM-5-TR as a condition for further study. It is characterized by persistent and recurrent use of the Internet to engage in gaming activities, often with other players, resulting in clinically significant impairment or distress (American Psychiatric Association

[APA], 2022). The DSM-5-TR comprises nine diagnostic criteria. These criteria include (1) preoccupation with gaming (the individual frequently thinks about previous gaming experiences or anticipates playing the next game), (2) withdrawal symptoms (experiencing irritability, anxiety, or sadness when not gaming), (3) tolerance (an increasing need to spend more time gaming), (4) unsuccessful attempts to control gaming habits, (5) loss of interest in previous hobbies, (6) continued excessive gaming despite problems (such as social or psychological issues), (7) deception about the extent of their gaming, (8) using gaming to escape negative mood, (9) jeopardizing relationships or opportunities (APA, 2022). To receive a diagnosis, an individual must meet at least five of these criteria within 12 months, and the severity will depend on the disruption of their lives. Previously, the World Health Organization (WHO) included gaming disorder as an official diagnosis in

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the International Classification of Diseases, 11th edition (ICD-11; WHO, 2018). The three core diagnostic features must be present for a minimum of 12 months are (1) inability to control gaming behavior, (2) increasing priority given to gaming over other activities, and (3) persistent gaming behavior despite experiencing negative consequences.

According to meta-analyses by Kim et al. (2022), Stevens et al. (2021) and Zhou et al. (2024), the estimated prevalence of IGD at the general population ranges between 3.05 % and 6.7 %. However, these estimates vary significantly when reported for specific age groups or derived from samples across different countries or continents (Stevens et al., 2021). Considering samples of children and adolescents, the prevalence typically ranges between 1 % and 9 % (Gentile et al., 2017). In general, the prevalence of adolescent samples is estimated at 4.6 % (95 % CI: 3.4 %–6.0 %). When examining these samples by continent, the prevalence for adolescents ranges from 4 % to 10 %. Additionally, the meta-analysis by Gao et al. (2022) found an overall prevalence of IGD among adolescents and young adults to be 9.9 % (95 % CI: 8.6 %–11.3 %), with lower prevalence rates observed in adolescents (8.8 %) compared to young adults (10.4 %). This rising prevalence in young adults underscores the importance of providing age-specific prevalence estimates and considering various factors contributing to variability.

Young adulthood is a crucial stage for biological, psychological, and social development, typically defined as the period from 18 to 35 years of age (Verburgh et al., 2014; APA, 2025). Within this age range, the concept of emerging adulthood specifically addresses individuals aged 18 to 29 (Arnett et al., 2014). Additionally, the WHO (2024) defines adolescents and youth as those up to 24 years old, recognizing the gradual transition into adult roles. This shift demonstrates a contemporary understanding of the delayed onset of traditional markers of adulthood, such as achieving financial independence, forming stable relationships, and starting a family (Sawyer et al., 2018). The American Psychological Association also notes that young adulthood can extend from the early 20 s to the mid-30 s, emphasizing that the process of adult development is often prolonged in modern societies (APA, 2025).

During this extended developmental stage, many processes that begin in adolescence, such as brain maturation, identity exploration, and the establishment of intimate relationships, remain ongoing (Institute of Medicine & National Research Council, 2015). While young adulthood is marked by increasing autonomy and cognitive maturity, it is also a period of instability and vulnerability, potentially heightening the risk for conditions such as IGD, as individuals seek coping mechanisms during transitions in education, work, and social life (Kinghorn et al., 2018).

IGD shares similarities with other behavioral and substance-related addictive disorders among young adults. One of these similarities is the loss of control over gaming behavior, which is comparable to issues found in disorders such as gambling disorder, compulsive buying disorder, and obsessive-compulsive disorder (Stevens et al., 2021). However, the DSM-5-TR notes that the diagnostic criteria for IGD are specifically applicable to gaming behaviors (APA, 2022). Prevalence estimates for these disorders among young adults or the general adult population also seem to vary significantly. The overall prevalence of gambling disorder in adults is estimated to be 2.8 % (95 % CI: 1.9 % to 3.9 %; Tran et al., 2024). The prevalence of compulsive buying in the adult population is estimated at 4.9 % (95 % CI: 3.4 % to 6.9 %; Maraz et al., 2015). For any type of obsessive-compulsive disorder in adults, the estimated prevalence is 17.5 % (95 % CI: 5.7 % to 33.9 %; Sharma et al., 2021), although this estimate decreases when focusing on specific obsessive-compulsive disorders. Even behavioral disorders with online components show markedly different prevalence estimates among emerging adults, suggesting that these conditions represent distinct forms of concern (mild-problematic internet use: 12.1 %; online gambling disorder: 5.1 %; Díaz-López et al., 2024).

Regarding IGD comorbidity, a comprehensive review found an association between IGD and various conditions, including depression, anxiety, ADHD, and other psychiatric symptoms (González-Bueso et al.,

2018). Furthermore, IGD seems to be associated with pathological gambling (Ayala-Rojas et al., 2021) and alcohol use disorder in adults (Na et al., 2017). Individuals with both IGD and alcohol use disorder tend to display more severe clinical features, such as impulsiveness, impaired self-control, and mood symptoms like depression, compared to those affected by only one of these conditions. These findings suggest not only a general comorbidity with certain disorders but also a potential for more specific or intensified comorbidities in adulthood.

1.1. The present study

The differences in prevalence and specific characteristics highlight the necessity to investigate the overall prevalence of IGD among young adults. Therefore, the main objective of this study is to provide a comprehensive meta-analytic synthesis of the prevalence of IGD in young adults, while also examining potential moderators that may account for the observed heterogeneity in prevalence rates. Understanding the extent of IGD in young adults will help practitioners develop targeted prevention strategies and interventions tailored to this specific age group and will contribute to the refinement of methodological approaches used in future IGD prevalence research.

2. Method

2.1. Study design

The present systematic review and meta-analysis were conducted following the Preferred Reporting Items for Systematic reviews and Meta-Analyses guidelines (PRISMA 2020; Page et al., 2021). The protocol for the present study was registered in PROSPERO (ID XXX). [Supplementary materials](#) (Table S1) include the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols guidelines (PRISMA 2020) and Guidelines for Reporting Systematic Reviews and Meta-Analyses (Rubio-Aparicio et al., 2018).

2.2. Search strategy

The study search was conducted between April and May 2025, using three electronic databases: Web of Science (Core Collection), Scopus and PsycInfo. The search strategy used was: (“internet gaming disorder” or “online games addiction” or “problematic gaming behav*” or “pathologic video game use” OR “digital game addiction”) AND (“emerg* adult*” OR “young adult*” OR “university*” OR “college” OR “youth”). Further manual searches of reference lists from the retrieved studies and previous systematic reviews and meta-analyses (Darvesh et al., 2020; Kim et al., 2022; Stevens et al., 2021; Zhou et al., 2024) were conducted to identify additional studies that met the inclusion criteria. Duplicate and reference management was performed using Refworks (ProQuest, n. d.).

2.3. Study selection criteria

Studies were included if they: (1) reported a prevalence figure of Internet gaming disorder in a general or gamer-specific sample; (2) provided original empirical data; (3) comprised a sample of participants with ages between 18 and 35 years; and (4) were available in English or Spanish. Studies were excluded if they: (1) provided insufficient demographic or methodological data; (2) reported a prevalence that could not be calculated from the available data; (3) used clinical specific samples (e.g., ADHD or IGD samples); or (4) used the same participant sample as another included study. Two researchers screened study titles, abstracts, and full-text inclusion criteria independently. Disagreements were resolved through discussion, and, if necessary, a third researcher was consulted.

2.4. Study coding

In order to investigate the potential influence of study characteristics on effect sizes, two researchers coded the study, methodological and participant variables independently. Disagreements were resolved through discussion, and, if necessary, a third researcher was consulted. Study-coded variables were (1) publication year, (2) country or continent where the study was conducted, (3) sampling technique (e.g., probabilistic or non-probabilistic), (4) year of data collection, (5) sample size, (6) instrument used to measure IGD, (7) number of items in the IGD instrument, (8) diagnostic manual on which the instrument was based, (9) instrument language, (10) number of response anchors, and (11) criteria used to identify IGD participants.

Methodological moderator variables were (12) study design (cross-sectional or longitudinal), (13) instrument used to measure IGD, (14) number of items in the IGD instrument, (15) diagnostic manual on which the instrument was based, (16) instrument language, (17) number of response anchors, and (18) criteria used to identify IGD participants.

Participant moderator variables were (19) reference population (e.g., general young adults, university students), (20) type of university students when applicable, (21) gamer-only sample (yes/no), (22) sample mean age, (23) sample age standard deviation, (24) age range, (25) proportion of female participants, (26) mean scale score, (27) standard deviation of the scale score, and (28) number of IGD cases.

2.4.1. Study quality

The risk of bias for individual studies was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Studies Reporting Prevalence Data (Joanna Briggs Institute, 2018; Munn et al., 2015). Risk of bias (RoB) was categorized as high when fewer than 50 % of items received a “yes,” moderate when 50–69 % received a “yes,” and low when 70 % or more received a “yes” (Kim et al., 2022). The checklist includes 9 criteria: (1) appropriate sample to address the target population, (2) appropriate sampling, (3) adequate sample, (4) detailed descriptions of study subjects and setting, (5) analysis conducted with sufficient coverage of the identified sample, (6) valid identification methods, (7) standardized and reliable measurements, (8) appropriate statistical analyses, and (9) adequate response rate. Each item was evaluated using yes/no/unclear coding (Supplementary materials Table S2). Two researchers independently assessed the risk of bias of individual studies. Disagreements were resolved through discussion and, if necessary, consultation with a third researcher. Risk of bias classifications were subsequently used as a moderator in the meta-analytic models.

2.4.2. Effect size estimate

Data on effect size included the proportion of participants who fulfilled the diagnostic criteria for IGD. This proportion was computed by dividing the number of participants who met the diagnostic criteria for IGD by the total number of participants in the sample. In line with standard meta-analytic procedures (Borenstein et al., 2021), the effect size from each study was converted to logits for all analyses. After performing the statistical analyses, the outcomes (in logits) were converted back to proportions along with their associated confidence intervals to facilitate interpretation. Only the baseline IGD data were considered in longitudinal study designs to ensure comparability across studies. Two researchers calculated proportions independently. Disagreements were resolved through discussion, and, if necessary, a third researcher was consulted.

2.5. Statistical analysis

Meta-analysis was conducted using generalized linear mixed models (GLMMs) with a logit link function to estimate the proportion of participants with IGD. GLMMs have been suggested for estimating non-normal distributions such as proportions, since they offer lower bias,

lower mean squared errors, and higher coverage probabilities than two-step methods (Lin & Chu, 2020). This study reports prevalence estimates with 95 % confidence intervals (CIs) and 95 % prediction intervals (PIs). All parameters were estimated using the maximum-likelihood approach. For each meta-analysis, a forest plot was created, and both the average effect size and a 95 % confidence interval (95 % CI) were determined. Inter-study heterogeneity was analyzed with Higgins' inconsistency index (I^2) and tested using the likelihood ratio test. Possible sources of heterogeneity were explored using univariate GLMMs. Categorical moderators included risk of bias, reference population, sampling technique, age-group category, geographical provenance, study design, and diagnostic manual underlying the IGD instrument. Quantitative moderators included year of publication, year of data collection, risk-of-bias score, mean age, proportion of female participants, and sample size.. Classical recommendations were used to assess categorical moderators with at least three studies at each level, and continuous moderators with at least ten studies per covariate (Borenstein et al., 2021). For each categorical moderator, a log-likelihood ratio test (LRT) was used to compare the null model against a model including the moderator. Significant omnibus tests ($p < 0.05$) were followed by pairwise post-hoc comparisons between moderator levels using Tukey-adjusted contrasts to determine specific group differences. Outlier diagnostic procedures were conducted to assess the potential impact of outliers or influential cases on the meta-analytic estimates (Viechtbauer & Cheung, 2010). Standardized residuals and studentized deleted residuals were computed for each study; effect sizes with either residual exceeding ± 1.96 were considered potential outliers. Influence was assessed using case-deletion diagnostics, including Cook's distance, covariance ratios and leverage (hat) values. When potential outliers demonstrated an influential impact on the meta-analytic results, sensitivity analyses were performed using a leave-one-out method, comparing the overall pooled estimate after excluding each study to assess whether its inclusion substantially affected the meta-analytic results. To assess potential publication bias, the DOI plot (Difference of Means–Oriented Index plot) symmetry and LFK index (Luis Furuya-Kanamori) were analyzed, as they are considered more sensitive techniques in prevalence meta-analysis than the funnel plot (Furuya-Kanamori et al., 2018). LFK index values between -1 and $+1$ indicate no asymmetry (no publication bias), values between ± 1 and ± 2 indicate minor asymmetry (possible bias), and values beyond ± 2 indicate major asymmetry (substantial publication bias). A $< 0.05p$ -value was considered statistically significant. Meta-analysis was performed using the *metafor* R package in R (version 4.4.0; Viechtbauer (2010)).

3. Results

3.1. Study selection

The search identified 1411 articles. After removing duplicates, 1,253 articles were screened based on title and abstract, of which 270 were identified as potentially eligible. After screening the full text of the 270 articles, 86 articles finally met the inclusion criteria. An additional manual search of reference lists from screened articles and previous systematic reviews identified 10 further records, of which 7 met the eligibility criteria. In total, 93 articles were included, contributing 96 analytical samples to the meta-analysis (Fig. 1). The complete list of included studies is provided in the Supplementary Materials.

3.2. Study characteristics

Supplementary materials (Table S3) included study characteristics of the meta-analyzed studies. All the studies included in the meta-analysis are empirical articles published in scientific journals. Of the 2-year periods considered, the one with the highest number of articles was 2023–2024 ($n = 31$; 33.3 %), followed by 2021–2022 ($n = 17$; 18.3 %), 2019–2020 ($n = 14$; 15 %), 2017–2018 ($n = 10$; 10.7 %), and

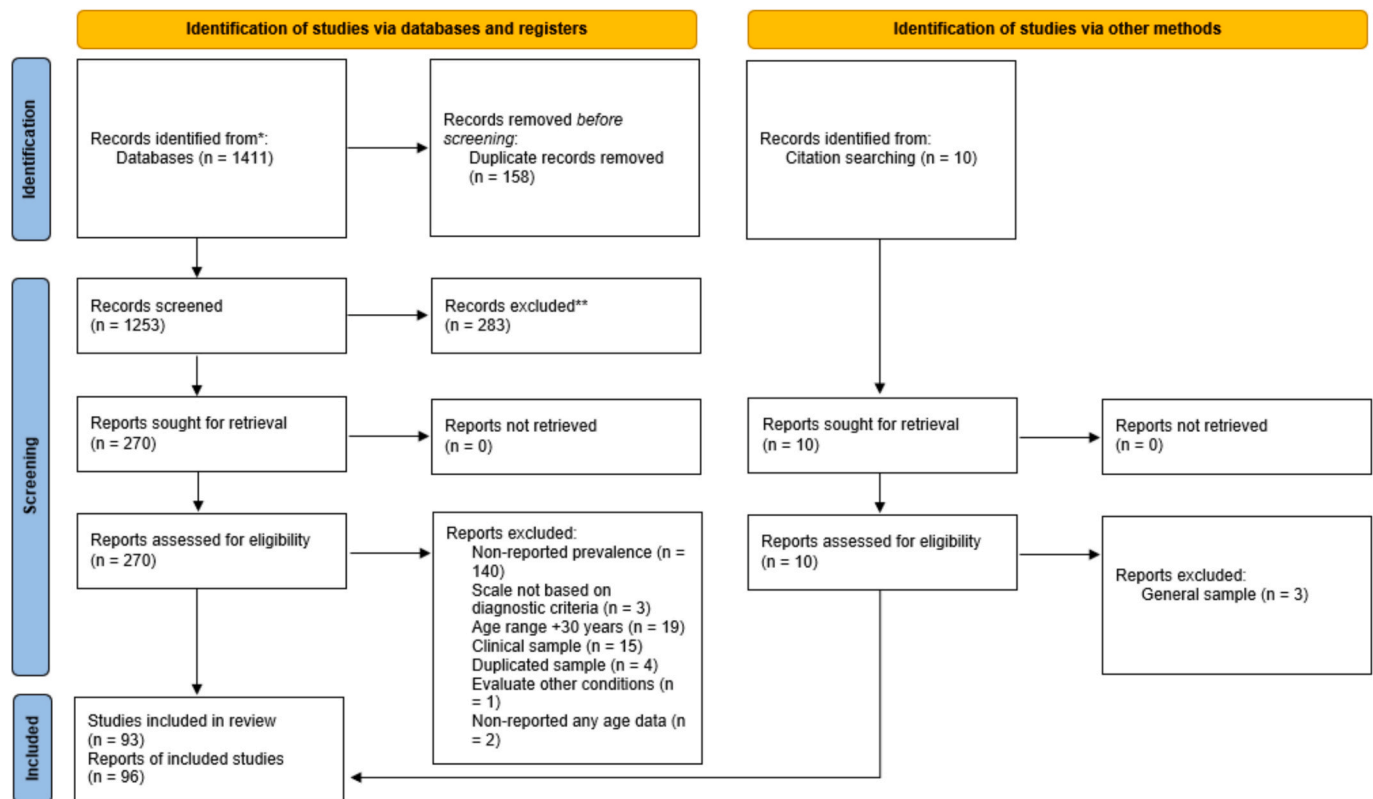


Fig. 1. PRISMA flowchart.

2015–2016 ($n = 5$; 5.3 %). The year 2025 had $n = 8$ (8.6 %). Most articles used a cross-sectional design ($k = 87$; 90.6 %) rather than a longitudinal design ($k = 9$; 9.4 %).

Of the analytic samples, the majority were Asian ($k = 38$; 39.6 %), followed by European ($k = 20$; 20.8 %), North American ($k = 17$; 17.7 %), African ($k = 6$; 6.3 %), and Oceanic ($k = 5$; 5.2 %). Additionally, 11 samples included participants from intercontinental backgrounds (11.5 %). The samples primarily came from university settings ($k = 70$; 73 %), followed by general samples ($k = 25$; 26 %), and vocational settings ($k = 1$; 1.0 %). Most of the samples were general, including gamers and non-gamers ($k = 69$; 71.9 %), compared to samples of gamers only ($k = 27$; 28.1 %). A total of 149,601 participants were involved in the analytical samples (51.22 % female). Most of the studies reported complete information on the age of the participants ($k = 56$; 58.3 %) or were missing data on one age variable extracted ($k = 30$; 31.3 %).

Regarding the instrument used to diagnose IGD, the main instruments were: IGDS9-SF ($k = 32$; 33.3 %), DSM-5 Criteria ($k = 14$; 14.6 %), IGDS ($k = 15$; 15.56 %), IGD-20 ($k = 10$; 10.4 %), GAS and derivatives ($k = 6$; 6.3 %), IGDT-10 ($k = 5$; 5.2 %), GSMQ-9 ($k = 2$; 2.1 %), and POGQ-SF ($k = 2$; 2.1 %). The remaining instruments (C-VAT 2.0, PVGU, CSAS, and others) were applied in a single sample each ($k = 1$; 1.0 %).

3.3. Quality assessment in studies

Table S2 included the quality assessment of the meta-analyzed studies. Of the 96 analytic samples, 38 were rated as low ($k = 39.6$ %), 49 as moderate ($k = 51$ %), and 9 as high ($k = 9.4$ %).

3.4. Meta-analytical results

Fig. 2 shows the forest plot of the global IGD prevalence in young adults ($k = 96$). The prevalence rate in primary studies ranged from 0 % to 63 %, with a mean prevalence of 6.1 % (95 % CI: 5.03 %, 7.4 %; 95 %

PI: 0.9–31.87 %) in young adult samples. This pooled estimate provides an approximation of IGD prevalence among young adults. Substantial between-study heterogeneity was observed (LRT: $\chi^2[95] = 10,849.87$, $p < 0.001$, $I^2 = 98.8$ %).

3.4.1. Sensitivity analyses

Three studies (Aggarwal et al., 2024; Chung et al., 2019; Leino et al., 2024) were identified as potential outliers and influential studies. Sensitivity analyses were conducted by refitting the random-effects model after excluding the three influential studies. Changes in confidence and prediction intervals were minimal (range: 6.12 %–6.45 %), supporting the robustness of the findings. In the mixed-sample subgroup (including both gamers and non-gamers), the same three studies were identified as influential outliers, but their exclusion did not materially affect the pooled prevalence (range: 5.42–5.84 %). In the gamer-only subgroup, no statistical outliers were detected. The leave-one-out analysis indicated that the prevalence estimate ranged from 5.97 % to 6.28 % when excluding individual studies, with confidence intervals consistent with the overall estimate. Heterogeneity and between-study variability remained stable, suggesting that the results are robust and not affected by outliers and influential studies.

3.4.2. Publication bias

Publication bias detection was conducted using the DOI plot (Difference of Means–Oriented Index plot) and the LFK index (Luis Furuya-Kanamori). Fig. 3 reveals a pronounced leftward asymmetry in the DOI plot, confirmed by an LFK index of -3.8 , which exceeds the established ± 2 threshold, indicating significant asymmetry. This finding suggests the likely presence of publication bias among the studies included in this meta-analysis.

3.5. Moderator analyses

Moderator analyses were conducted on the overall sample to

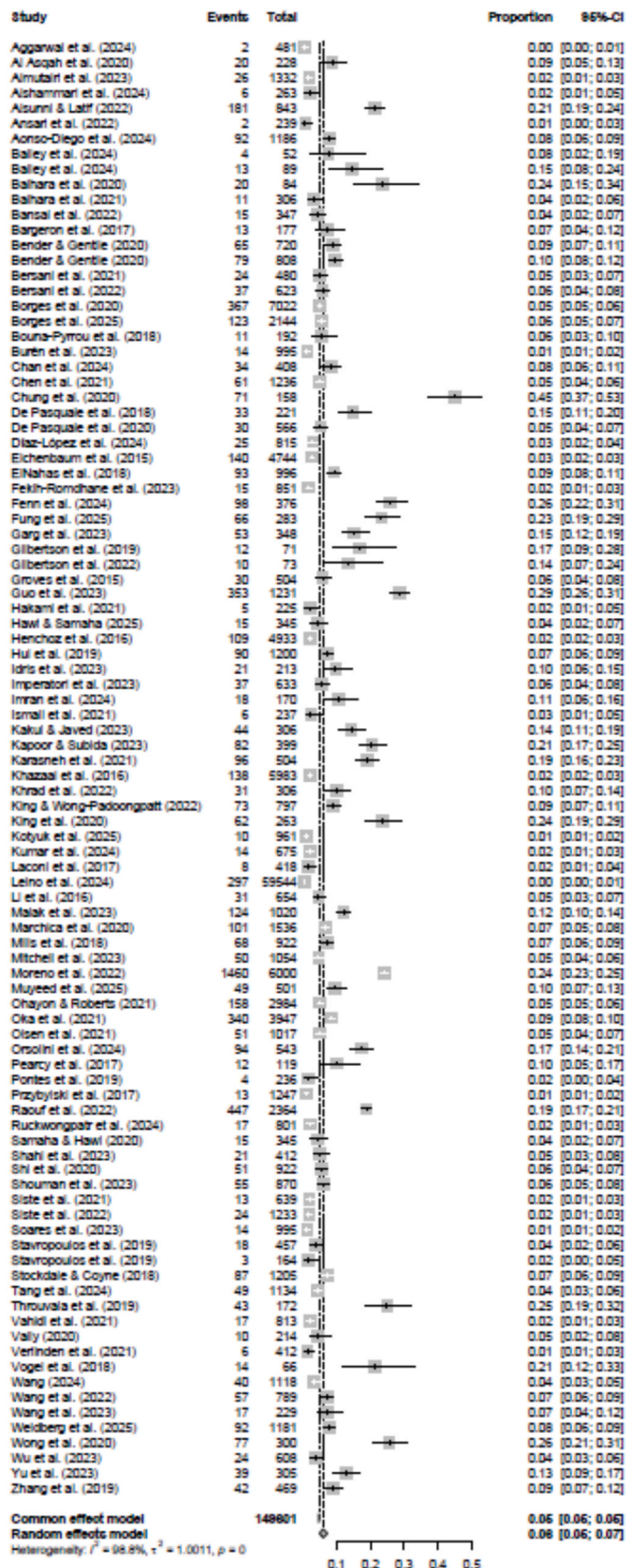


Fig. 2. Forest plot of observed prevalences and global mean estimate of IGD in young adults.

investigate potential sources of heterogeneity in the prevalence estimates of IGD. Furthermore, statistically significant differences were observed between samples of exclusive gamers and mixed samples (comprising gamers and non-gamers). Further analyses within each subgroup helped clarify the effects on these estimates. Tables 1 and 2 include the categorical and quantitative moderator analyses, respectively.

3.5.1. Global prevalence moderators

The prevalence of IGD among samples of gamers only was 8.1 % (95 % CI: 5.91 %, 11.01 %; 95 % PI: 1.53–33.3 %; $I^2 = 95.3$ %), which differed significantly from samples comprising both gamers and non-gamers (5.47 %; 95 % CI: 4.33 %, 6.90 %; 95 % PI: 0.7–30.3 %; $I^2 = 99.1$ %; $p = 0.049$). The prevalence of IGD among university samples was 6.02 (95 % CI: 4.83 %, 7.49 %; $I^2 = 98.6$), which did not differ from that of general young adults (6.29 %; 95 % CI: 4.16 %, 9.39 %; $I^2 = 99$ %; $p = 0.854$). Prevalence estimates could not be calculated for vocational students because of an insufficient number of studies ($k = 1$).

Regarding age groups (including studies that reported sample age range, $k = 70$), the prevalence of IGD did not differ between late adolescents (18–24 years; 8.02 %, CI 95 %: 5.26 %, 12.03 %, $I^2 = 97.2$ %), emerging adults (18–29 years; 6.78 %, CI 95 %: 4.95 %, 9.23 %, $I^2 = 98.3$ %) and young adults (18–35 years; 5.63 %, CI 95 %: 3.86 %, 8.14 %, $I^2 = 94.3$ %; $p = 0.458$).

The pooled prevalence estimates varied significantly depending on the instrument applied across the included studies ($k = 82$; $p = 0.002$; Table 1). Only those instruments used in at least three samples were included. Post-hoc pairwise comparisons, adjusted using the Holm method to control multiple testing, revealed that studies using the IGDS reported significantly higher IGD prevalence estimates than those using the IGDT-10 ($\Delta = 1.14$, $p_{adj} = 0.003$). Similarly, studies based on DSM-5 criteria yielded higher prevalence estimates than those based on the IGDT-10 ($\Delta = 1.15$, $p_{adj} = 0.031$). No statistically significant subgroup differences were found among the other categorical moderators (risk of bias, reference population, sampling technique, different age range samples, geographical precedence, and diagnostic manual). Meta-regression results with all samples indicated a marginally significant trend that samples with higher proportions of females were associated with lower IGD prevalence (coefficient = -0.011 , CI 95 %: -0.022 , 0.003 ; $p = 0.056$). Likewise, larger sample sizes were also statistically significantly linked to lower prevalence estimates (coefficient = -0.000 , CI 95 %: -0.001 , -0.000 ; $p = 0.004$).

3.5.2. Gamer prevalence moderators

Fig. 4 illustrates the observed prevalence and mean estimate in gamer-only samples. Statistically significant subgroup differences were found regarding studies' risk of bias ($k = 29$, $p = 0.023$). Post-hoc comparisons indicated that studies with a high risk of bias yielded significantly higher prevalence estimates of IGD compared to those with a moderate ($\Delta = 0.96$, $p_{adj} = 0.001$) or low risk of bias ($\Delta = 0.94$, $p_{adj} = 0.012$). No statistically significant subgroup differences were found among the other categorical moderators in gamer samples. Meta-regression results indicated that the estimated prevalence in the gamer sample increased over the years (coefficient = 0.21 , 95 % CI: 0.036 , 0.397 ; $p = 0.018$).

3.5.3. Mixed samples prevalence moderators

Fig. 5 illustrates the observed prevalence and global mean estimate in mixed samples (including gamers and non-gamers). Pooled prevalence estimates for IGD varied significantly by the instrument used in mixed samples ($k = 57$; $p = 0.002$). Post-hoc pairwise comparisons with Holm-adjusted p-values revealed that studies using the GAS showed lower prevalence than those using the IGDS ($\Delta = -1.62$, $p_{adj} = 0.05$). Larger sample sizes were also statistically significantly linked to lower prevalence estimates in mixed samples (coefficient = -0.00 , 95 % CI: -0.001 , -0.000 ; $p = 0.009$). No statistically significant subgroup

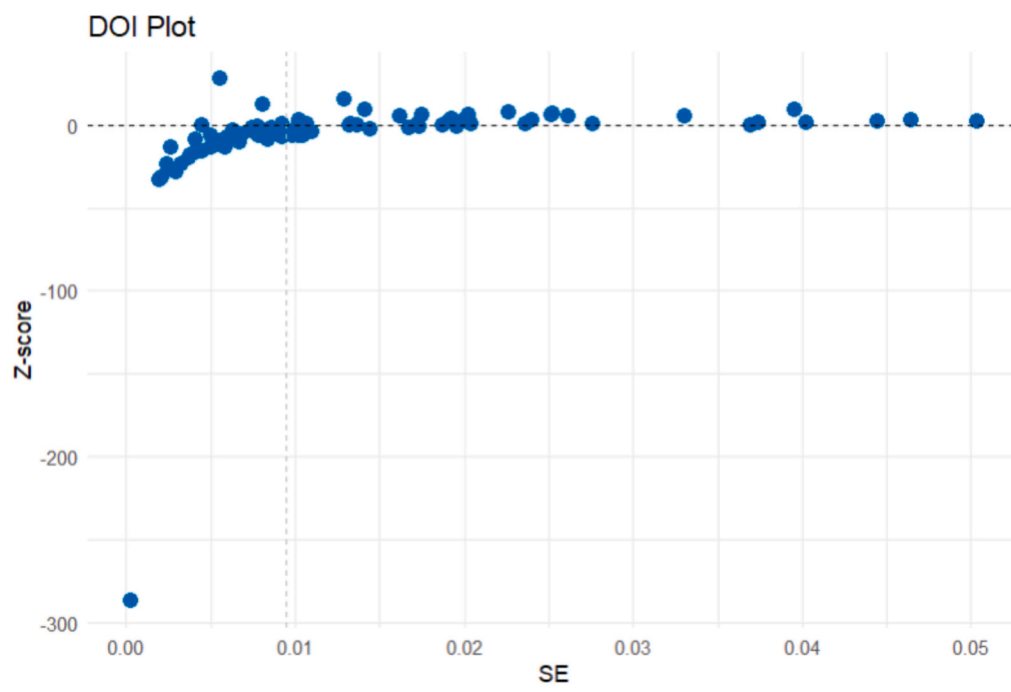


Fig. 3. Results of DOI plot.

Table 1

Results of categorical moderator variables on the prevalence of IGD in young adults.

	Global prevalence			Mixed samples			Gamer samples		
	<i>k</i>	eff (95 % CI)	<i>p</i>	<i>k</i>	eff (95 % CI)	<i>p</i>	<i>k</i>	eff (95 % CI)	<i>p</i>
Risk of bias	96		0.311	69		0.917	28		0.003
Low	38	5.64 % (4.14 %, 7.64 %)		31	5.32 % (3.73 %, 7.53 %)		7	6.36 % (5.80 %, 6.98 %)	
Medium	49	5.89 % (4.58 %, 7.54 %)		33	5.38 % (3.98 %, 7.24 %)		16	8.71 % (8.08 %, 9.38 %)	
High	9	10.52 % (4.95 %, 20.97 %)		5	7.14 % (1.79 %, 24.46 %)		4	16.63 % (13.20 %, 20.7 %)	
Reference population	95		0.854	69		0.430	26		0.291
General	26	6.29 % (4.16 %, 9.39 %)		19	6.44 % (3.91 %, 10.44 %)		7	5.94 % (2.90 %, 11.76 %)	
University students	69	6.02 % (4.83 %, 7.49 %)		50	5.15 % (3.96 %, 6.66 %)		19	9.03 % (6.31 %, 12.76 %)	
Sampling technique	96		0.168	69		0.345			
Non-probabilistic	85	5.88 % (4.75 %, 7.26 %)		60	5.31 % (4.07 %, 6.91 %)				
Probabilistic	11	7.97 % (5.46 %, 11.48 %)		9	6.54 % (4.63 %, 9.17 %)				
Age range	70		0.458	51		0.461	19		0.524
Late adolescence (18–24)	18	8.02 % (5.26 %, 12.03 %)		15	7.54 % (4.95 %, 11.30 %)		3	10.60 % (2.58 %, 34.72 %)	
Emerging adulthood (18–29)	33	6.78 % (4.95 %, 9.23 %)		23	5.61 % (3.70 %, 8.42 %)		10	10.05 % (7.04 %, 14.15 %)	
Young adulthood (18–35)	19	5.63 % (3.86 %, 8.14 %)		13	5.33 % (3.49 %, 8.06 %)		6	6.31 % (2.94 %, 13 %)	
Geographical procedence	95		0.854	67		0.219	27		0.811
Asia	46	5.94 % (4.36 %, 8.04 %)		33	5.13 % (3.55 %, 7.34 %)		13	8.58 % (5.04 %, 14.22 %)	
Europe	20	4.89 % (3.15 %, 7.52 %)		15	3.94 % (2.45 %, 6.28 %)		5	9.18 % (5.04 %, 14.22 %)	
America	21	7.39 % (5.95 %, 9.93 %)		15	7.39 % (4.92 %, 10.96 %)		6	7.26 % (5.54 %, 9.45 %)	
Oceania	3	5.95 % (2.77 %, 12.31 %)		—	—		3	5.95 % (2.77 %, 12.31 %)	
Africa	4	6.93 % (2.93 %, 15.54 %)		4	6.93 % (2.93 %, 15.54 %)		—	—	
Study design	94		0.642	69		0.625			
Cross-sectional	88	6.07 % (4.93 %, 7.45 %)		65	5.51 % (4.30 %, 7.04 %)				
Longitudinal	6	5.47 % (3.70 %, 8.02 %)		4	4.78 % (2.83 %, 7.96 %)				
IGD instrument	82		0.002	57		0.002	21		0.101
IGDS9-SF	32	4.98 % (3.52 %, 7.00 %)		25	4.82 % (3.20 %, 7.21 %)		7	5.58 % (2.99 %, 10.18 %)	
IGD-20	10	6.21 % (3.50 %, 10.76 %)		7	5.10 % (2.50 %, 10.09 %)		3	9.88 % (4.78 %, 19.32 %)	
DSM-5 Criteria	14	8.94 % (5.59 %, 13.99 %)		9	8.30 % (4.13 %, 15.98 %)		5	9.85 % (6.63 %, 14.40 %)	
IGDS	15	8.83 % (6.90 %, 11.24 %)		12	8.81 % (6.53 %, 11.80 %)		3	7.95 % (6.94 %, 9.09 %)	
GAS	6	4.59 % (1.46 %, 13.51 %)		4	1.88 % (0.83 %, 4.22 %)		—	—	
IGDT-10	5	3 % (1.77 %, 5.05 %)		—	—		3	3.19 % (1.39 %, 7.14 %)	
Scale diagnostic manual based on	94		0.718	68		0.193			
DSM-5	84	6.14 % (5.104 %, 7.48 %)		60	5.84 % (4.55 %, 7.46 %)				
DSM-4	10	5.38 % (2.53 %, 11.08 %)		8	3.58 % (1.76 %, 7.14 %)				

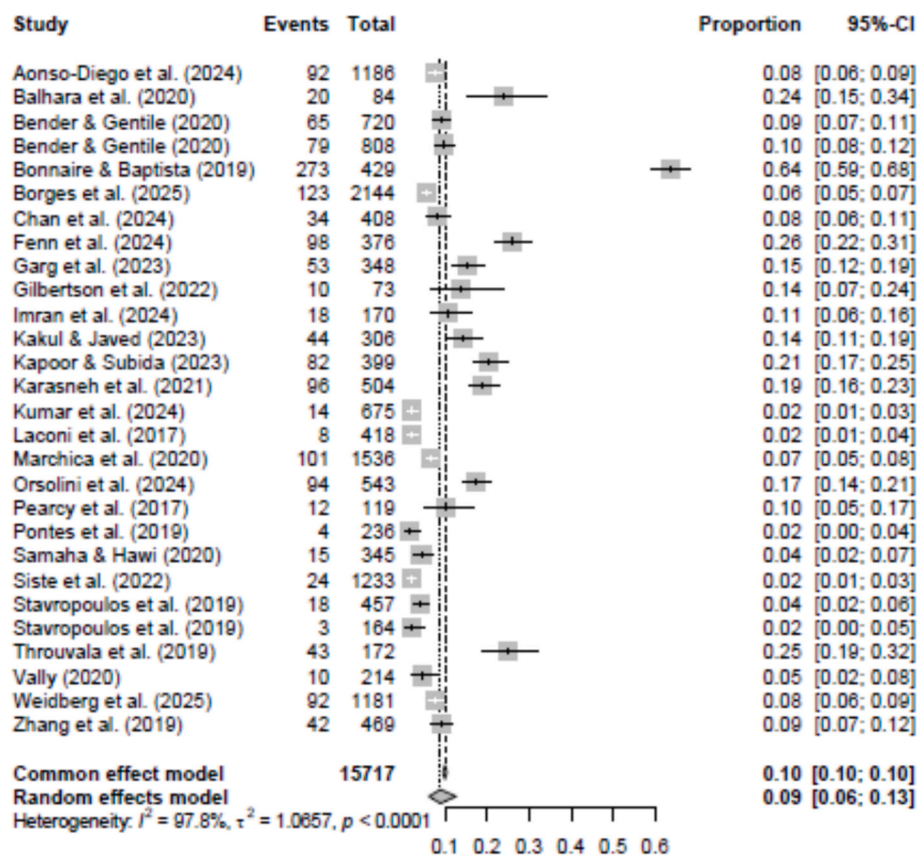
Note. *k*: number of studies included, eff: effect size (mean prevalence), 95% CI: 95% confidence interval.

Table 2

Results of quantitative moderator variables on the prevalence of IGD in young adults.

	Global prevalence				Mixed samples				Gamer samples			
	k	Coefficient	(95 % CI)	p	k	Coefficient	(95 % CI)	p	k	Coefficient	(95 % CI)	p
Year of publication	95	0.003	(−0.077, 0.085)	0.926	68	−0.031	(−0.127, 0.064)	0.513	26	0.095	(−0.043, 0.233)	0.176
Year of data collection	73	0.071	(−0.015, 0.156)	0.106	54	0.030	(−0.065, 0.126)	0.535	18	0.216	(0.036, 0.397)	0.018
Risk of bias of studies	95	0.228	(−0.094, 0.551)	0.165	68	0.103	(−0.301, 0.507)	0.206	26	0.355	(−0.155, 0.867)	0.173
Mean age sample	90	−0.075	(−0.182, 0.031)	0.163	64	−0.071	(−0.192, 0.051)	0.255	25	−0.029	(−0.248, 0.189)	0.793
Proportion of females	90	−0.011	(−0.022, 0.003)	0.056	63	−0.007	(−0.021, 0.006)	0.268	26	−0.016	(−0.037, 0.003)	0.098
Sample size	95	−0.00	(−0.001, −0.000)	0.004	68	−0.00	(−0.001, −0.000)	0.009	26	−0.00	(−0.001, 0.0002)	0.195

Note. k: number of studies included; 95% CI: 95% confidence interval.

**Fig. 4.** Forest plot of observed prevalences and global mean estimate of IGD in gamer-only samples.

differences were found among the other categorical and quantitative moderators in mixed samples.

4. Discussion

This study provides a systematic review and meta-analysis of the estimated prevalence of IGD in young adults, considering differences between gamers-only and mixed samples. A previous study by Gao et al. (2022) estimated IGD prevalence, and given the rise in gaming after COVID-19 and the increase in video game use beyond adolescence, updated data are required.

The results showed that the overall prevalence of IGD in young adult samples ranged from 5.03 % to 7.4 %, lower than that found by Gao et al. (2022; 10.4 %). These figures are higher than those observed in meta-analyses concerning the general population, which reported prevalence estimates between 3.05 % and 6.7 % (Kim et al., 2022; Stevens

et al., 2021; Zhou et al., 2024). The 95 % prediction interval ranged from 0.9 % to 31.87 %, indicating the range within which the true prevalence of IGD could be expected to fall in future studies. In this meta-analysis, prediction intervals were notably wider than the confidence intervals, reflecting the high degree of between-study heterogeneity and the variability of IGD prevalence across populations and study designs. Consequently, this variability suggests that while the pooled prevalence provides a useful overall estimate of IGD, the prevalence observed in future studies may vary substantially depending on contextual or methodological characteristics. This underscores the importance of interpreting pooled results with caution due to the observed heterogeneity.

Due to the high heterogeneity observed between studies, a meta-regression was conducted to determine if prevalence estimates differed significantly between studies that included only gamers and those that included mixed samples (both gamers and non-gamers). The

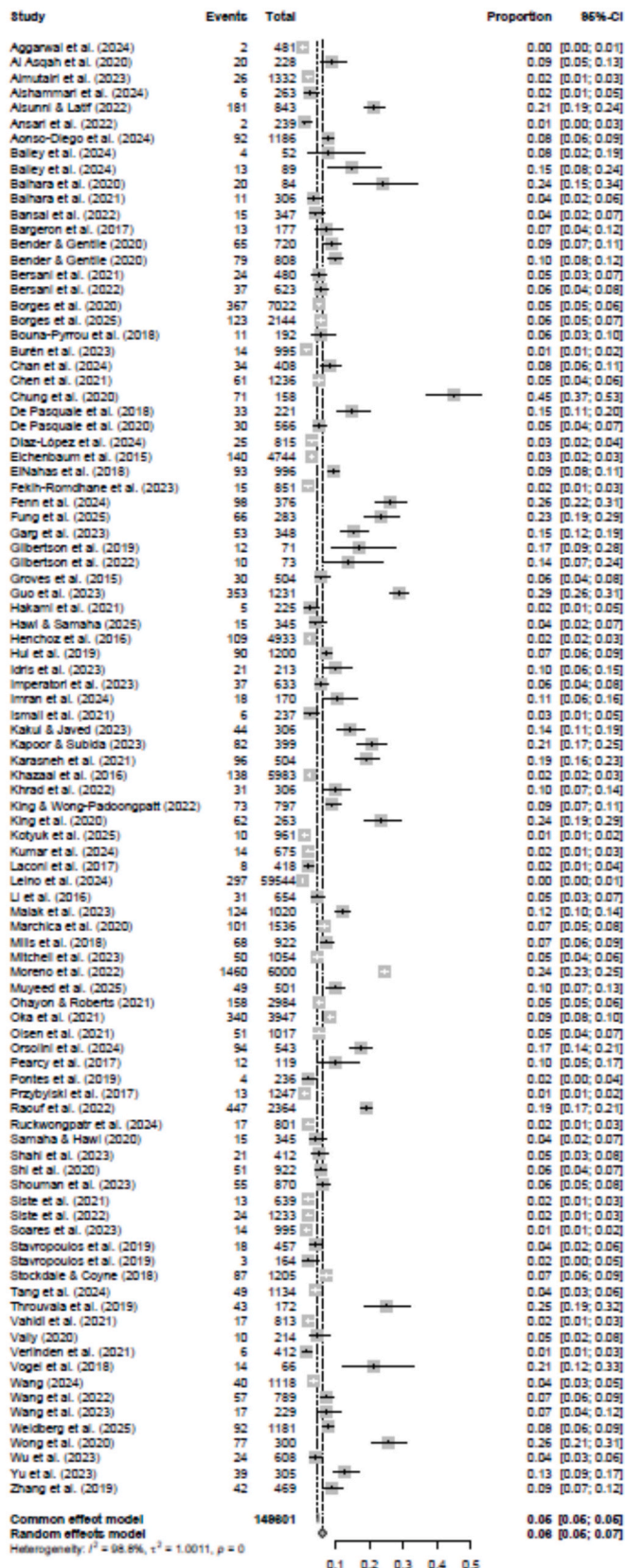


Fig. 5. Forest plot of observed prevalences and global mean estimate of IGD in mixed samples (gamers and non-gamers).

results showed that the estimated prevalence among samples of gamers only was 8.1 % (95 % CI: 5.91 %, 11.01 %; 95 % PI: 1.53–33.3 %), which was significantly different from the prevalence in mixed samples that had a rate of 5.47 % (95 % CI: 4.33 %, 6.90 %; 95 % PI: 0.7–30.3 %). Previous literature (Fam, 2018; Macur & Pontes, 2021) emphasized the importance of considering this distinction to avoid overestimating prevalence rates. In line with previous findings, the wide prediction intervals in both subgroups highlight significant variability within these categories, reflecting the impact of different contexts and methods used across studies. Thus, these findings emphasize the importance of investigating additional moderators that could explain this heterogeneity.

Considering the 96 reports included in the meta-analysis, 38 showed a low risk of bias, 49 showed a medium risk of bias, and 9 showed a high risk of bias. Statistically significant differences were observed primarily within the group of gamers, where studies with a high risk of bias reported a much higher prevalence estimate than the studies with moderate and low risk. These differences in study quality were mainly due to inadequate reporting of response rates, unclear standards and conditions for reliable measurements, insufficient coverage of the identified sampling, and inadequate sample sizes. Non-statistically significant differences in prevalence estimation were observed in overall and mixed samples.

Given that gaming habits vary across different age groups, meta-regressions were conducted to identify variables that might explain the high heterogeneity observed. Non-statistically significant differences were found among the age groups (categorized as early adulthood, which included late adolescence, emerging adulthood, and general young adulthood) in the three groups. However, the estimated prevalence of IGD seemed higher among late adolescents in the three samples (general, only gamers and mixed), followed by emerging adults. These findings align with those reported by Gao et al. (2022), which indicated that young adults aged 18 to 28 years have a higher prevalence of IGD compared to adolescents aged 8 to 18 years. Thus, it appears that the early stages of young adulthood represent a key group at risk for developing IGD.

Furthermore, the geographical provenance of the samples did not result in significant differences in IGD prevalence. Although some numerical variability was detected — with slightly higher prevalence estimates in American samples for the overall and mixed groups, and in European samples for gamer-only groups — these differences did not reach statistical significance. Although systematic reviews and meta-analyses on IGD prevalence among the general population have found regional differences (Fam, 2018), no such differences were found in the systematic review and meta-analysis by Gao et al. (2022) with adolescents and young adults. These results may be due to an insufficient number and balance of studies per region or the high heterogeneity between studies found, limiting the power to detect true cross-regional effects (Darvesh et al., 2020). Moreover, grouping countries into broad regions (e.g., “Europe”, “Asia”) may be too coarse to capture country-level variation, particularly within a young adult population (Gao et al., 2022). This age group has grown up with the global normalization of video gaming, potentially leading to more uniform gaming behaviors across regions. Thus, widespread access to global gaming platforms and cross-cultural gaming communities may reduce the regional distinctions observed in IGD across broader age groups.

IGD prevalence estimates in the general and mixed samples varied significantly, consistent with previous findings (King et al., 2020). In the general sample, studies using the IGDS and DSM-5 criteria reported higher prevalence rates than those using the IGDT-10. These differences may be due to the use of adapted diagnostic criteria or differences in response scales. In the observed differences between the IGDS and GAS ($\Delta = -1.62$, $p_{adj} = 0.05$) in mixed samples, it is important to note that these instruments are based on different diagnostic manuals, the DSM-V and DSM-IV, respectively. Therefore, instruments based on older diagnostic manuals may be less capable of accurately screening for IGD

prevalence. These methodological discrepancies highlight the need for standardized, up-to-date diagnostic instruments aligned with current classification manuals (King et al., 2020).

Non-statistically significant differences were found in prevalence estimates based on publication year or sampling year, except for the sampling year in the gamer-only subgroup, which showed significantly higher prevalence estimates in more recent studies ($p = 0.018$). This trend could be influenced by several factors, such as the inclusion of reward systems in popular video games (Przybylski et al., 2016), the rise of competitive gaming platforms (Király et al., 2023), or the incorporation of microtransactions and loot boxes in contemporary video games (King et al., 2019), all of which may contribute to a higher risk of IGD.

Significant effects of sample size were observed in the global and mixed samples, where larger samples were associated with lower prevalence estimates of IGD. This discrepancy may arise from the inclusion of studies with varying sample sizes, as smaller sample sizes are more prone to random errors and systematic biases that could lead to an overestimation of prevalence (Schmidt & Hunter, 2015), particularly in atypical conditions like IGD. Regarding other quantitative moderators, neither mean age, risk of bias nor proportion of women in the samples consistently predicted IGD prevalence across groups, although a trend toward lower prevalence with higher proportions of women was nearly significant in the global sample ($p = 0.056$). This is consistent with prior evidence indicating that women are generally less likely to engage in problematic gaming behaviors than men, which may contribute to lower IGD prevalence in samples with greater female representation (Stevens et al., 2021). All these findings highlight the importance of careful study design and reporting, as they can significantly impact IGD prevalence estimates.

4.1. Limitations and future directions

This study has several limitations. Firstly, the search strategy, which included terms related to the target age group, may not have identified some studies that only reported age in numerical terms. However, to retrieve studies that had not been identified in the systematic search, manual searches were conducted. Secondly, it should be noted that the studies used instruments based on diagnostic manuals or established criteria (e.g., WHO) rather than clinical interviews. Therefore, the prevalence estimates should be interpreted with caution. Thirdly, the LFK index indicates significant asymmetry and potential publication bias, suggesting that studies with less significant results are less likely to be published. This could distort estimates of the prevalence of IGD. Fourthly, substantial between-study variability was observed, which was partly explained by certain moderator variables. This may be due to differences in research objectives, methodologies, sample sizes, demographics, and measures used. Fifthly, the use of different cut-off values in some studies may lead to biased prevalence estimates that do not accurately reflect true rates. Lastly, the small number of studies prevented a thorough examination of specific categorical moderators in mixed and gamer-only samples. Given these limitations, caution should be exercised when generalizing the meta-analytical results.

Future directions should include the application of bias correction methods tailored to the specific nature of the data used in prevalence meta-analyses. Additionally, employing standardized clinical cut-off points for IGD is essential. To ensure comparability and diagnostic accuracy, it is crucial to utilize validated assessment tools that align with official diagnostic manuals, such as the DSM-5-TR or ICD-11. Similarly, analyzing the prevalence of IGD in samples presenting with clinical conditions comorbid with IGD (such as ADHD) may provide new insights into its prevalence in specific groups. Furthermore, incorporating studies from diverse cultures and geographic regions would provide more globally representative estimates and enhance our understanding of cross-cultural variations in the prevalence of IGD.

4.2. Practical implications

This meta-analysis provides an estimate of the prevalence of IGD among young adults. Traditionally, this developmental stage has not been the primary focus of studies related to gaming-related issues. This overall prevalence estimate highlights an emerging problem, emphasizing the need for policies or strategies aimed at prevention, as well as public and mental health interventions tailored to this age group. Furthermore, the specific findings related to young adults enable institutions, such as higher education establishments, to create digital education campaigns or workshops that promote responsible gaming. The results also underline the importance of training personnel in higher education and healthcare to identify IGD within this demographic.

5. Conclusions

This meta-analysis offers an estimate of the prevalence of IGD among young adults, a demographic that has often been overlooked in gaming research. The findings indicate that the prevalence of IGD in this age group is higher than in the general population, with statistically significant variations depending on the type of sample, the assessment tools used, the quality of the studies, and other studies' characteristics such as the female proportion, sample size and year of data collection. These results emphasize the importance of using standardized diagnostic tools based on official manuals and clinically validated cut-off points. Overall, this study provides valuable data to inform public health policies, clinical screening practices, and targeted educational programs for young adults at risk of developing IGD.

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CRediT authorship contribution statement

Júlia Gisbert-Pérez: Writing – original draft, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Claudio Longobardi:** Writing – review & editing, Project administration, Formal analysis, Data curation, Conceptualization. **Manuel Martí-Vilar:** Writing – original draft, Validation, Methodology, Investigation, Data curation, Conceptualization. **Sofia Mastrokoulou:** Writing – original draft, Investigation, Data curation, Conceptualization. **Laura Badenes-Ribera:** Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.addbeh.2025.108576>.

Data availability

Data will be made available on request.

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Emotional Intelligence and Gaming Disorder Symptomatology: A Systematic Review and Meta-Analysis

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Abstract

The increasing prevalence of the Internet gaming disorder has created an interest in identifying the factors associated with its development, including emotional intelligence, which has been negatively associated with many addictions. This work aimed to provide a narrative and quantitative synthesis of the association between emotional intelligence and Internet gaming disorder symptomatology. An online search of four electronic databases and an additional manual search identified 49 studies that met the inclusion criteria provided 54 independent samples ($N=43,289$) and a total of 166 correlation coefficients. The selected studies used different definitions of emotional intelligence (i.e., *emotional regulation*, *social-emotional competence*, *ability and trait*). Random-effect models were used to estimate the pooled correlation coefficient between emotional intelligence and Internet gaming disorder symptomatology. The results revealed a small-to-moderate negative association between any measure of emotional intelligence and Internet gaming disorder symptomatology. However, the various characteristics involved in its study, such as methodological quality, research design, geographical location and the means of assessing emotional intelligence, could modify the association between both variables. In short, any deficits in emotional regulation or social competence could be a risk factor for developing Internet gaming disorder.

Keywords Emotional Intelligence · Emotional Regulation · Social Competence · Gaming Disorder · Meta-analysis

Introduction

This study investigates the link between emotional intelligence and Internet gaming disorder. The growing prevalence of this disorder emphasizes the need to identify the possible factors associated with its development. This problem is especially significant among adolescents and young adults, who are more vulnerable to developing gaming disorder (Wang et al., 2021). This study proposes a meta-analysis to explore the relationship between gaming disorder and emotional intelligence, as it is believed to have a protective

role in preventing other addictions. Emotional intelligence continues to develop throughout adolescence and early adulthood, making this study relevant for both theoretical and practical implications in preventing the onset of gaming disorder.

Internet Gaming Disorder Conceptualization

Internet gaming disorder is becoming an increasingly common problem among the adolescent population (García-García et al., 2021; Wang et al., 2021). It usually begins in early adolescence, in the form of higher rates of gaming-related problems than in older age groups (general population: 3.05%; adolescents: 4.6%; Fam, 2018; Lemmens et al., 2015; Paulus et al., 2018; Stevens et al., 2021; Wang & Cheng, 2021), with higher rates in men (6.8%) than women (1.3%).

Internet gaming disorder was included in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) under the name “Internet gaming disorder” (IGD) (APA, 2013), and later included in the International Classification of Diseases, Eleventh Revision (ICD-11) as

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“Gaming Disorder” (WHO, 2018). According to the DSM-5, the diagnosis of this requires meeting five or more of the following criteria: (1) high preoccupation with gaming, (2) withdrawal symptoms, (3) increased tolerance, (4) unsuccessful attempts to quit or reduce gaming, (5) loss of interest in other hobbies or activities, (6) excessive gaming despite its negative consequences, (7) deceiving others about gaming activities, (8) using it as an escape or to avoid other hobbies or activities, (9) excessive gaming despite negative consequences (APA, 2013; Petry et al., 2014). For its part, ICD-11 considers it as due to addictive behavior, i.e. “a pattern of persistent or recurrent gambling behavior that is not primarily conducted over the internet and is manifested by: (1) impaired control over gambling (e.g. onset, frequency, intensity, duration, termination, context); (2) increasing the priority given to gambling to the extent that gambling takes precedence over other life interests and daily activities; and 3) continuation or escalation of gambling despite experiencing negative consequences” (WHO, 2018, p. 166). Its diagnosis requires a pattern of behavior severe enough to cause significant impairment in core areas of functioning. Gaming behavior patterns may be continuous or episodic but must be recurrent and evident for at least 12 months before diagnosis, although meeting all the criteria and having severe symptoms may reduce this requirement (Saunders et al., 2017; WHO, 2018).

Emotional Intelligence Conceptualization

Emotional intelligence is a broad and plural construct due to being widely studied and the absence of a consensus on its definition. Salovey and Mayer (1990) first defined it as an ability-based construct similar to general intelligence. They defined emotional intelligence as “the ability to carry out accurate reasoning about emotions and the ability to use emotions and emotional knowledge to enhance thinking” (Mayer et al., 2008, p. 511), suggesting a multidimensional approach to this construct. Different conceptualizations of emotional intelligence have emerged in the last three decades and can be grouped into three models (Miao et al., 2017): ability, trait, and mixed.

According to the ability models, emotional intelligence is a cognitive ability with emotions that process emotional information (MacCann et al., 2014, 2020; Mayer et al., 2008). The chief ability model is Mayer and Salovey’s (1997) *four-branch hierarchical model*, based on Gross’ model of emotion regulation (Gross, 1998), which focuses on the four components of emotional ability: (1) emotion perception, (2) emotion facilitation of thought, (3) emotion understanding, and (4) emotion management. The emotional intelligence level ranges in complexity from information processing to the deliberate use of emotions to achieve objectives (MacCann et al., 2020). Emotional intelligence

ability can be assessed by performance-based measures in the tradition of measures of intellectual intelligence, where there are right or wrong answers based on the predetermined criteria and by rating-scales (self-report measures). From the performance-based measures framework, the ability-based Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT, Mayer et al., 2002, 2003) is the one most frequently used to assess emotional intelligence. Of the rating-scales used to assess emotional intelligence, the Wong & Law Emotional Intelligence Scale (WLEIS, Wong & Law, 2002) is frequently applied to measure a set of basic emotional abilities consisting of a 16-item scale divided into four subscales: (1) self-emotion appraisal; (2) other’s emotion appraisal; (3) use of emotion, and (4) regulation of emotion. The trait model developed by Petrides and Furnham (2001) defines emotional intelligence as a trait, i.e. as persistent behavior over time, and is associated with dispositional tendencies, personality traits and self-efficacy beliefs. Emotional intelligence is thus considered as a constellation of self-perceived abilities and behavioral dispositions assessed by rating-scales (Petrides & Furnham, 2001, 2003) as the Trait Emotional Questionnaire (TEIQue; Petrides & Furnham, 2003) or its short version (TEIQue-SF, Petrides, 2009). This model comprises fifteen emotional intelligence domain personality grouped into four dimensions: (1) well-being, (2) self-control, (3) emotionality and (4) sociability (Petrides, 2009).

The mixed model considered emotional intelligence as a mixture of personality-type items and behavioral preferences and is assessed by rating-scales. According to the mixed model, emotional intelligence is the sum of emotional skills, personality traits and motivational factors that lead to emotionally intelligent behavior (Bar-On, 2006; MacCann et al., 2020; Petrides et al., 2007). These models include Goleman’s *emotional competence* (1998), Bar-On’s *social-emotional competence* (1997, 2006) and Rindermann’s *emotional competence* (2009). Goleman’s (1998) model defines emotional intelligence according to four main competencies: (1) self-awareness of one’s emotions, (2) self-control, (3) social awareness of other’s emotions and (4) social skills. This model thus differentiates between awareness (emotion detection) and management (regulation) of one’s own and others’ emotions and is measured by Goleman’s Emotional Competency Index (ECI; Sala, 2002). Bar-On’s (1997, 2006) model focuses on fifteen dimensions of social and emotional competence, which can be grouped into five scales: (1) inter- and (2) intrapersonal competence, (3) stress management, (4) adaptability, and (5) general mood or self-motivation. All of these are considered “key components of effective emotional and social functioning leading to psychological well-being” (Bar-On, 2000, p. 364). The Bar-On model is operationalized by the Emotional Intelligence Inventory (EQ-I, Bar-On, 1997), which is “a self-report measure of emotionally and socially

intelligent behavior that provides an estimate of emotional-social intelligence” (Bar-On, 2009, p. 15). Rindermann’s *emotional competence* (2009) includes emotional abilities and behavioral tendencies, which can be grouped into four dimensions of perceived abilities: the multidimensional construct of emotional competence consists of the perceived abilities to (1) recognize and understand one’s own emotions, (2) recognize and understand other’s emotions, (3) regulate and control one’s own emotions, and (4) emotional expressiveness. The emotional competence questionnaire (EKF; German designation: Emotionale-Kompetenz-Fragebogen, Rindermann, 2009), a self-reported measure, was developed to assess Rindermann’s *emotional competence* (2009).

The Role of Emotional Intelligence in Addictions

Emotional intelligence relates to well-being or self-control (Petrides et al., 2007). Having emotional self-awareness and cognitive control over one’s emotions is an important preventive factor against involvement in problematic behaviors (Kircaburun et al., 2020). Individuals with lower levels of trait emotional intelligence are at a higher risk of facing heightened psychological and interpersonal challenges, which may facilitate potential problematic behavior such as internet or gaming disorder (Kun & Demetrovics, 2010; Leite et al., 2019).

Many studies have found a negative association between emotional intelligence and addictions in adolescents, thereby reinforcing the potentially protective role of emotional intelligence against them (Aslanidou et al., 2019; Henning et al., 2021; Leite et al., 2019). Ranjbar and Bakhshi’s (2018) meta-analysis of the association between emotional intelligence and Internet addiction found a moderate and inverse association (pooled correlation = -0.393 ; 95% CI: $-0.564, -0.190$). Several empirical studies reported a negative correlation between various behavioral addictions and emotional intelligence. The study by Parker et al. (2008) focused on the relationship between different adolescent behavioral addictions (e.g. gaming, gambling and internet) and their results indicated moderate-to-strong negative correlations between emotional intelligence and behavioral addictions. The results of Hamissi et al. (2013), in a study on a sample of 201 students, indicated small-to-moderate negative correlations between internet disorder and emotional intelligence, in line with others carried out on the general population (Saraiva et al., 2018). Emotional intelligence is also negatively correlated to mobile phone addiction (Arrivillaga et al., 2020; Beranuy et al., 2009), pathological gambling (Parker et al., 2008, 2013), and addiction to video games (Kircaburun et al., 2019; Parker et al., 2008, 2013; Bender et al., 2020). All these findings suggest that lower emotional intelligence scores may represent vulnerability or a risk factor for

developing behavioral addictions, especially in adolescence (Henning et al., 2021).

A previous systematic review of the relationship between emotional regulation and Internet gaming disorder (Marchica et al., 2019) found inconsistent results: 90% of the reviewed studies showed a negative and statistically significant relationship between emotional regulation and video gaming disorder symptomatology (the higher the emotional regulation, the lower the gaming disorder symptomatology), although 10% of the studies did not detect this association between both variables. There are also two previous meta-analyses on risk and protective factors for Internet gaming disorder limited to the Chinese (Ji et al., 2022) and Korean (Koo & Kwon, 2014) contexts. However, the relationship between emotional intelligence and Internet gaming disorder symptomatology across different social contexts (e.g. nationalities) has not been systematically examined to date by a meta-analysis technique.

It is important to note that the examination of emotional intelligence and internet gaming disorder is particularly relevant during stages such as adolescence, considered as a period of heightened vulnerability, impacting both the overall development and susceptibility to addiction (Krishnamoorthy, 2021). Consistent with the findings in the general population, lower scores in emotional intelligence seem to be associated with gaming disorder symptomatology (Aksoy & Erol, 2021; Amendola et al., 2019). In the comparative study between age groups by Kircaburun et al. (2020), the results indicated that the effect of emotional intelligence was stronger in adolescent players than in adult players.

Current Study

Emotional intelligence has been negatively associated with acquiring different addictions, but its specific relationship with internet gaming disorder has not yet been explored. This article describes a meta-analytic study to quantitatively synthesize the relationship between emotional intelligence and Internet gaming symptomatology and to determine the pooled effect of this association (Research Question 1). Its secondary aim was identify the different study characteristics (e.g., geographic location, age, gender, etc.) that could influence the resulting heterogeneous results (Research Question 2).

Methods

A meta-analysis of the relationship between emotional intelligence and Internet gaming disorder was conducted in line with the PRISMA guidelines (Page et al., 2021,

see Supplementary Table 1). A previous search in the PROSPERO and Cochrane databases had confirmed that there were no previous SR or meta-analysis that had already investigated this relationship. A protocol was registered in PROSPERO (Registration Number: CRD42023400540), including the review question, type of review, searches, study conditions, population of interest, types of studies included, the expected results, data extraction, risk of bias, data synthesis strategy and the language of the study.

Study Selection Criteria

The inclusion criteria were as follows: (1) original, quantitative investigation; (2) publication in peer-reviewed journal; (3) included a measure of Internet gaming disorder (e.g. using an instrument that assessed Internet gaming disorder symptoms or its diagnostic criteria, etc.); (4) contained a measure of emotional intelligence in some way (e.g. emotion intelligence, emotion competence, emotion perception, emotion management, etc.); examined the relationship between emotional intelligence and Internet gaming disorder; (6) reported a correlation coefficient or the required statistical data; (7) written in English or Spanish. There were no limits as to date of publication, geographical location or the participants' ages.

All qualitative studies, reviews, meta-analyses, commentaries, editorials and studies that did not explore the relationship between emotional intelligence and Internet gaming disorder were excluded. Those reporting multivariate results (e.g., regression analysis) were also excluded for not being comparable with others (Lipsey & Wilson, 2001).

Search Strategy

The online searches were conducted on September 20th, 2023 in the Scopus, Pubmed, Web of Science and PsycInfo databases using the following search strategy: (emotion* intelligence OR emotion* competence OR socioemotion* competence OR emotion* perception OR emotion* understanding OR emotion* management OR emotion* regulation OR emotion* expression OR emotion* facilitation OR self-awareness OR self-management OR social awareness OR social skills OR intrapersonal competence OR interpersonal competence OR stress management OR adaptability OR self-motivation) AND (gaming disorder OR video game disorder OR videogame disorder). This search resulted in 3639 eligible studies.

A manual search in the reference lists of the retrieved studies was also carried out and yielded 6 additional studies. Finally, references from previous reviews and meta-analyses were examined (e.g., Bäcklund et al., 2022; Bender et al., 2020; Gao et al., 2022; Ji et al., 2022; Koo & Kwon, 2014;

Marchica et al., 2019; Pan et al., 2020) but no further eligible studies were found.

Coding of the Studies

A protocol was systematically applied by two independent coders to extract the studies' characteristics as follows: authors, year of publication, country of origin, search design (cross-sectional vs longitudinal), sampling method (probabilistic vs non-probabilistic), sample size, participant's mean age, gender (percentage of males), sexual orientation, ethnicity (percentage of Caucasians), marital status, educational qualifications, conceptualization of emotional intelligence and Internet gaming disorder, percentage of Internet gaming disorder in the sample, hours of play, video game studied, and correlation coefficients or reported statistics to calculate the effect size.

Study Quality

The methodological quality of the primary studies was individually assessed by two researchers, who applied the 10-item checklist previously used by Badenes-Ribera et al. (2019) to examine the relationship between muscle dysmorphia and eating disorders. Each of the 10 checklisted items was given a score of 1 when the study met the criteria and 0 when it did not (see Supplementary Table 2). Their total quality score (range: 0–10) was calculated by adding the corresponding quality item scores, with a higher score indicating a higher methodological quality and lower risk bias.

Effect Size

The effect size index was a correlation coefficient (e.g., Pearson's correlation coefficient, Spearman's correlation coefficient, etc.) computed between measures of emotional intelligence and Internet gaming disorder (Borenstein et al., 2009, 2021), which was then coded and translated into a Fisher's Z score to normalize their distributions and stabilize their variance by applying the following formula (Cooper et al., 2019, pp. 220–221): $Z_r = \frac{1}{2} \log_e \left(\frac{1+r}{1-r} \right)$, with sampling variance: $V(Z_r) = \frac{e^{2Z_r} - 1}{e^{2Z_r} + 1}$, with e being the base of natural logarithms. The Fisher's Z for the individual effect sizes, as well as those for the pooled effect sizes and their confidence limits, were back translated into the correlation coefficient metric to simplify their interpretation. Following criteria Cohen's guidelines (1988), correlation coefficients of about 0.10, 0.30, and 0.50 (in absolute values) are indicative of low, moderate and large relationships between the variables, respectively.

To handle the statistical dependence among correlation coefficients from the same study, in which multiple

correlation coefficients were reported for the relationship between emotional intelligence and internet gaming disorder (Aksoy & Erol, 2021; Che et al., 2017; Fumero et al., 2020; Hollett & Harris, 2020; Kim et al., 2023; King et al., 2013; Kökönyi et al., 2019), their average was calculated to obtain a synthetic correlation coefficient for each study instead of treating each correlation coefficient as an independent unit in the analysis. This synthetic correlation coefficient was used as the unit analysis (Borenstein et al., 2021; Hedges, 2019). When the studies did not report an emotional intelligence/Internet gaming disorder correlation coefficient, the appropriate statistical data were extracted (e.g., mean and standard deviation) to calculate the effect size and apply translations between them (Dieter et al., 2017; Gentile et al., 2011; Hong et al., 2022; Marchica et al., 2020; Müller & Bonnaire, 2021; Paulus et al., 2021; Uçur & Dönmez, 2021; Yen et al., 2018). For instance, standardized mean differences (d) were computed, after which the d were translated into r , with $r = \frac{d}{\sqrt{d^2 + a}}$, where a was estimated by $a = \frac{(n_1 + n_2)^2}{n_1 \cdot n_2}$, and n_1 , n_2 were the sample sizes in both conditions (Borenstein et al., 2009, 2021). In addition, in the studies with only one control group and two pathological video gaming groups (e.g., King et al., 2013; Müller & Bonnaire, 2021), the sample size of the control group was divided by two to enable two comparisons and avoid statistical dependence. For the longitudinal studies, the data from the first data point (i.e., Time 1) were recorded. Finally, to code the correlation coefficient between any measure of Emotional Regulation and Internet gaming disorder, the effect size was reverse-scored when the emotional regulation was measured by negative indicators (e.g., Difficulties Emotional Regulation Scale). The coded positive effect sizes (r) thus represented an association between Emotional Regulation and a higher degree of Internet gaming disorder.

Statistical Analysis

Separate meta-analyses were conducted to examine the relationships between emotional intelligence and Internet gaming disorder symptomatology, assuming random-effects models. The correlations coefficients were then weighted by inverse variance (Borenstein et al., 2021; Cooper et al., 2019) and a restricted maximum likelihood was used to estimate inter-study variance (τ^2). Pooled correlation coefficients, with their 95% confidence interval (CIs) and credibility interval (CRs), were calculated applying the method recommended by Hartung and Knapp (2001). The statistical significance of the pooled correlation coefficients was assessed by the t test. Forest plots were drawn up to visually examine effect size heterogeneity. Cochran's Q -statistic and the I^2 index were also calculated. A Q -statistic with $p < 0.05$

and $I^2 > 25\%$ indicated effect size heterogeneity (Higgins et al., 2003; Huedo-Medina et al., 2006).

Moderator analyses using a mixed-effects model were carried out (Borenstein et al., 2009, 2021; Knapp & Hartung, 2003; López-López et al., 2014) to identify the study characteristics statistically related to effect sizes for meta-analyses with at least 20 correlation coefficients (López-López et al., 2014). Weighted ANOVAs were applied for the categorical variables and for the continuous variables simple meta-regression were performed. Q_W and Q_E statistics were used to evaluate model misspecification for categorical and continuous variables, respectively. Q_B and Q_R statistics were applied to evaluate the statistical significance of categorical and continuous variables, respectively, while the proportion of variance accounted for by the moderator variable was also estimated (López-López et al., 2014; Raudenbush, 2009).

Funnel plots with Duval and Tweedie's trim-and-fill method for imputing missing data (Duval & Tweedie, 2000) and Egger's test (Sterne & Egger, 2005) were used to examine publication bias. When the meta-analysis only included two studies, the funnel plot and Egger's test could not be applied, given the small number of studies (Sterne & Egger, 2005; Sterne et al., 2000; Thornton & Lee, 2000). Finally, sensitivity analyses were performed to examine the robustness of the meta-analytic results and the impact of including or excluding one-to-one correlation coefficients. All the statistical tests were conducted on the Metafor Package in R (Version 3.0.2) and interpreted assuming a significance level of 5% ($p < 0.05$) using two-tailed tests.

Results

Study Selection Process

Figure 1 includes a flowchart of the screening and selection process used in this work. As can be seen, the search strategies identified a total of 3645 references. After removing duplicate references ($n = 656$), a total of 2995 articles remained. The titles and abstracts of these references were screened, and 203 potential articles were pre-selected and examined on the basis of their full text, by which 151 studies were excluded for not meeting the inclusion criteria. The search strategy thus identified 49 published articles for systematic review and meta-analysis, all published in peer-reviewed journals between 2008 and 2023, of which 7 did not include emotional intelligence/Internet gaming disorder correlation coefficients or the statistical data required to calculate them (Efrati & Spada, 2023; Liao et al., 2015; Nugraha et al., 2021; Schettler et al., 2023; Torres-Rodriguez et al., 2018; Wichstrøm et al., 2019; Wang et al., 2022b). The authors were contacted by email to request these data, only one of which complied, so that five studies were excluded

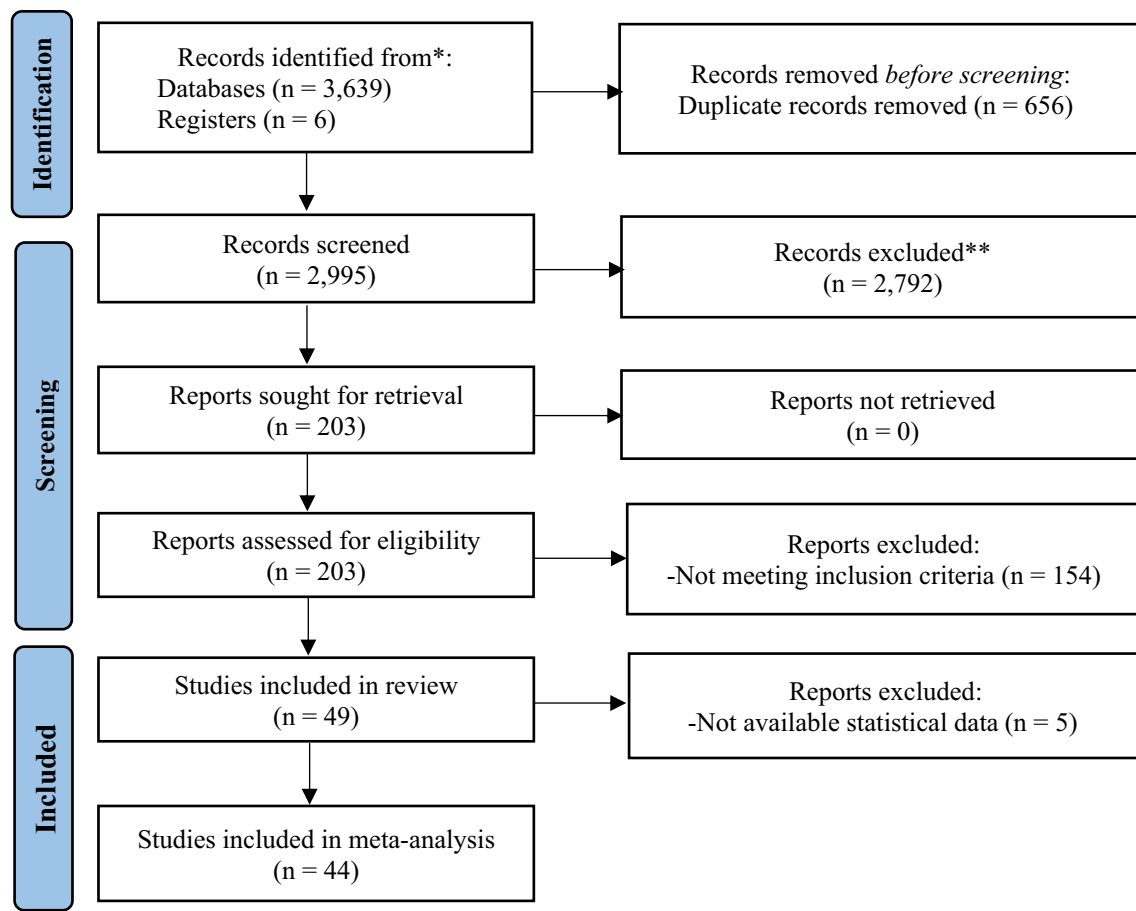


Fig. 1 Flowchart of the screening and selection process following PRISMA guidelines

from the meta-analytic synthesis. Several studies reported on the correlation coefficients from different independent samples (Dieter et al., 2017; Kim et al., 2023; King et al., 2013; Müller & Bonnaire, 2021; Parker et al., 2013, Parker et al., 2008; Soares et al., 2023; van Den Eijnden et al., 2018; Wang et al., 2022b; Wichstrøm et al., 2019), so that the database of the present meta-analysis included a total of 54 independent samples, which provided a total of 166 correlation coefficients.

Study Characteristics

Appendix A includes the descriptive characteristics of the articles included in the systematic review meta-analysis ($n=49$). Most of these used convenience sampling (e.g., community, university or schools, forums or websites, clinical settings) and a cross-sectional design. Three used stratified random sampling (Kököneyi et al., 2019; She et al., 2021; Wichstrøm et al., 2019) and random sampling (Paschke et al., 2020, 2021; Schettler et al., 2023), two used a crowdsourcing technique from Qualtrics and Prolific (Giordano et al., 2022; Kim et al., 2023) and cluster

random sampling (Wu et al., 2022). Eight studies applied a longitudinal research design (Dang et al., 2019; Liao et al., 2015; Van Den Eijnden et al., 2018; Gentile et al., 2011; Mun & Lee, 2022; Paulus et al., 2021; Wichstrøm et al., 2019; Efrati & Spada, 2023), and one study had both a cross-sectional and longitudinal design (Schettler et al., 2023). Ten studies were conducted in China, six in Canada, five in Spain, Germany and Turkey, four in Italy, two in the USA and South Korea, and only one in Hungary, Singapore, The Netherlands, Australia, France, Iran, Indonesia, Norway, Israel, Sweden and Pakistan. Most of the studies ($n=30$) were conducted on adolescent and young adult samples, fifteen used mixed samples, four used child samples and one included both an adult and a child dyad sample.

The total number of participants in the samples was $N=43,289$, with a mean age of 15.75 years old, ranging from 4 to 75. Two studies did not report any data on the age of the sample participants. Most did not report the participants' ethnicity ($n=40$) or marital status ($n=44$), while none reported sexual orientation data.

As can be seen in Appendix A, the 49 studies examined different types of emotional intelligence and used different

instruments to assess Internet gaming disorder and emotional intelligence. Most focused on specific constructs that included emotional intelligence, and only nine addressed this factor emotional intelligence itself. Its most frequently studied emotional intelligence component was emotional regulation ($n=37$), focusing mainly on difficulties in emotional regulation ($n=20$). In its turn, the instrument most frequently used to measure emotional intelligence was also specific to emotional regulation difficulties: the Difficulties in Emotional Regulation Scale or its reduced variants (DERS, Gratz & Roemer, 2004; Kaufman et al., 2016) ($n=19$), following either the Cognitive Emotion Regulation Questionnaire or its short version (CERQ, Garnefski & Kraaij, 2006; Garnefski et al., 2001) ($n=4$), and the Emotional Regulation Questionnaire (ERQ, Gross et al., 2003) ($n=3$). The Difficulties in Emotional Regulation Scale assesses clinically relevant difficulties in emotional functioning, including lack of emotional awareness, nonacceptance of one's emotions, lack of ability to engage in goal-directed cognition and behavior, lack of ability to manage one's impulses, lack of emotional clarity, and lack of access to effective strategies for feeling better when distressed. Higher scores in this scale reflect greater difficulties in regulating emotions. The Cognitive Emotion Regulation Questionnaire measures nine cognitive strategies that individuals use in response to stressful life events, which can be grouped into maladaptive (rumination, self-blame, other-blame, and catastrophizing) or adaptive emotional regulation strategies (acceptance, positive refocusing, putting into perspective, positive reappraisal, and planning). Higher scores indicate greater usage of the specific strategy. The Emotional Regulation Questionnaire measures an individual's tendency to regulate his emotions in two ways, according to Gross's (1998) process-oriented approach: cognitive reappraisal and expressive suppression. Higher scores indicate greater usage of the specific strategy.

The Wong and Law Emotional Intelligence Scale (WLEIS, Wong & Lang, 2002) ($n=3$) was the one most often used in the nine comprehensive studies on emotional intelligence, followed by the Emotional Quotient Inventory: Young Version, (EQ-i:YV, Bar-On & Parker, 2000) ($n=2$), and the Trait Emotional Intelligence Questionnaire-Short Form (TEIQue-SF, Petrides, 2009) ($n=2$). The Wong and Law Emotional Intelligence Scale is a 16-item self-report emotional intelligence ability scale based on Mayer and Salovey's theoretical framework (1997). The Emotional Quotient Inventory: Young Version is a 60-item self-reporting emotional intelligence measure for use with children and adolescents between 7 and 18 years of age, which assesses the way individuals' feel, think or act in most situations. This scale measures total emotional intelligence and four dimensions (intrapersonal, interpersonal, stress

management, and adaptability) and provides a total score. Higher scores reflect a higher level of social and emotional competency. The Trait Emotional Intelligence Questionnaire-Short Form contains 20 items divided into four emotional intelligence dimensions, such as well-being, self-control, emotionality and sociability. The emotional intelligence global trait score is obtained via combination of these dimensions. The higher the score, the higher the level of emotional intelligence.

Twenty-eight different instruments were used to measure Internet gaming disorder, the most frequently used being the Internet Gaming Disorder Scale (IGDS), based on DSM-V diagnostic criteria ($n=13$), followed by the Gaming Disorder Scale for Adolescents (GADIS-A; $n=5$), the Gaming Addiction Scale (GAS; $n=4$), and the MULTICAGE CAD-4, and Pathological Video-Game Use (PVU; $n=3$). The remaining instruments were used in two studies (Ten-Item Internet Gaming Disorder Test (IGDT-10), Problematic Video Game Playing scale (PVP), Pathological Video Gaming Scale (PVGS), Internet Addiction Test – World of Warcraft version (IAT-WoW), Screener for Substance and Behavioral Addictions – Gaming (SSBA Gaming)) or in only one (Questionnaire of Smoking Urges adapted to Gaming (QSU-Brief Gaming), Problematic Online Gaming Questionnaire Short-Form (POGQ-SF), Video Gaming Dependency Scale or “Computerspielabhängigkeitsskala” (CSAS), Game Addiction Inventory for adults (GAIA), 10-item scale DSM-IV, GUP addiction scale, Internet Gaming Disorder Questionnaire (IGDQ), Pathological Video Game Use Questionnaire, Scale for the Assessment of Internet and Computer game Addiction (AICA-30), Problematic Technology Use Checklist, Gaming Disorder Scale for Parents (GADIS-P), Parental version of the Internet Gaming Disorder Scale (P-IGDS), Chen Internet Addiction Scale (CIAS), Korea Agency for Digital Opportunity scale (KADO), Gaming and Social Media Questionnaire (GSMQ).

Assessment of Methodological Quality

Supplementary Table 3 gives the details of the studies' methodological quality assessment. A TQS was also obtained by adding the 1 s and 0 s for the items of the checklist (range: 0–10). The studies obtained an average methodological quality score of 4.83 ($SD=1.33$, $Min.=1$, $Max.=8$). The quality criteria most often used were item 7 (*Absence of reporting bias*, $n=49$), followed by item 4 (*The measurement instrument used to assess emotional intelligence shows good psychometric properties*, $n=40$) and item 5 (*The measurement instrument used to assess gaming disorder shows good psychometric properties*, $n=38$). The least met criteria were item 10 (*Statistical Power*, $n=2$) and item 3 (*Dropouts were similar in socio-demographic characteristics to those of the final sample*, $n=4$).

Quantitative synthesis: Meta-analysis

The final dataset of the meta-analysis consisted of 44 studies published between 2008 and 2023 (Median = 2020), which provided 54 independent samples and 166 correlation coefficients. All of these were written in English. Sample size ranged from 48 to 3136 participants (Median = 412 participants) with an average participants' mean age of 18.21 years old (Median = 16.27, $SD = 6.18$, $Min. = 9.18$, $Max. = 41.80$) and the average percentage of males in all the studies was 56.3% (Median = 54.8).

To quantitatively synthesize the relationship between emotional intelligence and Internet gaming disorder symptomatology, several independent meta-analyses were conducted by type of emotional intelligence examined (i.e., Emotional Regulation, Social-Emotional Competence, Intelligence as ability and Intelligence as trait) and by measurement instrument used for assessing emotional intelligence.

Relationships Between Emotional Intelligence Measured as Emotional Regulation and Internet Gaming Disorder Symptomatology

The 36 correlation coefficients reported for the relationship between Emotional Regulation and Internet Gambling disorder symptomatology ranged from -0.52 to 0.25 , with a pooled correlation coefficient of -0.237 (95% CI: -0.287 , -0.186 , $p < 0.001$) (see Table 1 and Fig. 2), indicating that the higher the emotional regulation, the lower the Internet Gambling disorder symptomatology. According to Cohen's (1988) criteria, a pooled correlation coefficient of -0.223 can be considered as reflecting a low-to-medium relationship. The heterogeneity analysis showed that there was a large degree of heterogeneity among the correlation coefficients reported ($Q(35) = 614.156$, $p < 0.0001$, $I^2 = 93.7\%$).

Gauged by measurement instrument (see Table 1), the relationship between the Difficulties Emotional Regulation Scale (DERS) total score and the Internet gaming disorder symptomatology was 0.299 (95% CI: 0.236 , 0.359 , $p < 0.0001$, $k = 18$), ranging from 0.07 to 0.52 , indicating that the greater the difficulties emotional regulation, the greater the Internet gambling disorder symptomatology.

Table 1 Pooled correlation Coefficients, 95% confidence intervals, 95% prediction intervals, and heterogeneity statistics for the relationship between emotional regulation and internet gaming disorder symptomatology

Outcome	k	N	r_+	95% CI		95% PI		Q	I^2	τ
				LL	UL	LL	UL			
Any measure	36	24,450	$-.237$	$-.287$	$-.186$	$-.502$	$.068$	614.156***	93.7	0.023
DERS										
Total score	18	13,113	.299	.236	.359	.020	.535	350.147***	92.6	0.018
Nonacceptance	13	9467	.201	.130	.271	$-.057$	.435	182.678***	90.3	0.013
(lack of) Goals	12	9245	.192	.121	.260	$-.058$	.419	171.039***	89.9	0.012
Impulse	10	7584	.296	.227	.362	.070	.413	113.191***	87.6	0.010
(lack of) Awareness	13	7678	.077	.037	.118	$-.026$	.179	25.218*	51.7	0.002
(lack of) Strategies	10	7584	.289	.207	.367	.020	.519	142.187***	90.7	.014
(lack of) Clarity	15	9668	.194	.131	.256	$-.039$	.407	147.438***	87.2	.011
CERI										
Negative Impact	2	995	.258	$-.551$	.817	$-.812$	.930	3.835*	73.9	0.007
CERQ										
Maladaptive cognitive strategies	5	6282	.196	.109	.279	.028	.353	16.820**	73.4	0.003
Adaptive cognitive strategies	3	1866	$-.049$	$-.365$	.278	$-.585$	.517	9.078*	74.4	0.015
ERQ										
Cognitive Reappraisal	3	375	$-.162$	$-.322$	.006	$-.322$	.006	1.140	0.0	0.0
Expressive Suppression	3	375	.256	$-.083$	.541	$-.322$	.695	4.951	58.3	0.013
ERQ-Sort										
Total score	2	740	.052	$-.987$	.990	-1.00	1.00	30.307***	96.7	0.080

Note. DERS = Difficulties Emotional Regulation Scale. CERI = Comprehensive Emotion Regulation Inventory. CERQ = Cognitive Emotion Regulation Questionnaire. ERQ = Emotional Regulation Questionnaire. k = number of independent samples. N = total sample size. r_+ = pooled correlation coefficient. CI: Confidence interval for r_+ . PI: prediction interval for r_+ . LL and UL = lower and upper limits of the 95% confidence and prediction intervals for r_+ . Q = Cochran's heterogeneity Q statistic; Q statistic has $k - 1$ degrees of freedom. I^2 = heterogeneity index. τ = between-studies standard deviation estimated using restricted maximum likelihood. * $p \leq .050$, ** $p < .010$, *** $p < .0001$

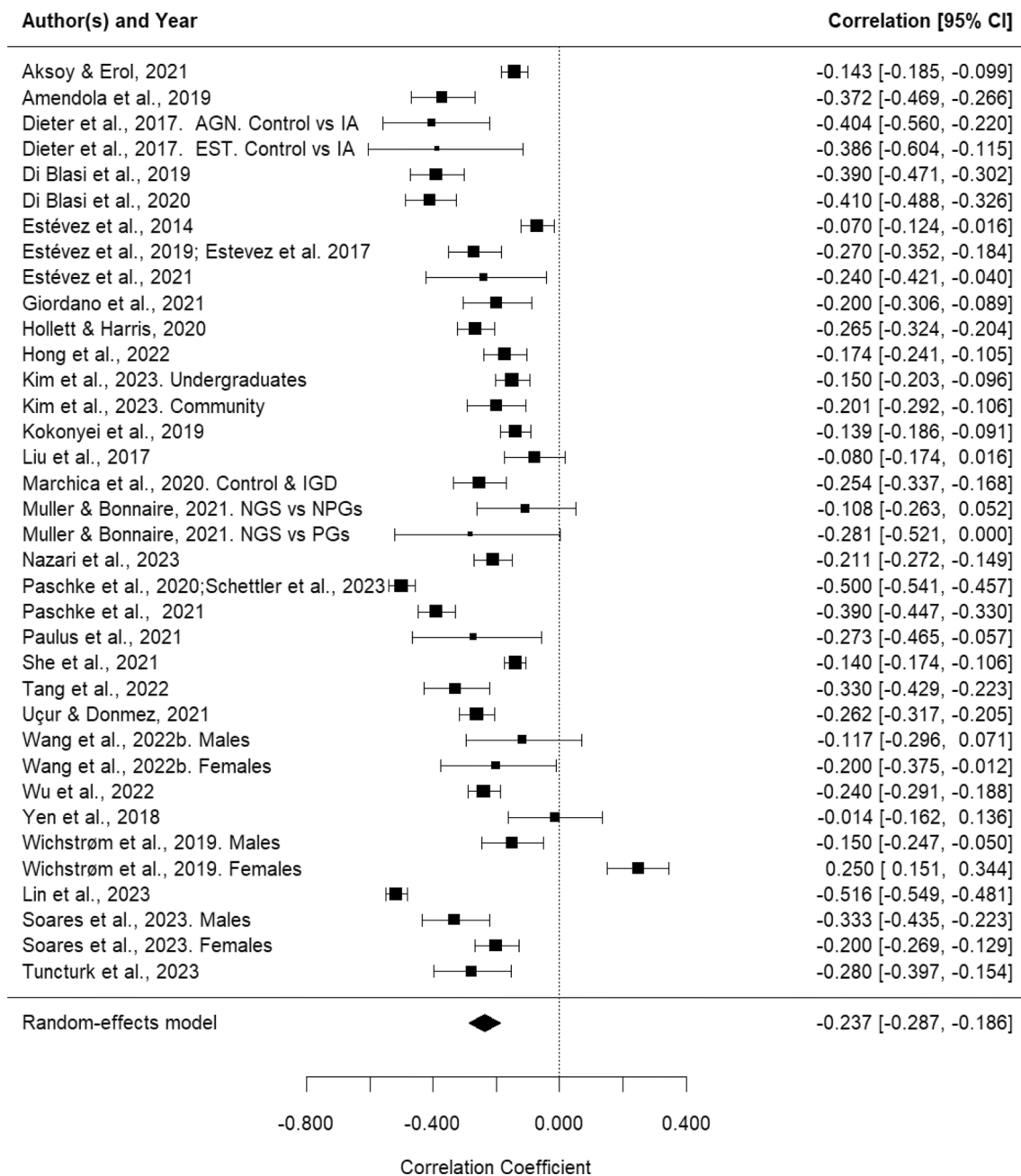


Fig. 2 Forest plot of the association between any measured of emotional intelligence as emotional regulation and internet gaming disorder symptomatology

According to Cohen's (1988) criteria, a correlation coefficient of 0.299 can be considered as reflecting a medium relationship. For the Difficulties Emotional Regulation Scale (DERS) subscales, the pooled correlation coefficient for the nonacceptance subscale was 0.201 (95% CI: 0.130, 0.271, $p < 0.0001$, $k = 13$), ranging from 0.03 to 0.42; for the lack of goals subscale was 0.192 (95% CI: 0.121, 0.260, $p < 0.0001$, $k = 12$), ranging from 0.03 to 0.42; for the impulse subscale was 0.296 (95% CI: 0.227,

0.362, $p < 0.0001$, $k = 10$), ranging from 0.16 to 0.47; for the lack of awareness was 0.077 (95% CI: 0.037, 0.118 $p = 0.001$, $k = 13$), ranging from 0.03 to 0.29; for the lack of strategies subscale was 0.289 (95% CI: 0.207, 0.367 $p < 0.001$, $k = 10$), ranging from 0.13 to 0.48; and for the lack of clarity subscale was 0.194 (95% CI: 0.131, 0.256 $p < 0.0001$, $k = 15$), ranging from 0.01 to 0.39.

Concerning the Cognitive Emotion Regulation Questionnaire (CERQ), the 5 correlation coefficients reported on

the association between the maladaptive cognitive emotion regulation strategies and Internet gaming disorder symptomatology ranged from 0.059 to 29, with a pooled correlation coefficient of 0.196 (95% CI: 0.109, 0.279 $p=0.003$), indicating that the higher the maladaptive cognitive emotion regulation, the higher the Internet gaming disorder symptomatology. According to Cohen's (1988) criteria, a pooled correlation coefficient of 0.196 can be considered as reflecting a low-to-moderate relationship. Moderate to large heterogeneity was noted among the correlation coefficients reported ($Q(4)=16.820$, $p=0.002$, $I^2=73.4.0\%$), although the adaptive cognitive emotion regulation strategies were not related with Internet gaming disorder symptomatology ($p=0.593$).

In the Emotional Regulation Questionnaire (ERQ), the 3 correlation coefficients reported for the relationships between Cognitive reappraisal subscale and Internet gaming disorder symptomatology ranged from -0.24 to -0.10 , with a pooled correlation coefficient of -0.162 (95% CI: -0.322 , 0.006 , $p=0.053$, $k=3$), indicating that both variables were not associated. For the expressive suppression subscale, the 3 correlation coefficients reported ranged from 0.12 to 0.35 , with a pooled correlation coefficient of 0.256 (95% CI: -0.083 , 0.541 , $p=0.083$, $k=3$), indicating no relationship between both variables. However, following Cohen's (1988) criteria, a pooled correlation coefficient of 0.162 and 0.256 can be considered as reflecting low-to-medium relationships.

Relationships Between Emotional Intelligence Measured as Social-Emotional Competence and Internet Gaming Disorder Symptomatology

The 13 correlation coefficients reported for the relationships between Social-Emotional Competence and Internet gaming disorder symptomatology ranged from -0.570 to 0.034 , with a pooled correlation coefficient of -0.230 (95% CI: -0.333 , -0.121 , $p<0.001$) (see Table 2 and Fig. 3), indicating that higher social competence, lower Internet gaming disorder symptomatology. According to Cohen's (1988) criteria, a pooled correlation coefficient of -0.160 can be considered as reflecting a low-to-moderate relationship. Again, a large degree of heterogeneity was noted among the correlation coefficients reported ($Q(12)=107.338$, $p<0.0001$, $I^2=92.9\%$).

The relationships between the Teenage Inventory of Social Skills (TISS) total score and Internet gaming disorder symptomatology by measurement instrument was -0.129 (95% CI: -0.220 , -0.036 , $p=0.036$, $k=2$), ranging from -12 to -0.14 , indicating that the higher the Social Skills, the lower the Internet gaming disorder symptomatology. However, the TISS positive and negative social skills subscales did not show a relationship with Internet

gaming disorder symptomatology ($p=0.824$, $p=0.899$, respectively). Finally, for Harters' Self Perception Profile of Adolescents total score, the pooled correlation did not reach statistical significance -0.291 (95% CI: -0.812 , 0.489 , $p=0.138$, $k=2$).

Relationships Between Emotional Intelligence as Ability and Internet Gaming Disorder Symptomatology

The 2 correlation coefficients reported for the relationships between Wong and Law's Emotional Intelligence Scale (WLEIS) total score and Internet gaming disorder symptomatology ranged from -0.23 to -0.23 , with a pooled correlation coefficient of -0.249 (95% CI: -0.386 , -0.101 , $p<0.001$), indicating that the higher the Emotional Intelligence, the lower the Internet gaming disorder symptomatology (see Table 2). According to Cohen's (1988) criteria, a pooled correlation coefficient of -0.249 can be considered as reflecting a low-to-medium relationship.

Relationships Between Emotional Intelligence as Trait and Internet Gaming Disorder Symptomatology

The pooled correlation of the Trait Emotional Intelligence Questionnaire-Short Form (TEIQue-SF) total score with Internet gaming disorder symptomatology (see Table 2) did not reach statistical significance ($r_+ = -0.276$, 95% CI: -0.977 , 0.929 , $p=0.314$, $k=2$).

Moderator Analyses

Moderator analyses were performed on the relationship between any measure of Emotional regulation and Internet gaming disorder symptomatology, since this was the one outcome that presented more than 20 correlation estimates. To facilitate the interpretation of meta-regression analyses, the correlation coefficients representing the relationships between any emotional regulation and internet gaming disorder symptomatology were adjusted so that all of them were positive. Simple meta-regression analyses revealed that the methodological quality of primary studies exhibited a positive and statistically significant association with the correlation coefficients, accounted for 12.7% of the variance (see Table 3).

The weighted ANOVAs applied to correlation coefficients found that three categorical moderator variables showed an association with correlation estimates (see Table 4): the research design ($p=0.020$), measurement instrument applied for assessing emotional regulation ($p=0.022$) and country in which the study was conducted ($p=0.014$). The research design, classified as cross-sectional versus longitudinal, accounted for 14.8% of the variance. Stronger

Table 2 Pooled correlation Coefficients, 95% confidence intervals, 95% prediction intervals, and heterogeneity statistics for the relationship between emotional intelligence measured as social-emotional competence, trait or ability with Internet gaming disorder symptomatology

Outcome	<i>k</i>	<i>N</i>	<i>r</i> ₊	95% CI		95% PI		<i>Q</i>	<i>I</i> ²	<i>τ</i>
				LL	UL	LL	UL			
Emotional intelligence as Social-Emotional Competence										
Any measure	13	7394	−.223	−.333	−.121	−.544	.141	107.338***	92.9	0.027
EQ-i:YV										
Total score	4	1193	−.249	−.386	−.101	−.485	.021	7.221	59.7	.005
Intrapersonal	4	1193	−.160	−.308	−.004	−.423	.128	7.815*	65.6	0.006
Interpersonal	4	1193	−.291	−.408	−.163	−.493	−.059	6.401	52.8	0.004
Adaptability	4	1193	−.059	−.123	.005	−.123	.005	1.436	0.0	0.00
Stress management	4	1193	−.208	−.329	−.080	−.409	.013	5.759	48.1	0.003
EKF										
Total score	2	143	−.528	−.807	−.056	−.807	−.056	0.240	0.0	0.000
EKF-EE	2	143	−.461	−.677	−.172	−.677	−.172	0.090	0.0	0.000
EKF-EA	2	143	−.268	−.793	.486	−.793	.486	0.551	0.0	0.000
EKF-RE	2	143	−.233	−.368	−.090	−.482	.050	8.814	44.7	0.009
EKF-EX	2	143	−.419	−.681	−.061	−.681	−.061	0.126	0.0	0.000
TISS										
Total score	2	1026	−.129	−.220	−.036	−.220	−.036	0.056	0.00	0.00
Positive Skills	2	1026	.039	−.936	.945	−.994	.995	19.264***	94.8	0.036
Negative Skills	2	1026	.110	−.895	.931	−.987	.992	15.344***	93.4	0.028
HSPPA										
Total score	2	538	−.291	−.812	.489	−.908	.724	2.290	56.6	.005
Emotional intelligence as ability										
WLEIS										
Total score	2	597	−.249	−.386	−.101	−.485	.021	0.000	0.0	0.00
Emotional intelligence as trait										
TEIQue-SF										
Total score	2	948	−.276	−.977	.929	−.998	.995	21.887***	95.4	0.044

Note. EQ-i:YV=Emotional Quotient Inventory: Young Version. EKF=Emotional competence questionnaire. EKF-EE=Recognizing and understanding the own emotions. EKF-EA=Recognizing and understanding others' emotions. EKF-RE=Regulation and control of the own emotions. EKF-EX=Emotional expressiveness. TISS=Teenage Inventory of Social Skills. HSPPA=Hartners' Self Perception Profile of Adolescents. TEIQue-SF=Trait Emotional Intelligence Questionnaire-Short Form. WLEIS=Wong and Law's Emotional Intelligence Scale. *k*=number of independent samples. *N*=total sample size. *r*₊=pooled correlation coefficient. CI: Confidence interval for *r*₊. PI: prediction interval for *r*₊. LL and UL=lower and upper limits of the 95% confidence and prediction intervals for *r*₊. *Q*=Cochran's heterogeneity *Q* statistic; *Q* statistic has *k* - 1 degrees of freedom. *I*²=heterogeneity index. *τ*=between-studies standard deviation estimated using restricted maximum likelihood. **p*≤.050, ****p*≤.0001

emotional regulation-Internet gaming disorder associations were found in cross-sectional ($r_+ = -0.244$, $p < 0.001$) than in longitudinal studies ($r_+ = -0.033$, $p = 0.715$). The measurement instrument applied to assess emotional regulation explained 30.9% of the variance. The ERQ-Sort instrument was the least sensitive to capturing the relationship between the emotional regulation-Internet gaming disorder relationships found ($r_+ = 0.051$, $p = 0.608$), in comparison with the other instruments used ($r_+ = -0.254$, $p < 0.001$). The country in which the research was carried out explained 36% of the variance.

Analysis of Publication Bias

The funnel plot with the trim-and-fill method and Egger's test were applied for each meta-analysis to examine publication bias. The Egger's tests applied did not reach statistical significance for any the meta-analysis of the relationships between any measure of Social Emotional competence and Internet gaming disorder symptoms (see Appendix B). In addition, the trim-and-fill method required the imputation of correlation coefficients to achieve symmetry in twelve other funnel plots, in eleven of which the adjusted pooled correlation coefficient displayed a negligible difference from the original pooled correlation coefficient (see Table 5). The adjusted

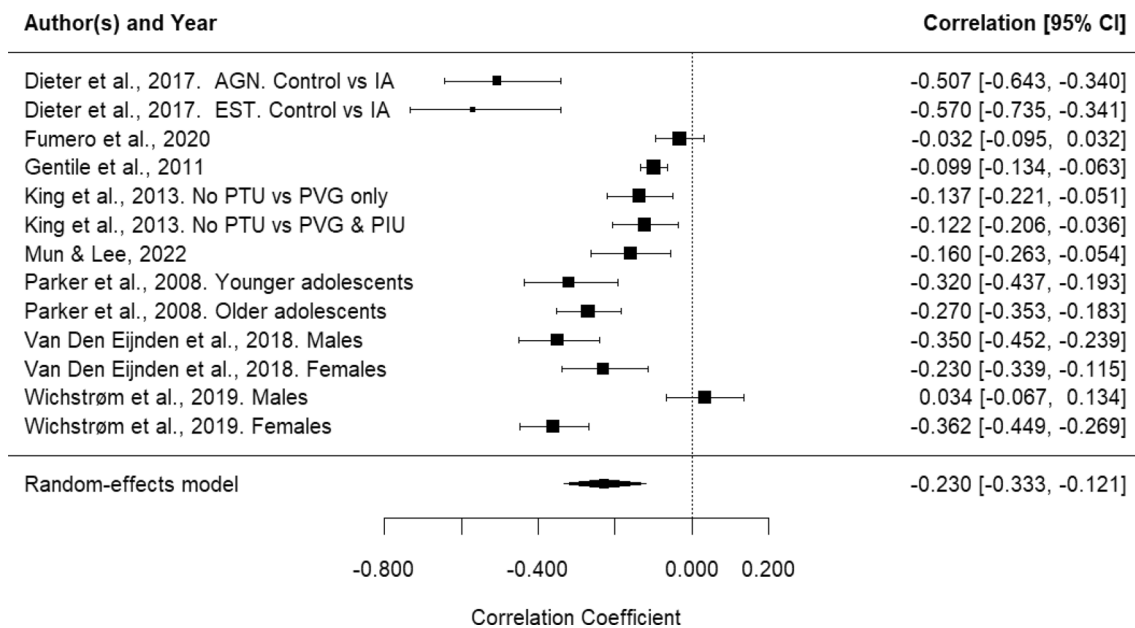


Fig. 3 Forest plot of the association between any measured of emotional intelligence as social-emotional competence and internet gaming disorder symptomatology

Table 3 Results of the simple meta-regressions applied on correlation coefficients for the relationships between any emotional regulation and internet gaming disorder symptomatology, taking continuous moderator variables as predictors

Predictor variable	<i>k</i>	<i>b_j</i>	95% CI		<i>F</i>	<i>Q_E</i>	<i>R</i> ²
			LL	UL			
N	36	0.000	-0.0001	0.0001	0.009	601.017***	.000
Gender	35	0.002	0.005	0.004	2.513	565.807***	.057
Age Mean	36	0.006	-0.003	0.014	1.940	596.097***	.029
Age SD	34	0.012	-0.005	0.029	2.234	492.748***	.034
Year	36	0.015	-0.011	0.040	1.378	549.830***	.025
MQ total score	36	0.052	0.008	0.097	5.769*	550.891***	.127

Note. N=sample size. Gender=percentage of males in the sample. Age Mean=average age (years) of the sample. Age SD=standard deviation of the age (years). Year=publication year of the study. MQ=Methodological quality of primary studies. *k*=number of independent samples. *b_j*=regression coefficient of each predictor. LL and UL=lower and upper limits of the 95% confidence interval for *b_j*. *F*=Knapp-Hartung's statistic for testing the significance of the predictor (the degrees of freedom for this statistic are 1 for the numerator and *k* - 2 for the denominator). *Q_E*=statistic for testing the model misspecification. *R*²=proportion of variance accounted for by the predictor. **p* ≤ .050, ****p* < .001

pooled correlation coefficient showed a slight difference from the original only for the meta-analysis on the adaptive cognitive strategies as measure of emotional regulation outcome ($r_+ = -0.049$, $r_{adj+} = 0.072$, difference = 0.121) but was not relevant. In both cases, the relationships between the adaptive cognitive strategies as measure of emotional regulation outcome and Internet gaming disorder was not statistically significant so that publication bias can be safely discarded as a threat to the meta-analytic results.

Analyses of Sensitivity

Sensitivity analyses were performed to examine the robustness of the results and the impact of including or excluding

one-to-one correlation coefficients. By deleting each study one by one and performing the analyses again each time, the pooled correlation coefficient for the relationships between emotional intelligence measured as emotional regulation and Internet gaming disorder symptomatology (*k* = 35) ranged from -0.227 (95% CI: -0.178, -0.275) to -0.251 (95% CI: -0.207, -0.294), and for the relationship between emotional intelligence measured as social-emotional competence and Internet gaming disorder symptomatology (*k* = 12), the pooled correlation coefficient ranged from -0.206 (95% CI: -0.102, -0.305) to -0.249 (95% CI: -0.144, -0.349), indicating that the pooled correlation coefficients were robust. Supplementary Material 2 provides the results of the sensitivity analysis for each measurement instrument and

Table 4 Results of the weighted ANOVAs applied on correlation coefficients for the relationships between any measure of Emotional Regulation (ER) and IGD, taking categorical moderator variables as independent variables

Variable	<i>k</i>	<i>N</i>	<i>r</i> ₊	95% CI		ANOVA results
				LL	LU	
Research design						$F(1,34) = 5.956, p = .020$
Cross-sectional	33	23,630	-.254	-.302	-.204	$R^2 = .148$
Longitudinal	3	820	-.033	-.211	.147	$Q_W(34) = 559.491, p < .001$
Sampling method:						$F(1,34) = 0.024, p = .877$
Convenience	33	18,868	-.239	-.292	-.184	$R^2 = .00$
Random	3	5582	-.225	-.386	-.051	$Q_W(34) = 587.791, p < .001$
Target population:						$F(6,29) = 0.804, p = .575$
Clinical	3	397	-.265	-.447	-.063	$R^2 = .00$
Community	13	8835	-.243	-.324	-.158	$Q_W(29) = 485.599, p < .001$
Gamers	2	2154	-.365	-.540	-.160	
Mixed (Clinical & Community)	2	143	-.396	-.604	-.138	
Mixed (Gamers & Community)	4	421	-.168	-.341	.016	
School students	8	10,302	-.205	-.309	-.096	
University students	4	2198	-.193	-.343	-.032	
Measurement Instrument for ER						$F(8,27) = 2.891, p = .018$
ALPS	1	2001	-.143	-.375	.107	$R^2 = .310$
CBCL	1	80	-.273	-.547	.054	$Q_W(27) = 398.717, p < .001$
CERI	2	995	-.263	-.428	-.082	
CERQ	5	6282	-.169	-.283	-.049	
DERS	18	13,113	-.299	-.345	-.241	
EKF	2	143	-.397	-.583	-.171	
ERQ-Sort	2	740	.051	-.137	.236	
ERICA	1	301	-.200	-.442	.069	
ERQ	4	594	-.101	-.248	.048	
Measurement Instrument for ER (II)						$F(1,34) = 9.271, p = .005$
ERQ-Sort	2	740	.051	-.149	.248	$R^2 = .200$
Other	34	23,710	-.254	-.300	-.207	$Q_W(34) = 552.123, p < .001$
Country						$F(8,24) = 3.161, p = .014$
Canada	5	3364	-.239	-.346	-.125	$R^2 = .360$
China	8	7778	-.202	-.292	-.108	$Q_W(24) = 338.282, p < .001$
France	2	201	-.174	-.389	.058	
Germany	5	2244	-.406	-.512	-.289	
Italy	3	1075	-.391	-.515	-.252	
Italy & Sweden	2	995	-.264	-.429	-.081	
Norway	2	740	.051	-.138	.237	
Spain	3	1883	-.186	-.334	-.028	
Turkey	3	3290	-.225	-.363	-.077	
Continent:						$F(2,33) = 0.453, p = .640$
Asia	12	12001	-.207	-.294	-.116	$R^2 = .000$
Europe	18	8784	-.261	-.333	-.185	$Q_W(33) = 610.409, p < .001$
North America	6	3665	-.233	-.352	-.107	

Note. ALPS=Adolescent Lifestyle Profile Scale. CBCL=Child Behavior Checklist. CERQ=Cognitive Emotion Regulation Questionnaire. DERS=Difficulties Emotional Regulation Scale. EKF=Emotional competence questionnaire. ERQ-Sort=Emotion Regulation Q-Sort. ERICA=Emotion Regulation Index for Children and Adolescents. ERQ=Emotional Regulation Questionnaire. *k*=number of independent samples. *N*=total sample size. *r*₊=pooled correlation coefficient. LL and LU=lower and upper 95% confidence limits for *r*₊. *F*=Knapp-Hartung's statistic for testing the significance of the moderator variable. *Q*_W=statistic for testing the model misspecification. *R*²=proportion of variance accounted for by the moderator

Table 5 Publication bias analysis: Results of the Trim-and-Fill method

Outcome	<i>k</i>	<i>k_{imp}</i>	<i>k_{TaF}</i>	<i>r_{adj+}</i>	95% CI		95% PI		Difference (<i>r₊</i> and <i>r_{adj+}</i>)
					LL	UL	LL	UL	
DERS									
Total scores	18	2	20	.323	.261	.382	.037	.560	−0.024
Nonacceptance	13	2	15	.227	.161	.292	−.028	.455	−0.026
(Lack of) Goals	12	2	14	.219	.153	.283	−.027	.440	−0.027
Impulse	10	2	12	.325	.262	.385	.103	.517	−0.029
(Lack of) Awareness	13	3	16	.061	.023	.099	−.053	.174	0.016
(Lack of) Strategies	10	1	11	.307	.234	.377	.056	.522	0.018
CERQ									
Adaptative cognitive strategies	3	2	5	.072	−.110	.250	−.331	.453	0.121
ERQ									
Cognitive Reappraisal	3	1	4	−.151	−.244	−.056	−.244	−.056	0.011
Any measure of SEC	13	1	14	−.211	−.305	.111	−.525	.155	0.012
EQ-i:YV									
Total Scores	4	1	5	−.228	−.307	−.146	−.382	−.062	0.021
Adaptability	4	1	5	−.070	−.121	−.018	−.121	−.018	0.011
Stress management	4	1	5	−.180	−.262	−.097	−.341	−.009	0.028

Note. DERS=Difficulties Emotional Regulation Scale. CERQ=Cognitive Emotion Regulation Questionnaire. ERQ=Emotional Regulation Questionnaire. SEC=Social Emotional Competence. EQ-i:YV=Emotional Quotient Inventory: Young Version. *k*=number of original independent samples. *k_{imp}*=Number of imputed independent sample by the Trim- and-Fill method. *k_{TaF}*=number of independent samples from the Trim- and-Fill method. *r_{adj+}*=adjusted pooled correlation coefficient from the Trim-and-Fill method. CI: Confidence interval for *r₊*. PI: prediction interval for *r₊*. LL and UL=lower and upper limits of the 95% confidence and prediction intervals for *r*

shows that all the meta-analytic results were significantly robust.

Discussion

The prevalence of Internet gaming disorder has increased, and there is interest in identifying protective factors against its development. This study examined the association between Internet gaming disorder and a variable that is protective against other types of addiction: emotional intelligence. This study provides a meta-analytic synthesis of the existing research on the association between emotional intelligence and Internet gaming disorder symptomatology. Previous meta-analyses (Ji et al., 2022; Koo & Kwon, 2014) focused on specific social contexts (i.e., China and Korea), without considering potential differences across countries. Separate meta-analyses were performed to examine the relation between emotional intelligence and Internet gaming disorder symptomatology across different social contexts.

The results showed a negative and statistically significant relationship between emotional intelligence measured as emotional regulation and Internet gaming disorder symptomatology, indicating that the higher levels of emotional

regulation were related to lower levels of Internet gaming disorder symptomatology. According to Cohen's (1988) criteria, a pooled correlation coefficient of $r_+ = -0.237$ can be considered as reflecting a low-to-medium association. Higher Internet gaming disorder scores are associated with lower emotional regulation scores, suggesting two possible implications. On one hand, deficits in emotional regulation or maladaptive regulation strategies may be a risk factor in Internet gaming disorder development and gaming may provide an escape from emotional distress. On the other hand, emotional regulation deficits have also been linked to impulsivity (or deficits in self-control), another risk factor for multiple addictions (Estévez et al., 2019, 2021). In this case, emotional regulation could play a mediating role between impulsivity and Internet gaming disorder.

A negative and statistically significant relationship was found between emotional intelligence measured as social-emotional competence and Internet gaming disorder symptomatology, indicating that higher levels of social-emotional competence are related to lower levels of Internet gaming disorder symptomatology. According to Cohen's (1988) criteria, a pooled correlation coefficient of $r_+ = -0.230$ can be considered as reflecting a relevant low-medium association. These results indicate that there is a not only a negative

correlation between Internet gaming disorder and emotional intelligence, but also a correlation with one of the key emotional intelligence components: social-emotional competence. As in the case of emotional regulation, this correlation may have different implications, e.g., deficits in social competence may favor dysfunctional gaming. Although video games do have a social character, they do not necessarily require direct interaction with other players, which may be an aspect sought by people with little social competence. On the other hand, excessive gaming patterns may be linked to less time spent on other social activities and could impair social performance.

The results also showed the existence of a negative and statistically significant relationship between emotional intelligence measured as an ability and Internet gaming disorder symptomatology, indicating that the higher levels of emotional intelligence were related to lower higher levels of this symptomatology. According to Cohen's criteria (1988), a pooled correlation coefficient of $r_+ = -0.249$ can be considered as reflecting a low-to-medium association, in line with previous studies focusing on the association between Internet gaming disorder and emotional intelligence as ability (Dang et al., 2019; Fatima & Zulfiqar, 2023). These findings may suggest that emotional intelligence acts as a protective factor, and therefore working on emotional awareness and management in prevention programs may reduce the likelihood of developing online gaming problems (Henning et al., 2021).

A negative and statistically significant relationship was detected between emotional intelligence measured as a trait and Internet gaming disorder symptomatology was found, indicating that the higher levels of emotional intelligence are related to lower higher levels of Internet gaming disorder symptomatology. According to Cohen's (1988) criteria, a pooled correlation coefficient of $r_+ = -0.276$ can be interpreted as reflecting a low-to-medium association, in line with previous studies on the association between emotional intelligence and Internet gaming disorder (Hamissi et al., 2013; Parker et al., 2008; Ranjbar & Bakhshi, 2018; Saraiva et al., 2018). Higher Internet gaming disorder scores are associated with lower emotional intelligence scores, suggesting that emotional intelligence may mediate the users' level of addiction. The results suggest that trait emotional intelligence, which is a stable personality trait, may be inversely related to internet gaming disorder symptomatology. One implication is that people with higher levels of trait emotional intelligence may be less likely to develop Internet gambling problems. Previous evidence suggests that this relationship is stronger in adolescents than in adults (Kircaburun et al., 2020).

Overall, as the size of the relationships between any emotional intelligence and Internet gaming disorder symptomatology presented a large variability across studies, moderator

analyses (e.g., ANOVAs and meta-regressions) were conducted to identify the study features that could explain at least part of the correlation coefficient variability. However, they could only be performed on the relationship between emotional intelligence measured as emotional regulation and Internet gaming disorder symptomatology due to the small number of studies that examined the other relationships (e.g., trait emotional intelligence and social competence with Internet gaming disorder symptomatology). Several characteristics of the studies were statistically associated with correlation coefficients, such as the methodological quality of primary studies, the research design, the measurement instrument for assessing emotional regulation, and the country in which the study took place. The studies with a higher methodological quality score were more sensitive in identifying the relationships between emotional regulation and Internet gaming disorder symptomatology. In other words, those with higher methodological quality scores showed a stronger relationship between emotional regulation and Internet gaming disorder than those with a lower score, exemplifying the benefits of rigorous methodologies in achieving more robust and trustworthy findings. The commitment to higher methodological standards not only enhances the precision of estimations but also facilitates a more accurate identification of the relationships of interest (Cohen, 1988). Also, stronger emotional regulation-Internet gaming disorder associations were found in cross-sectional than in longitudinal studies, suggesting that the studies' methodological characteristics could explain differences in the magnitude of the relationship between emotional intelligence and Internet gaming disorder symptoms found in the literature.

The findings revealed that of all the emotional regulation measurement instruments, the ERQ-Short (Shields & Cicchetti, 1997) was the least sensitive tool in identifying relationships with Internet gaming disorder symptomatology. Based on this result, the ERQ-Short should be the last choice for assessing emotional regulation when it wants to examine the co-occurrence of internet gaming disorder symptomatology and difficulties emotional regulation. In addition, the country in which the study was conducted was also statistically related to correlation coefficients, which suggests that the strength of this relationship could vary across different social contexts. These findings support the view that emotional intelligence is culturally specific, reflecting differences in the cultural and individual dimensions of understanding, regulating, and managing emotions (Pathak & Muralidharan, 2020). Previous research has shown that individualistic-collectivist orientations in society tend to shape and influence psychological processes, with a stronger relationship found between collectivist cultures and emotional intelligence (Bhullar et al., 2012; Margavio et al., 2012). Similarly, the prevalence of gaming

disorder differs across countries, particularly in Asia and North America, which the highest rates of video game consumption are found (Warman, 2018).

On the other hand, the participant's age, gender distribution, and the target population (e.g., clinical, community, gamers, mixed, school students or university students), did not show a statistically significant association with the correlation coefficients, which suggests that age, gender, and the target population does not affect the strength of the relationship, which therefore does not systematically vary across age, genders, and the target population. The size of the relationship between emotional intelligence measured as emotional regulation and Internet gaming disorder symptomatology are thus equally regardless of age, gender, and target population.

The present present meta-analysis has limitations in terms of sample size and characteristics of the sample studies. One of the limitations is associated with the small number of studies included in certain analyses ($k=2$). This limitation could affect the precision of the estimation, potentially failing to accurately reflect the true relationship between emotional intelligence and the symptoms of internet gaming disorder. The results of these analyses should therefore be interpreted with caution. Additionally, the present meta-analysis is limited by the following points: most of the included studies used a non-probabilistic sampling method (i.e., convenience sample, non-representative sample), which makes it difficult to generalize the meta-analytic results. Most also used a cross-sectional research design, which cannot draw causal inferences on the association between emotional intelligence and Internet gaming disorder symptomatology. Longitudinal studies might help to understand this association in chronological terms to determine whether emotional intelligence precedes Internet gaming disorder symptomatology (or vice versa). In addition, four studies which examined the relationship between emotional intelligence and Internet gaming disorder symptomatology could not be included in the meta-analyses as they did not provide statistical data to compute the effect sizes and their authors did not reply to the request for data. There was also great heterogeneity among the correlation coefficients, so that there are possibly other moderator variables which could not be considered in the present analysis because they did not report on the original studies (i.e., hours playing or percentage of Internet gaming disorder in the sample) and could be relevant in explaining this variability. It would be interesting in future primary

studies to analyze the emotional intelligence-Internet gaming disorder relationship to include other variables that could be used as moderators, such as participant variables (i.e., personality traits), consumption habits (i.e., hours of playing, game genre, game mode) and study methodology (i.e., study design, sampling method, risk of bias). Future research could focus on analyzing the components of emotional intelligence that have a greater protective effect on the development of Internet gaming disorder, and whether they are differential in the development of other types of addiction. Also, a study could explore whether the size of the correlation between emotional intelligence and Internet gaming disorder symptomatology found is stable across different age groups, or whether there is an age group in which the correlation becomes stronger. Practical implications for the practical field can also be drawn from the results, especially in preventing Internet gaming disorder prevention and in its treatment programs.

Conclusion

The increasing incidence of Internet gaming disorder highlights the need to investigate factors associated with its onset. This study examined emotional intelligence as a study variable in relation to Internet gaming disorder, due to its relevance to the development of other addictive behaviors. The results suggest a significant negative association between Internet gaming disorder and emotional intelligence. A low-to-medium association was found between Internet gaming disorder and overall emotional intelligence, emotional regulation, and social competence. Given the protective role of emotional intelligence in substance and behavioral addictions, a similar role can be expected for gaming disorder. The authors consider that these results could make a valuable contribution to the improvement of research in this area, especially as regards understanding the development of gaming addiction in adolescence and early adulthood.

Appendix A

Studies' Characteristics

Author	Country	Research design	Sampling method	Sample size	Mean Age	SD Age	% Male	Ethnicity	Sexual orientation	Marital Status	IGD Scale	EI Scale
Aksoy & Erol, 2021	Turkey	CS	Convenience sampling collected from three high schools	2001	16.5	1.07	66.6	NR	NR	NR	GASA	ALPS
Amendola et al., 2019	Italy	CS	Convenience sampling collected from secondary schools	280	13.31	2.33	51	NR	NR	NR	CSAS	DERS
Che et al., 2017	China	CS	Convenience sampling from two middle schools	931	16.18	0.95	100	NR	NR	NR	CIAS	Chinese Emotional Intelligence Scale
Dang et al., 2019	China	L	Convenience sampling from university	282	20.47	1.15	40	NR	NR	NR	DSM-5 Criteria	WLEIS
Di Blasi et al., 2019	Italy	CS	Convenience sampling from WoW forums	390	28.28	8.24	74.10	NR	NR	NR	IAT-WOW	DERS-18
Di Blasi et al., 2020	Italy	CS	Convenience sampling from WoW forums, Facebook groups and gaming pages	405	28.1	8	75.1	NR	NR	NR	IAT-WOW	DERS-18
Dieter et al., 2017	Germany	CS	Convenience sampling in a clinic and with advertisements on the websites of the Central Institute of Mental Health and Mannheim University	44 healthy controls and 51 internet addicts (30 IGD)	27.15	8.21	54.74	NR	NR	NR	AICA.30 subscale	EKF
Efrati & Spada, 2023	Israel	L	Convenience sampling from institutes	1056	15.77	1.43	57.7	NR	NR	NR	IGDS9-SF	ERQ-CA
Estévez et al., 2014	Spain	CS	Convenience sampling from schools, universities and leisure time groups, and from associations and centers associated with FEJAR	1316	17.28	2.70	57.4	NR	NR	NR	MULTICAGE CAD-4	DERS
Estévez et al., 2017	Spain	CS	Convenience sampling from nine high schools and vocational education centers	472	15.6	1.33	48.4	NR	NR	NR	MULTICAGE CAD-4	DERS
Estévez et al., 2021	Spain	CS	Convenience sampling of a gambling disorder treatment clinic	95	41.8	13.2	93.5	NR	NR	43.2	MULTICAGE CAD-4	DERS
Fumero et al., 2020	Spain	CS	Convenience sampling from private and public schools	946	14	1.52	51.5	NR	NR	NR	PVP	Social Skill Scale
Gentile et al., 2011	USA	L	Convenience sampling from grades 3,4,7,8 of 6 primary and secondary schools	2998	11.2	2.06	72.6	NR	NR	NR	DSM-5 Criteria	PSI-II
Giordano et al., 2022	USA	CS	Crowdsourcing from Qualtrics	350	15.23	1.35	48.6	44.9% White	NR	NR	IGDS9-SF	ERICA

Author	Country	Research design	Sampling method	Sample size	Mean Age	SD Age	% Male	Ethnicity	Sexual orientation	Marital Status	IGD Scale	EI Scale
Hollett & Harris, 2020	Canada	CS	Convenience sampling from social media advertisements	928	25.6	6.5	61.7	88% White	NR	33.8	PVP	DEKS-36
Hong et al., 2022	China	CS	Convenience sampling and online survey	780	14	de 7 a 18	49.9	NR	NR	NR	IGDS	DEKS
Kim et al., 2023	Canada	CS	Convenience sampling from universities	1827	19.86	4.34	26.7	39.1% White	NR	78.4	SSBA Gaming	DEKS-18
Kim et al., 2023	Canada	CS	Crowdsourcing from Prolific	528	29.12	9.24	43.7	40% White	NR	56.3	SSBA Gaming	DEKS-18
King et al., 2013	Australia	CS	Convenience sampling from public and private schools	1287	14.8	1.5	50	NR	NR	NR	PTU Checklist	TISS
Kircaburun et al., 2019	Turkey	CS	Convenience sampling from a high school	470	16.29	1.17	40.4	NR	NR	NR	IGDT-10	TEIQUE-SF
Kircaburun et al., 2020	Turkey	CS	Convenience sampling from gaming forums	478	20.88	4.79	96	NR	NR	NR	IGDT-10	TEIQUE-SF
Kököneyi et al., 2019	Hungary	CS	Stratified random sampling	1646	15.4	2.19	62.9	NR	NR	NR	POGQ-SF	CERQ-short
Liau et al., 2015	Singapore	L	Convenience sampling from schools	2998	-	-	72.6	72.6% Chinese, 14.2% Malay, 8.8% Indian and 4.3% others	NR	NR	10 item scale DSM-IV	PSI-II
Lin et al., 2023	China	CS	Convenience sampling from social net-working sites and gaming forums	1768	17.96	3.04	64	NR	NR	NR	IGDS9-SF	DEKS-16
Liu et al., 2017	China	CS	Convenience sampling from elementary schools	420	9.74	0.45	52.3	NR	NR	NR	PVGU	ERQ
Marchica et al., 2020	Canada	CS	Convenience sampling from colleges, universities and social media sites	753	20.77	2.73	45.82	NR	NR	NR	IGDS9-SF	DEKS-36
Müller & Bonnaire, 2021	France	CS	Convenience sampling from a school and Facebook groups	201	19.02	4.2	63.18	NR	NR	NR	GAS	DEKS
Mun & Lee, 2022	South Korea	L	Data from a longitudinal investigation (GUP)	336 dyads	NR	NR	7.1 (fathers)/ 58 (boys)	NR	NR	NR	GUP	Social Intelligence Scale

Author	Country	Research design	Sampling method	Sample size	Mean Age	SD Age	% Male	Ethnicity	Sexual orientation	Marital Status	IGD Scale	EI Scale
Nazari et al., 2023	Iran	CS	Convenience sampling from a web-based platform	933	15.08	0.82	58.6	NR	NR	NR	GADIS-A/ IGDS9-SF	DERS-SF
Nugraha et al., 2021	Indonesia	CS	Convenience sampling from schools	136	16.02	0.69	63.2	NR	NR	NR	GAS	ICQ
Parker et al., 2008	Canada	CS	Convenience sampling from communities in Ontario	667	16.20	1.45	37.3	84% White	NR	NR	PVGS	EQ-i:YV
Parker et al., 2013	Canada	CS	Convenience sampling from a local pediatric clinic and special needs school	526(270 clinical outpatients + 256 special need students)	15.22/16.27	1.63/1.21	64.4	91.5/79% White	NR	NR	PVGS	EQ-i:YV
Paschke et al., 2020	Germany	CS	Random sampling method from market research	1221	13.01	2.36	59.9	NR	NR	NR	GADIS-A/ IGDS/P-IGDS	DERS-SF
Paschke et al., 2021	Germany	CS	Random sampling method from market research	800 dyads	46.38 (parents)/12.99 (children)	0.93(parens)/2.37(child ren)	47.8(parens)/58.6(children)	NR	NR	NR	GADIS-P/ GADIS-A/P-IGDS	DERS-SF
Paulus et al., 2021	Germany	L	Convenience sampling from a psychiatric clinic	80	9.2	2.03	63.7	NR	NR	NR	DSM-5 Criteria	DERS
Schettler et al., 2023	Germany	CS/L	Random sampling method from market research	1221/659	13.04/13.11	2.39/2.38	54/53	NR	NR	NR	IGDS/GADIS-A	DERS-SF
Seo et al., 2012	South Korea	CS	Convenience sampling from schools	2199	13.37	2.09	58.8	NR	NR	NR	KADO Scale	Emotional Intelligence Questionnaire
She et al., 2021	China	CS	Stratified random sampling from secondary schools	3136	13.6	1.3	48	NR	NR	NR	DSM-5 Criteria	CERQ-Short
Soares et al., 2023	Italy/Sweden	CS	Convenience sampling from social media and university campuses	995	25	6.31	31.3	NR	NR	NR	GSMQ-9	CERI (subscale Negative Impact)
Tang et al., 2022	Canada	CS	Convenience sampling from a university	287	19.8	3.01	47	43.6% White	NR	94.8 single, 2.4 married, 2.8 common law	GAIA	DERS-36
Torres-Rodríguez et al., 2018	Spain	CS	Convenience sampling from two public mental health centers (clinical sample IGD +)	31	14.97	1.74	100	NR	NR	NR	IGD-20	TMMS-24
Tunçtürk et al., 2023	Turkey	CS	Convenience sampling from an outpatient clinic specialized in GD	222 (111 IGD +)	14.39	2.18	NR	NR	NR	NR	IGDS9-SF/ GADIS-A	DERS

Author	Country	Research design	Sampling method	Sample size	Mean Age	SD Age	% Male	Ethnicity	Sexual orientation	Marital Status	IGD Scale	EI Scale
Uğur and Dönmez, 2021	Turkey	CS	Convenience sampling from schools	1067	14.7	1.8	54.3	NR	NR	NR	GAS	DERS-36
Van Den Eijnden et al., 2018	The Netherlands	L	Convenience sampling from two secondary education schools	538	12.9	0.73	48.9	NR	NR	NR	IGDS	Hartgers' Self Perception Profile of Adolescents
Wang et al., 2022a	China	CS	Convenience sampling from an online survey	789	20.78	3.72	34.9	NR	NR	NR	IGDQ	WLEIS
Wang et al., 2022b	China	CS	Convenience sampling from online advertisements and posters	109	21.7	2.26	49.5	NR	NR	NR	QSU-Brief Gaming	CERQ
Wichstrøm et al., 2019	Norway	L	Stratified sampling from 2003 and 2004 birth cohorts	740	10	0	51.4	91.7% White	NR	NR	DSM-5 Criteria	Emotion Regulation Checklist/ Social Skills Rating System
Wu et al., 2022	China	CS	Cluster random sampling method from schools	1,28	16.09	0.98	44	NR	NR	NR	PVGU	CERQ
Yen et al., 2018	Taiwan	CS	Convenience sampling from advertisements at universities	87	23.29	2.34	80.5	NR	NR	NR	DSM-5 Criteria	ERQ
Zahra et al., 2020	Pakistan	CS	Convenience sampling from universities	315	23.97	6.07	51.1	NR	NR	NR	IGD-20	WLEIS

Note. AICA.30 = checklist for the Assessment of Internet and Computer game Addiction. ALPS = Adolescent Lifestyle Profile Scale. CBCL = Child Behavior Checklist. CER1 = Comprehensive Emotion Regulation Inventory. CERQ = Cognitive Emotion Regulation Questionnaire. CIAS = Chinese Emotional Intelligence Scale. CSAS = Video Game Dependency Scale. DEFS = Difficulties in Emotion Regulation Scale. EKF = Emotional Competence Questionnaire. EQ-i: YV = Emotional Quotient Inventory: Youth Version. ERICA: Emotion Regulation Index for Children and Adolescents. ERQ = Emotion Regulation Questionnaire. GADIS- A = Gaming Disorder Scale for Adolescents. GADIS-P = Gaming Disorder Scale for Parents. GAIA = Game Addiction Inventory for Adults. GAS = Gaming Addiction Scale. GASA = Game Addiction Scale for Adolescents. GSMQ-9 = Gaming and Social Media Questionnaire. IAT-Wow = Internet Addiction Test – Wow Version. ICQ = Interpersonal Competence Questionnaire. IGDS = Internet Gaming Disorder Scale. PSI II = Personal Strengths Inventory II. PTU = Pathological Technology Users. PVGS = Problematic Video Game Scale. PVGU = Pathological Video Game Use Questionnaire. PVP = Problematic Videogame Playing. QSU = Brief Questionnaire of Smoking Urges. TEIQue-SF = Trait Emotional Intelligence Questionnaire-Short Form. TISS = Teenage Inventory of Social Skills. TMMS-24 = Trait Meta Mood Scale. WLEIS = Wong and Law's Emotional Intelligence Scale

Appendix B

Publication Bias Analysis: Results of the Egger's Test

Outcome	<i>k</i>	<i>b</i> ₀	95% CI		<i>t</i>	<i>df</i>	<i>p</i>
			LL	UL			
Any measure of ER	36	−0.231	−0.342	−0.121	−0.227	34	0.822
DEERS							
Total score	18	0.318	0.130	0.206	−0.119	16	0.907
Nonacceptance	13	0.205	0.010	0.401	−0.012	11	0.991
(Lack of) Goals	12	0.220	0.028	0.413	−0.334	10	0.745
Impulse	10	0.337	0.081	0.593	−0.301	8	0.771
(Lack of) Awareness	13	0.004	−0.082	0.090	2.030	11	0.067
(Lack of) Strategies	10	0.341	0.038	0.644	−0.351	8	0.735
(Lack of) Clarity	15	0.244	0.104	0.384	−0.822	13	0.426
CERQ							
Maladaptive cognitive strategies	5	0.203	0.007	0.400	−0.113	3	0.918
Adaptive cognitive strategies	3	0.146	−0.111	0.403	−5.958	1	0.106
ERQ							
Cognitive Reappraisal	3	−0.066	−2.563	2.432	−0.518	1	0.696
Expressive Suppression	3	0.163	−4.479	4.805	0.289	1	0.822
Any measure of SEC	13	0.065	−0.097	0.226	−4.2361	11	0.001
EQ-i:YV							
Total score	4	−0.253	−2.070	1.565	−0.004	2	0.997
Intrapersonal	4	−0.249	−2.090	1.593	0.209	2	0.854
Interpersonal		−0.560	−1.884	0.763	0.858	2	0.481
Adaptability		−0.161	−0.783	0.461	0.712	2	0.550
Stress management	4	0.071	−1.142	1.285	−1.012	2	0.418

Note. ER = Emotional Regulation. DEERS = Difficulties Emotional Regulation Scale. CERQ = Cognitive Emotion Regulation Questionnaire. ERQ = Emotional Regulation Questionnaire. SEC = Social Emotional Competence. EQ-i:YV = Emotional Quotient Inventory: Young Version. *k* = number of independent samples. *b*₀ = intercept. LL and UL = lower and upper limits of the 95% confidence interval for *b*₀. *t* = *t*-test. *df* = degrees of freedom. *p* = *p*-value

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Declarations

Conflict of interest The authors report no conflict of interests.

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Preregistration The review was prospectively registered in the International Prospective Register of Systematic Reviews (PROSPERO; registration number: CRD42023400540).

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Review

Reliability Generalization Meta-Analysis of Internet Gaming Disorder Scale

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Abstract: The objective of this study was to carry out a reliability generalization meta-analysis of the Internet Gaming Disorder Scale (IGDS) to find out if it presents adequate values that justify its application in its four versions: original and abbreviated with dichotomous or ordinal response. A systematic review including 26 studies that apply this instrument from 2015 to June 2022 was conducted. For each version, a reliability generalization meta-analysis was performed with the random coefficients (RC) and varying coefficients (VC) model. Results showed reliability levels > 0.80 in the ordinal versions (IGDS9P and IGDS27P) and in the dichotomous 27-item version (IGDS27D), while the dichotomous 9-item version (IGDS9D) produced levels > 0.70 . High heterogeneity was found in all versions ($I^2 > 95\%$; $R_b > 90\%$). Cronbach's α means with both models (RC-VC) did not differ significantly except for the IGDS9D version. It is concluded that, considering the dependence of the results on sample size, abbreviated versions do not guarantee that reliability remains acceptable, and dichotomous versions may provide limited but acceptable reliability. Finally, IGDS27P version is recommended in contexts where high precision is required.

Keywords: IGDS; internet gaming disorder; meta-analysis; reliability

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1. Introduction

1.1. Literature Review

Since the inclusion of Internet gaming disorder (IGD) in the DSM-5 [1], a set of controversies and opportunities arose for mental health professionals regarding the evaluation and intervention of IGD [2,3]. This incorporation reinforced the development and adaptations of psychometric instruments that evaluate the IGD, presenting a set of proposals based on DSM-5 diagnostic criteria [4].

According to DSM-5, IGD is characterized by a pattern of persistent and recurrent gaming behavior that leads to clinically significant impairment or discomfort over 12 months, in which five or more symptoms are present such as preoccupation with gaming, withdrawal symptoms when not gaming (sadness, anxiety, and irritability), tolerance, inability to reduce or stop gaming, giving up other pleasurable activities, continuing to game despite problems, misleading family or others about the amount gaming time, using gaming to relieve negative moods, and risking or losing a job or relationship over gaming [1]. Although this disorder is labeled “online” due to its association with specific online games, it can also develop with offline games [1] (p. 796). It is also included in the ICD-11 as a “video game disorder” [5].

In a systematic review and meta-analysis of IGD prevalence in 17 countries [6], the worldwide prevalence was estimated to be 3.05%. These rates exceed the prevalence of problem gaming, and are similar to those of some substance use disorders and obsessive-compulsive disorder [6].

IGD usually begins in early adolescence [7,8]. During adolescence, there are higher rates of gaming-related problems compared to older age groups [6,9–11]. Thus, the pooled prevalence of IGD is 4.6% in adolescent samples [12], with higher rates in men (6.8%) than in women (1.3%). Regarding the geographical context, Asia and North America report a higher prevalence of IGD in adolescents (9.9% and 9.4%, respectively), who also present the highest rates of video game use [13].

However, the prevalence of problematic video game use among adults should be considered. In an intergenerational prevalence study [11], IGD rates were compared among 847 Millennials, Generation X'ers, and Baby Boomers from Hong Kong. The prevalence of IGD increased in the younger generations, being a worrying phenomenon both in Millennials (7.4% of the general sample) and in Generation X (1.3% of the general sample).

With the COVID-19 pandemic, there has been an increase in the number of video game users and related phenomena, such as video game streaming [14]. However, cases of Internet gaming disorders have also increased by between 1–2.5% [15]. This highlights the current importance of the comprehensive and intergenerational study of this phenomenon and the development of reliable diagnostic instruments for IGD.

Since the introduction of IGD in the DSM-5, different instruments have been developed for its diagnosis, such as the Internet Gaming Disorder Test-IGD-20 [16], the Questionnaire of Experiences Related to Video Games (CERV) [17], or the Internet Gaming Disorder Scale (IGDS) [9], among others. This study focuses on the IGDS of Lemmens et al. [9] as it provides greater possibilities in terms of response format (dichotomous and polytomous version), extension (27 or 9 items), and multiple adaptations to other languages [18–20].

The IGDS is an instrument based on the nine DSM-5 IGD diagnostic criteria: preoccupation, tolerance, withdrawal, persistence, escape, problems, deception, displacement, and conflict [1]. Since the initial proposal, four variants have been presented: a 27-item scale with a polytomous response or IGDS27P (Likert 0–6), a 27-item scale with dichotomous responses or IGDS27D, a 9-item scale with a polytomous response or IGDS9P (Likert 0–6) and a 9-item scale with a dichotomous response or IGDS9D [9]. The psychometric properties found for all the scales were evaluated in samples of adolescents and young adults, finding high internal consistency in all of them (coefficient α): IGDS27P (>0.94), IGDS27D (>0.93), IGDS9P (>0.95), and IGDS9D (>0.83) [9]. The evidence for validity was acceptable, as well as evidence for content validity [18], internal structure [9,18,19,21], and validity in relation to other variables [9,18,19,22].

Regarding its structure, the unidimensionality of the scale has been reported in some studies [9,18,21] and multidimensional in others [19]. For the diagnosis of gaming disorder, the cut-off point recommended and established by researchers is to present five or more criteria during 12 months, based on the recommendation of the DSM-5 [9]. This criterion, assumed from the DSM-5 (>5), showed high specificity and adequate sensitivity [23]. These authors, assuming this cut-off point, identified three types of players: normal, risk, and disordered [9,21].

However, despite its frequent use, no study reports its average reliability across multiple application studies. The need for a study of these characteristics adds to the fact that some studies report low-reliability values [20,23,24], and therefore, the reliability scores of the instrument may not justify its use. Reliability generalization meta-analyses are used to statistically integrate reliability estimates calculated in different applications of an instrument. In addition, they provide information on how different sample characteristics affect the variation in an instrument's reliability indices [25]. It should be considered that some aspects can increase the variance error, affecting reliability. Some authors highlight the fatigue in the participants [26], the lack of monitoring in massive applications, or the induction of the validity of the instrument [27,28], among others. Quality controls and specifying the conditions of application contribute to the reliability of the instrument scores [29].

Having a meta-analysis of an instrument that presents good reliability is useful both for a good diagnosis and for providing adequate care to users who require it [30]. After

a previous search, no examples of this type of meta-analysis have been found for the IGDS. However, while it was being carried out, a study was detected that included a reliability generalization meta-analysis of the IGDS [31], with which there are substantial differences in the included versions of the IGDS, the meta-analytic models employed, the sample size, and the sample size, and the assessment of heterogeneity. Therefore, this study includes the four main versions of the IGDS, as well as more models and reliability and heterogeneity estimators, and discusses which of the four versions may be more reliable. A more comprehensive differentiation between the two studies is included in Appendix A.

Given that IGD usually begins and develops during adolescence, such a study could benefit clinical practice by providing evidence of the reliability of a diagnostic tool for IGD, as well as promoting the prevention and early treatment of IGD.

1.2. Goal Setting

To carry out this study, a main research question was posed: does the IGDS in its four versions present adequate reliability values to justify its application? Consequently, the main objective of this study is to carry out a reliability generalization meta-analysis to estimate the internal consistency of the IGDS in order to know whether it presents adequate values that justify its application in all its versions. Likewise, it is intended to analyze whether the reliability indices are affected by the characteristics of the studies. It was hypothesized that the IGDS, in its four versions, would continue to be an instrument with good internal consistency reliability.

2. Materials and Methods

2.1. Information Sources

After not identifying a systematic review or meta-analysis similar to the one proposed, a systematic review was carried out following the PRISMA 2020 method [32] in the Web of Science (WoS, Main Collection), PsycInfo, Scopus, and Dialnet databases.

2.2. Eligibility Criteria

A protocol was registered in PROSPERO, with the identification code CRD42022330840. For screening, the following inclusion criteria were proposed: (a) original empirical studies that apply the IGDS, (b) include the IGDS in the original or translated language, (c) include the IGDS in the original or reduced version, (d) validations and adaptations of the IGDS, and (e) report the reliability of the instrument using Cronbach's α or another indicator. It was not considered to limit the search to the type of sample, since the instrument has been adapted to different populations. Likewise, those studies that met any of the following exclusion criteria were discarded: (a) not using the IGDS and (b) book chapters or books.

2.3. Search Strategy

First, manuscripts using IGDS instrument [9] were identified in three iterations. The search was carried out in July 2021 and was updated in June 2022. This process was carried out by one of the authors and corroborated by another through the Covidence tool.

2.3.1. First Iteration

The first search was performed on the Web of Science (WoS Main Collection), PsycInfo, Scopus, and Dialnet databases. On all bases, the term "Internet Gaming Disorder Scale" was introduced to include all those works that contained said instrument. Given the generality of the search profile, the results were refined by including only the works between 2015 and June 2022, both inclusive, and written in English and Spanish.

The search was limited to the field of psychology. In the WoS database, the search was limited to the categories "social sciences", "psychology", "applied psychology", "clinical psychology", "developmental psychology", "experimental psychology", "multidisciplinary psychology", and "psychology Social". In Scopus, the fields of study "psychology" and

“social sciences” were selected. In Dialnet, it was not limited by the field of study. At PsycInfo, the field of study was also not limited by being a psychology database.

2.3.2. Second Iteration

The second search was manual, reviewing the references of the studies found in the first search.

2.3.3. Third Iteration

A second manual search was performed in Google Scholar to expand the sample.

2.4. Selection of Studies

Once duplicates were eliminated with RefWorks bibliographic manager, the Covidence Software was used to carry out a blind peer review by title and abstract, and full text, following the eligibility criteria. In longitudinal studies or those that included more than one measurement performed on the same subjects, the first study was selected, or in its exception, the first that reported a reliability coefficient. In contrast, studies using more than one sample and their reliability values were considered independent samples.

2.5. Data Extraction

The reliability coefficient of the selected studies (α , McDonald’s omega (ω), or test-retest) was manually extracted. Both reported (i.e., the study’s coefficient) and induced reliability values were considered. In this scale, the use of the single score or total α (although there are several specific dimensions) is indicated and was used for the correlations of the original study. Therefore, no study reports the reliability of the 9 dimensions of the scale.

Regarding the induced reliability, it was subdivided into three categories: omitted, vague, and precise [33]. It was considered omitted when no reliability coefficient was reported in the study, vague when “good” reliability was expressed by citing other previous studies, and precise when the exact value of a previous study was reported.

From the studies with reported reliability values, information was extracted regarding the year of publication, version of the IGDS, the language of the IGDS, country of application, application method, sample size, general characteristics of the sample, and classification of the gamers in the sample (include only players or players and non-players), mean age, mean IGDS scores and standard deviation, percentage of women in the sample, mean weekly gaming hours, data collection method, adjustment indices, use of test-retest, presence of statistical validation of the IGDS, and percentage IGD+ in the sample. Data extraction was performed with Covidence and Microsoft Excel.

2.6. Analysis

After obtaining the sample, a reliability generalization meta-analysis was performed for each version of the IGDS following the recommendations of the REGEMA checklist (Appendix B).

2.6.1. Description and Evaluation of α Coefficients

The adequacy of the reliability in each study, and the mean α coefficient, were evaluated by comparing their confidence intervals (95%) obtained against a null value [34]. This null value was established in two values of the coefficient α : 0.70 and 0.80. These values were chosen because they are usually minimum criteria to generically determine the appropriateness of a reliability coefficient [35].

2.6.2. Modeling

Due to the characteristics of the study that could influence the conclusions (i.e., inter-study and intra-study heterogeneity, and the size of the selected studies), the modeling decision was oriented towards two approaches: random coefficients (RC model) [36] and variant coefficients (VC model) [37].

Random coefficients model. There are several contextual factors (e.g., a large number of measures applied to an examinee, evaluation monitored by an examiner or without monitoring, etc.), individual variables (e.g., mood, motivation, effort, personality attributes, etc.), data quality (e.g., multivariate outliers, response trends, etc.), and the interaction between them, which can produce variability in the estimation of the reliability of the obtained score [38,39]. Thus, the first model for meta-analyzing the α coefficients of the IGDS was random effects (RC) [36]. RC has several underlying assumptions: first, the estimates obtained vary from study to study, due to actual differences between studies, and due to sampling variation. Second, the study sample came from a random selection from a normally distributed population of α coefficients, which implies that this is an overpopulation. Third, to generalize the results to future studies not similar to this study, the RC model is generally accepted as the recommended option, and is one of the preferred goals of research [40].

For the estimation of the amount of variance between studies (τ^2) [41], the restricted maximum likelihood (REML) method [42] was implemented, with the Knapp–Hartung modification [43] was applied to the statistical test of variability (Q) [44], τ^2 , and confidence intervals. This method is based on the Student's *t*-distribution and tends to provide more robust estimates under various data conditions [45]. The measures of heterogeneity of the selected studies were: (a) the statistical test *Q* [44], with the significance level set at 0.10 [46], and (b) estimators of the size of heterogeneity: I^2 [47], R_b [48], and CV_b and CV_w [48] as measures of between-study and intra-study variability, respectively [48].

Due to the potential bias produced in the estimation of I^2 in meta-analyses with a small number of studies [49], its interpretation mainly used its confidence intervals. Two qualitative criteria used to interpret I^2 were: The first, by Deeks et al. [50] and Higgins et al. [47]: $<I^2 = 40\%$ ("could be small"), $I^2 = 30\text{--}60\%$ ("could be moderate"), $I^2 = 50\text{--}90\%$ ("could be moderate"), and $I^2 = 75\text{--}100\%$ ("could be substantial"). The second, by Higgins et al. [51]: $I^2 < 25\%$ (trivial), $I^2 \geq 25\%$ (minor), $I^2 \geq 50\%$ (moderate), and $I^2 \geq 75\%$ (substantial).

According to the recommendation of Sánchez-Meca et al. [52] and Romano et al. [53], under the RC model, the α coefficients were transformed with the Bonett method [54], $L_i = Ln(1 - \alpha)$, and their sampling variance [54] was obtained with: $V_i = \frac{2J}{(J-1)(n_i-2)}$, in which *J*: number of items and n_i : sample size of the study. On the other hand, the weighting of the studies to obtain the α_{mean} was conducted with the general approach of creating weights based on the inverse of the variance [55]. To assess the independence between the size (i.e., number of participants) and the α coefficient of the studies [37,56], both parameters were correlated. Respectively, for IGDS9D, IGDS9P, IGDS27D, and IGDS27P, the following was obtained: $r = 0.149$ ($p = 0.53$), $r = -0.213$ ($p = 0.78$), $r = 0.382$ ($p = 0.61$), and $r = -0.793$ ($p = 0.108$). According to the lack of statistical significance, the weights could be applied with little apparent risk of bias in the estimation of the α_{mean} in the IGDS9D, IGDS9P, and IGDS27D, but the interpretation of the results requires caution in IGDS27P due to the size of the correlation.

Varying coefficients model. Although meta-analytic research usually uses the RC model, the analysis was also conducted with the varying coefficients (VC) model [37]. This model was chosen due to: (a) the unlikely fulfillment of the assumption of normality of the hypothetical population of α coefficients, (b) the actual absence of random selection of manuscripts, and (c) the small number of selected studies (i.e., less than 6 in IGDS9P, IGDS27D, and IGDS27P). These are conditions that make it difficult to justify the RC model, particularly when the identification of a well-defined population of studies is problematic [37]. Specifically, in our study, variability is observed in multiple factors of the sample. Firstly, there are differences in gamer conceptualization. On the one hand,

some studies define a gamer according to a minimum game frequency (e.g., playing at least once a month [9,21,57–61]), while others only consider as gamers those who currently play [18–20,24,62–67]. On the other hand, some studies did not specify what they considered as a gamer, since in most of these cases the diagnosis of IGD was not their main objective [15,20,68–74]. Differences are also observed in terms of the characteristics of the samples, sometimes including players and non-players or exclusively gamers. In some studies, game intensity (hours and days of game), gamer profiles (players for fun, amateur, professionals, etc.), and video game genre (e.g., MMORPG) were considered. Methodological variability was also observed. Finally, both the size and age groups of the study samples are variable, ranging from 204 to 2078 participants, including adolescents, young adults, adults, and the general community. Consequently, heterogeneity is present in different combinations of the aforementioned variables.

VC model is an appropriate approach when the number of meta-analyzed studies is small (<30) [52], when strong heterogeneity is present (in the Results section, this is observed), and when there was no randomized extraction of studies [75]. In contrast to the RC model, the generalizability of the VC results is oriented to a population of studies similar to those that were selected [52]. VC does not assume compliance with the common assumptions of fixed effects and random coefficient methods [76]. In the VC method, the log-transformation is applied to α_{mean} ($\ln [1 - \alpha_{\text{mean}}]$) [37] to stabilize the variance [54], and the studies are not weighted to obtain the mean meta-analytics.

2.6.3. Sources of Heterogeneity

Due to the small number of studies analyzed (<25), the identification of sources of heterogeneity in the IGDS with the largest number of meta-analyzed studies (i.e., IGDS9D, n studies = 20) was explored with K-means cluster analysis, within a dependency *cluster-covariate analysis* [77]. Accordingly, (a) strictly exploratory clusters were identified with the K-means procedure, and (b) these clusters were compared with the existing natural clusters in the studies. This comparison was made using the χ^2 independence test, and the Cramer-V effect size estimator. The similarity found in this comparison would suggest the substantive interpretation of these new groupings and avoid random capitalizing. The descriptive variables were: the language of the scale (original and English dichotomous classification), mode of application, age characteristics of the sample (adolescents, young people, adults, or general community), and the condition of gamers in the sample (only gamers or mixed samples with gamers and non-gamers) (Appendix C). Differences in mean alpha estimates for each group of studies were estimated using Bonnet's method [37], based on the confidence interval of the differences ($CI \Delta_{\text{diff}}$).

In the versions with smaller number of meta-analyzed studies (i.e., IGDS9P, IGDS27D, and IGDS27P; in all $n < 5$), subgroup identification was performed on a quantitative–qualitative basis, and within *qualitative evidence synthesis* (QES) framework [78]. This was conducted to identify the distinguishing characteristic of the studies that could be associated with the variability of the α_{mean} coefficient. The procedure followed was: (a) quantitative identification of homogeneous groups with K-means cluster analysis, (b) content exploration of the identified groups by K-means analysis (i.e., qualitative examination of the characteristics of their studies from their descriptive variables: instrument language, etc.), (c) assignment of apparent quality that distinguishes these identified groups, and (d) reproducibility evaluation of the three previous steps (independently by one of the authors).

2.6.4. Outliers and Robust Estimation

As part of the heterogeneity assessment, outliers were detected for each study, and the mean α was robustly reestimated excluding them. For each study, its impact on τ^2 was also estimated, using the V_{RATIO} and TAU_{RATIO} statistics [79]; the cut-off point Q (Q_{vratio} and Q_{tauratio}) to identify the strength of the impact of each study ($V_{\text{RATIO}} > Q_{\text{vratio}}$; $TAU_{\text{RATIO}} > Q_{\text{tauratio}}$) was established with 1000 bootstrap samples [79].

Regarding the software used, the following R programs were used: RC modeling with *metafor* [80], VC modeling with *vcmeta* [81], the impact assessment of each study on variability was conducted with *boutliers* [79], outlier detection and robust estimation were conducted with the *dmetar* [82], alternative measures of heterogeneity (R_b , CV_b , CV_w) were obtained with the R *hetmeta* [48], and K-means cluster analysis with R *stats* [83].

3. Results

3.1. Results of the Study Selection Process

The identification, screening, and selection process carried out according to PRISMA 2020 [32] is detailed in Figure 1.

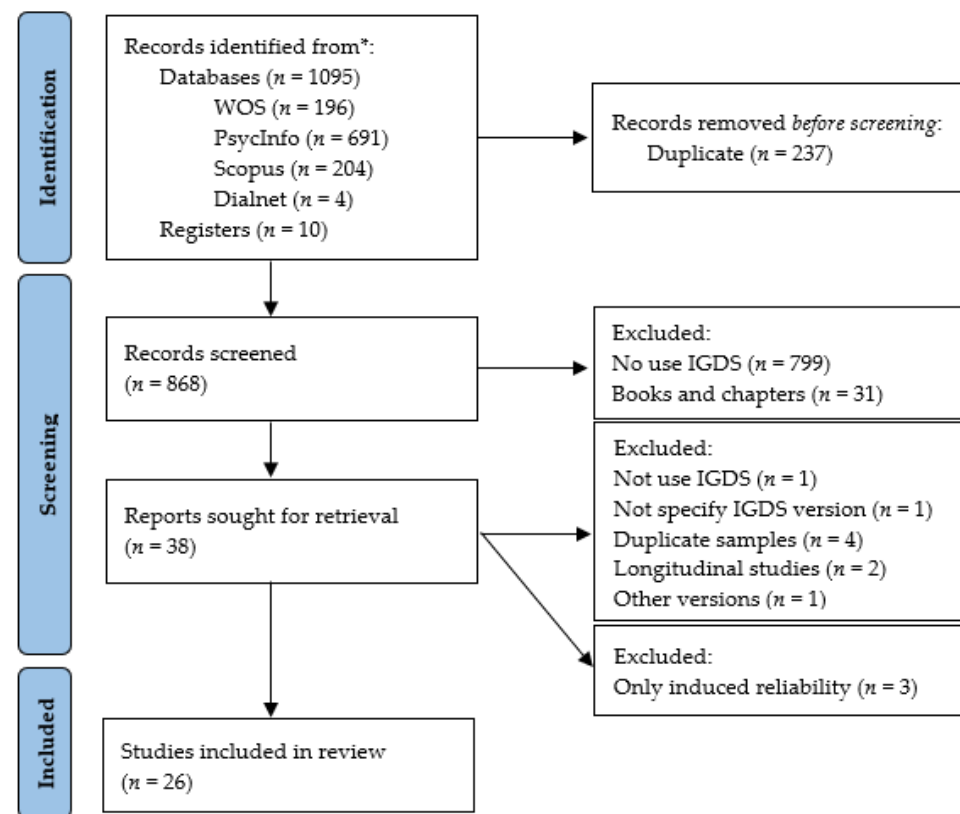


Figure 1. Flowchart of the selection and screening process of the systematic review articles according to the PRISMA 2020 statement.

First, using the database tools, a total of 1095 articles were identified, including 204 from Scopus, 196 from WoS, 691 from PsycInfo, and 4 from Dialnet. Additionally, 10 articles were identified in a second ($n = 3$) and third ($n = 7$) iteration. After removing duplicates ($n = 237$), the remaining 868 articles were screened for eligibility criteria. In total, 38 articles were selected to read the full text. Nine articles were excluded: for not administering the instrument ($n = 1$), for not specifying IGDS version ($n = 1$), for administering a version whose answers are provided by third parties ($n = 1$), second measures from longitudinal studies ($n = 2$), and by using repeated samples ($n = 4$). Of the 29 studies, 3 studies only include induced reliability values (omitted ($n = 2$) and precise ($n = 1$)). Only articles that reported reliability ($n = 26$) were included for the meta-analysis. These studies were divided according to the version of the IGDS administered. As mentioned, the studies that presented several independent samples that reported the reliability values and the N of each one of them were coded as independent samples. The distribution was as follows: IGDS27P ($n = 5$), IGDS27D ($n = 4$), IGDS9P ($n = 4$), and IGDS9D ($n = 20$) (Appendix C).

3.2. Description and Evaluation of the Level

Results are presented in Table 1. Regarding IGDS9D, 60% ($n = 12$) of the studies produced an alpha coefficient > 0.70 , while the rest were below this level (20%, $n = 4$) or had an inconclusive result (20%, $n = 4$), because the confidence interval of the difference includes zero. Meanwhile, less than half of the studies produced coefficients > 0.80 . Regarding IGDS9P and IGDS27P, all random-effects coefficients > 0.80 . Finally, IGDS27D was predominantly > 0.80 .

Table 1. Characteristics of the reliability levels of the articles included in the meta-analysis.

	N	α	se	95% CI α		Levels		Impact on Variability			
				LI	UL	>0.70	>0.80	V_{RATIO}	Q_{ratio}	TAU_{RATIO}	Q_{tauratio}
IGDS9D	18,828										
Study 1	989	0.830	0.00	0.814	0.845	Y	Y	10.07 *	0.87	10.02 *	0.82
Study 2	394	0.850	0.00	0.826	0.871	Y	Y	10.04 *	0.88	0.99 *	0.83
Study 3	1020	0.820	0.01	0.803	0.836	Y	Y	10.08 *	0.89	10.03 *	0.84
Study 4	204	0.610	0.00	0.523	0.684	N	N	0.92	0.92	0.88	0.88
Study 5	708	0.810	0.04	0.788	0.830	Y	NC	1.09 *	0.88	1.04 *	0.83
Study 6	354	0.740	0.01	0.697	0.778	NC	N	1.10 *	0.88	1.05 *	0.83
Study 7	538	0.730	0.02	0.694	0.763	NC	N	1.09 *	0.89	1.04 *	0.84
Study 8	257	0.820	0.01	0.784	0.851	Y	NC	1.08 *	0.88	1.03 *	0.83
Study 9	310	0.840	0.01	0.811	0.865	Y	Y	1.06 *	0.89	1.00 *	0.84
Study 10	855	0.810	0.01	0.790	0.828	Y	NC	1.09 *	0.89	1.04 *	0.83
Study 11	1306	0.690	0.01	0.664	0.714	NC	N	1.04 *	0.89	0.99 *	0.84
Study 12	351	0.810	0.01	0.778	0.838	Y	NC	1.09 *	0.90	1.04 *	0.84
Study 13	1001	0.660	0.01	0.627	0.691	N	N	0.98 *	0.90	0.93 *	0.84
Study 14	1081	0.790	0.01	0.771	0.808	Y	NC	1.11 *	0.86	1.05 *	0.81
Study 15	2078	0.740	0.01	0.723	0.756	N	N	1.10 *	0.88	1.05 *	0.83
Study 16	1121	0.830	0.00	0.815	0.844	Y	Y	1.07 *	0.86	1.02 *	0.81
Study 17	3938	0.840	0.00	0.832	0.847	Y	Y	1.06 *	0.88	1.00 *	0.82
Study 18	762	0.780	0.00	0.756	0.803	Y	N	1.11 *	0.87	1.06 *	0.81
Study 19	777	0.720	0.01	0.689	0.748	NC	N	1.09 *	0.88	1.03 *	0.83
Study 20	784	0.560	0.01	0.512	0.604	N	N	0.68	0.90	0.63	0.85
IGDS9P	2787										
Study 1	923	0.95	0.002	0.945	0.955	Y	Y	1.09 *	0.26	0.81	0.26
Study 2	457	0.93	0.005	0.920	0.939	Y	Y	1.73 *	0.21	0.45	0.21
Study 9	1029	0.85	0.007	0.836	0.863 *	Y	Y	0.61 *	0.25	1.30	0.25
Study 18	378	0.89	0.009	0.872	0.906	Y	Y	1.87 *	0.21	1.42	0.21
IGDS27D	2919										
Study 1	989	0.93	0.003	0.9234	0.936	Y	Y	1.64 **	0.27	1.23 *	0.17
Study 14	1026	0.90	0.004	0.8908	0.908	Y	Y	2.02 *	0.17	1.52 *	0.11
Study 16	423	0.93	0.004	0.9198	0.939	Y	Y	1.64 *	0.18	1.23 *	0.10
Study 26	481	0.81	0.012	0.7842	0.833 *	Y	NC	0.12	0.22	0.09	0.15
IGDS27P	2454										
Study 1	923	0.95	0.001	0.95	0.96	Y	Y	0.31	0.64	0.20	0.49
Study 2	457	0.94	0.002	0.93	0.94	Y	Y	1.03 *	0.64	0.80 *	0.49
Study 5	315	0.97	0.002	0.96	0.97	Y	Y	1.63 *	0.78	1.33 *	0.60
Study 13	272	0.96	0.003	0.95	0.96	Y	Y	1.62 *	0.78	1.32 *	0.60
Study 19	487	0.96	0.003	0.95	0.96	Y	Y	1.64 *	0.64	1.33 *	0.49

α : Cronbach's α reliability; n: sample size; se: standard error; >0.70 , >0.80 : Levels for qualify α (Y = yes; N = no; NC = non conclusive); V_{RATIO} y TAU_{RATIO} : impact indexes of each study, on the variability of α_{mean} ; Q_{ratio} , Q_{tauratio} : cutoff points for V_{RATIO} y TAU_{RATIO} (1000 bootstrap samples). * $p < 0.05$. ** $p < 0.01$.

3.3. Random-Effects Model

3.3.1. Mean Reliability

The size distribution of each study ranged from 204 to 3938 ($M = 941.1$, $Md = 780$). Based on 20 studies ($n_{\text{total}} = 20$) for IGDS9D, the mean reliability was higher than 0.70. In contrast, the mean point estimates for the remaining versions IGDS9P ($n_{\text{total}} = 4$), IGDS27D ($n_{\text{total}} = 4$), and IGDS27P ($n_{\text{total}} = 5$) were found to be higher than 0.90. In the population

variability range (95% CI), the coefficients varied between approximately 0.75 and 0.97, higher than 0.70. The prediction intervals for IGDS9D, IGDS9P, and IGDS27D, placed the mean reliability at low levels, except for the mean reliability of IGDS27P, in which the predictivity of the mean coefficient is above 0.90.

3.3.2. Robust Estimate

Outliers were only detected in the IGDS9D studies, specifically nine studies [9,15,20,23,24,59,64,65,69]. With the remaining 11 studies [18,20,61–63,68,71,73,74], the α_{mean} was 0.781 (se = 0.05), 95% CI = 0.758, 0.802 (95% PI: 695, 843). The heterogeneity of this robust estimate was statistically significant ($Q = 101.49$, $df = 11$, $p < 0.001$), and, also, had a high $I^2 = 89.9\%$ (95% CI = 78.8%, 96.8%), even with high intra-studies ($CV_W = 0.603$) compared with between-study variability ($CV_b = 0.106$, 95% CI = 0.106, 0.108).

3.4. Varying Coefficients Model

3.4.1. Heterogeneity Estimation

The smallest part of the heterogeneity came from random variation ($<0.10\%$), while the strong degree of between-study heterogeneity ($I^2 > 95\%$; $R_b > 90\%$) was predominant in the analysis of all IGDS versions. Between-study variability (CV_b) was trivial in the IGDS27P studies, and was similar in the rest of the IGDS versions (CV_b between 0.189 and 0.206), while the variability from intra-study differences was strong in the IGDS9D, compared to the rest (CV_W between 0.383 and 0.473) (Table 2).

Table 2. Meta-analytical estimates.

		α_+	95% CI		Heterogeneity					
K			Confidence LL, UL	Prediction LL, UL	Q (df)	τ (τ^2)	I ² (CI 95%)	R _b (CI 95%)	CV _b (CI 95%)	CV _w
Random coefficients model										
IGDS9D	20	0.775	0.74, 0.80	0.56, 0.88	726.40 ** (11)	0.307 (0.094)	97.43 (95.5, 98.8)	96.1 (96.2, 96.4)	0.206 (0.20, 0.20)	0.864
IGDS9P	4	0.912	0.81, 0.95	0.51, 0.98	279.53 ** (3)	0.488 (0.233)	98.55 (95.4, 99.8)	98.4 (98.3, 98.4)	0.198 (0.19, 0.20)	0.408
IGDS27D	4	0.908	0.79, 0.95	0.48, 0.98	174.98 ** (3)	0.465 (0.217)	98.63 (95.7, 99.9)	98.5 (98.3, 98.6)	0.201 (0.19, 0.20)	0.383
IGDS27P	5	0.958	0.943, 0.969	0.913, 0.980	79.41 ** (4)	0.244 (0.05)	92.99 (80.6, 99.1)	92.2 (93.1, 93.5)	0.07 (0.07, 0.07)	0.473
Varying coefficients model										
	K	α_+	Confidence LL, UL							
IGDS9D	20	0.764	0.755, 0.775	-	-	-	-	-	-	-
IGDS9P	4	0.905	0.889, 0.991	-	-	-	-	-	-	-
IGDS27D	4	0.892	0.885, 0.899							
IGDS27P	5	0.958	0.955, 0.960							

k: number of studies; GF: k–1 degrees of freedom; LL, UL: lower and upper limits; α_+ : mean coefficient α ; τ^2 : between-studies variance estimated using restricted maximum likelihood. ** $p < 0.01$.

3.4.2. Exploratory Analysis

IGDS9D. In the cluster–covariate analysis [77], two exploratory solutions were identified in the IGDS9D (Table 3), one of three groups (three Clusters: group 1 = 6 studies, group 2 = 2 studies, group 3 = 12 studies), and another of two groups (two clusters: group 1 = 12 studies, group 2 = 8 studies). The χ^2 independence test did not reject the null inde-

pendence hypothesis between these two solutions and the existing groupings in the data (language of the scale, language, mode of application, sample, and gamer condition; see Table 4). These results suggest that the association found (Cramer-V) may be included in the sampling variation. Advancing in a qualitative evidence synthesis (QES) framework [78], regarding the solution of three groups: in cluster 1, 2 articles share samples of young people (under 20 years of age) in which only gamers are included, in cluster 2, all agree on the administration of the IGDS in European languages and online administration, and in cluster 3, no similarities are found. Between clusters, there are no clear differences in the variables studied.

Table 3. Exploratory analysis results.

IGDS9D	Kmeans 1 (n _g = 3)	Kmeans 2 (n _g = 2)
Study 1	3	1
Study 2	3	1
Study 3	3	1
Study 4	1	2
Study 5	3	1
Study 6	2	2
Study 7	2	2
Study 8	3	1
Study 9	3	1
Study 10	3	1
Study 11	2	2
Study 12	3	1
Study 13	2	2
Study 14	3	1
Study 15	2	2
Study 16	3	1
Study 17	3	1
Study 18	3	1
Study 19	2	2
Study 20	1	2
Wc SSC	91.3%	71.8%
IGDS9P	Kmeans 1 (n _g = 2)	
Study 1	1	-
Study 2	2	-
Study 3	1	-
Study 4	1	-
	83.1%	-
IGDS27D	Kmeans 1 (n _g = 2)	
Study 1	2	-
Study 2	2	-
Study 3	2	-
Study 4	1	-
	93.8%	
IGDS27P	Kmeans 1 (n _g = 2)	
Study 1	1	-
Study 2	2	-
Study 3	1	-
Study 4	1	-
	37.5%	-

Table 4. IGDS9D: dependence of cluster–covariable analysis.

	2 Clusters		3 Clusters	
	c^2 (df)	Cramer—V	c^2 (df)	Cramer—V
Language	16.38 ^{NS} (19)	0.373	4.97 ^{NS} (19)	0.343
English language	2.78 ^{NS} (19)	0.187	8.59 ^{NS} (19)	0.296
Application mode	5.87 ^{NS} (19)	0.308	9.28 ^{NS} (19)	0.341
Sample	7.69 ^{NS} (19)	0.334	6.26 ^{NS} (19)	0.268
Gamer condition	4.97 ^{NS} (19)	0.254	8.06 ^{NS} (19)	0.291

NS: not statistically significant ($p > 0.50$); Cramer-V: effect size estimate.

IGDS9P. The minimum interpretable solution was two groups (see Table 3). Qualitative analysis of the similarity between this clustering and the study characteristics suggested that cluster 1 were similar in including general population, with similar mean ages, and gamer-only samples (although the report of the Lei et al. [19] study is missing). The difference in α coefficient between the cluster 1 studies (study 1 and 2; α mean = 0.94), with the cluster 2 (study 9 and 18; α mean = 0.87) can be established as statistically significant, but also as small ($\Delta\alpha = 0.07$; 95% CI $\Delta_{\text{diff}} = 0.05, 0.08$), because the range of the difference (95% CI Δ_{diff}) was small and close to 0.0.

IGDS27D. The minimum interpretable solution was two unbalanced groups (see Table 3). Qualitative analysis of the similarity between this grouping and the characteristics of the studies suggested that the studies of cluster 1 only include gamers in their samples, compared to the study of cluster 2, which has a mixed sample. However, the difference in α coefficient between the study identified as cluster 2 (study 4, $\alpha = 0.81$) and the rest of the three studies (α mean = 0.92), can be established as trivial, ($\Delta\alpha = -0.11$, 95% CI $\Delta_{\text{diff}} = -0.13, -0.08$).

IGDS27P. The minimum interpretable solution was two unbalanced groups (see Table 3). Qualitative analysis suggested that the only difference between both groups was the presence of gamers and non-gamers in the sample of the second study. However, the difference in the α coefficient between the study identified as the only member of its group (study 2, $\alpha = 0.97$), with the rest of the three studies (α mean = 0.95) can be established as trivial, ($\Delta\alpha = -0.01$, 95% CI $\Delta_{\text{diff}} = -0.01, -0.00$).

4. Discussion

The objective of this study is to perform a reliability generalization meta-analysis of the IGDS. For this purpose, the internal consistency values of the IGDS in different samples are analyzed, and possible causes of the observed variations are examined [84].

The appropriateness of the alpha coefficients of the retrieved studies depended on instrument length (number of items) and response scaling (i.e., dichotomous and polytomous); both structural characteristics had a clear influence, as all versions of the IGDS using ordinal scaling (IGDS9P and IGDS27P) or the long version with 27 dichotomous items (IGDS27D), almost entirely produced scores with reliabilities >0.80 . In contrast, the short version with dichotomous items (IGDS9D) produced levels <0.70 .

Two major issues to be elaborated in this discussion can be drawn. Ordinal scales and the larger number of items can be taken into account when choosing the IGDS version. In terms of brevity, the IGDS9P may be the recommended version. In a first look at the influence that each study had on the overall estimation of the degree of heterogeneity of the studies (with V_{RATIO} and $\text{TAU}_{\text{RATIO}}$) [79], almost all individual studies potentially produced non-negligible changes in the α -mean heterogeneity of each version (Table 1). In the versions with few meta-analyzed studies (IGDS9P, IGDS27D, and IGDS27P), there was an apparent hypersensitivity and consequent Type I error. The studies detected as a source of statistically important impact subsequently showed trivial differences with the rest of the coefficients compared.

Regarding the α coefficient meta-analysis, the point estimates of the mean α produced by the VC and RC model were not substantially different, except for the IGDS9D version (α mean = 0.775; 95% CI = 0.74, 0.80). The rest of versions can achieve a level of accuracy

of the scores that is usually considered optimal for group description purposes and basic research [35,85].

In both RC and VC models, IGDS27P was shown to be exceptionally high (lower CI limit > 0.93), while the most widely used version, IGDS9D, remained at an acceptable level (lower CI limit > 0.70), but not optimal compared to the rest of the IGDS versions. One implication of these specific results is that the IGDS27P may be the best option for using highly reliable scores, particularly when the context of IGDS use demands this level of precision, such as the classification of individuals, and the differentiation of individual gamer vs. non-gamer, etc. On the contrary, with both estimated models (i.e., CR and VC), IGDS9D showed acceptable levels of reliability, but they are likely to be unacceptable when high precision in the interpretation of its scores is required, as in clinical practice [25]. Due to the number of meta-analyzed studies ($n_{\text{studies}} = 20$) in the IGDS9D version, this conclusion is relatively reliable and can be taken as a reference.

The prediction intervals (PI) did not set optimal minimum values in future studies using the IGDS9D, IGDS9P, and IGDS27D. Using the lower limit of the PI as a reference, the lowest estimates obtained (IGDS9D = 0.56, IGDS9P = 0.51, and IGDS27D = 0.48) showed that the scores may contain a high proportion of error variance, even at levels where no instrument would be eligible for research and applied use (< 0.60). On the other hand, the upper limit of the PI indicated that the predicted levels can exceed the value 0.85. The best consistently achieved level on this was the IGDS27P, where the error variance was consistently very low. Three implications of these results are that: first, to maintain high and optimal true variance in IGDS scores, the IGDS27P is the best option in the context of high intra-study variability; second, the abbreviated versions of the IGDS (IGDS9D and IGDS9P) do not guarantee that the reliability remains within a range of acceptable use; and third, the dichotomous versions of the IGDS may yield a limited minimum acceptable reliability. Therefore, it is apparent that IGDS27P is the recommended option in a wide range of applications, especially when high precision is required. As a further note here, the confidence intervals generated by RC tended to be wider compared to the CIs generated by VC, a problem intrinsic to the RC model when the number of studies is small [37].

In the robust analysis, the re-estimation of α_{mean} could only be conducted in the IGDS9D, because in the rest of the versions no outliers were detected. The robust α_{mean} obtained was slightly higher ($\alpha_{\text{mean}} = 781$) than the non-robust estimate ($\alpha_{\text{mean}} = 0.775$), as well as the 95% CI was very similar, and therefore both parameters can be considered equivalent. This equivalence may be because the outliers were symmetrically distributed, producing little bias in the estimation [86]. In contrast, the PI was different in the robust analysis (95% PI: 0.695, 843), because the predicted level of the α coefficient indicates an acceptable level of reliability. An implication of this is that the user must consider that the internal consistency of the IGDS9D can be maintained at the level declared in previous paragraphs.

It should be mentioned that the detection of outliers by the method used (i.e., Harter, et al. [82]) did not have an apparent sensitivity in the studies analyzed for IGDS9P, IGDS27D, and IGDS27P, as no outlier studies were detected. This suggested that the heterogeneity detected could not be explained by the presence of studies with extreme alpha coefficients (i.e., outlier studies). Given the strong heterogeneity found, it is likely that the reason for this lack of sensitivity of the method used [82] was the effect of the small number of these studies in each version ($n_{\text{studies}} \leq 5$).

Usual (I^2) and new (R_b) indicators of heterogeneity converged in pointing out that the amount of variability was strong ($> 90\%$), and that an important source seems to come from the intra-study variability (CV_w) compared with the inter-study variability (CV_b). The exploration of the heterogeneity between the studies gave an unclear clue as to the sources of the variability of the alpha coefficients. Qualitative inspection suggested that when the size of meta-analyzed studies is small [78] only some studies were an apparent source of differentiation (i.e., the study by Evren et al. [19] on IGDS9P, Zemestani et al. [67]

in IGDS27D, and Evren et al. [19] in IGDS27P; Table 3), but this was trivial because the differences produced in their α mean coefficients without these studies were of trivial size.

The exploration of the heterogeneity carried out suggests that there are other possible and realistic explanations for the degree of heterogeneity found. These can be attributed to the characteristics of the individual studies, which may be causally linked to the distance of each alpha coefficient from its α mean. Specifically, methodological or artificial heterogeneity [87] may have played an important and not ignorant role in this heterogeneity. The methodological aspects are specifically focused on the quality of the data, and the calibration of the IGDS in each sample. In the first, possible response biases were not explicitly incorporated into the analytical procedures of the selected studies, which requires a set of a priori decisions about their detection or treatment. These have been termed random responses [88], item content-independent responses [89], insufficient effort response [90], or careless response [91].

There is empirical literature that has shown its effects on a long chain of statistical estimates, such as the spurious variability of responses [38,39], the internal structure of the instrument [39,92], and in general, the prevalence of error Type I and Type II [93]. In the study of behavioral addictions mediated by the web platform, this issue is no less critical compared to other areas of research. There is an explicit call to address it as well [94], more so when a small prevalence of C/IE responses can produce non-ignorable changes in quantitative estimates [95], which are unrealistic for the measurement of the construct of interest [92].

Second, in the selected substantive studies, the internal structure of the IGDS was not explicitly verified, resorting to supporting the validity argument using previous results. This is a problem of inducing the validity of the instrument (specifically, its structure or the interpretation of its scores) from background evidence, but without corroborating it with the available data [27,28,96]. Due to the natural variability of samples and application conditions, it does not seem reasonable to expect that the internal structure of an instrument will remain intact, even more so if the instrument contains several items that capitalize on sampling variability and methodological variability. These changes in the instrument may be expressed in different magnitudes of intra-study or between-study factor loadings on the set of items, the presence of correlated residuals between items, or the emergence of a general method factor. This means that even to obtain a valid measure of the reliability of the scores, this corroboration is required [35,97], and as a general rule, it should be resolved even in non-psychometric studies. As part of good reporting practices, it is proposed to check the internal structure of the IGDS and to report the psychometric adjustment obtained.

Modern reliability estimates aim to calculate other coefficients that tend to better represent the structure of the items of a measure, such as the coefficient ω [98] for congeneric one-dimensional measures [99], that is, with variability in factor loads of the items. This reliability measure was hardly calculated in the selected studies with the IGDS, and it is reasonable to conclude that the reliability estimates obtained with the alpha coefficient are the lower bond of the reliability of the scores obtained by omega [98,99]. A practical implication is that the mean reliabilities of the IGDS versions may be higher than those obtained in the present study. How high? It is not possible to give an approximate or precisely answer, due to the high prevalence of induced validity and the consequent lack of knowledge of factor loads. In practice, it may be advisable to report both coefficients, α and ω .

Finally, in comparison with another meta-analysis analyzing the reliability of various instruments [31], the two polytomous versions of the IGDS (IGDS27P and IGDS9P) show higher reliability scores than those found on other similar instruments. This highlights that these versions may be more suitable for the assessment of the IGD.

4.1. Limitations

Firstly, the present study considered that the minimum reasonable evidence to quantitatively addressed the generalization of reliability was the number of studies included (20 in the IGDS9D; between 4 and 5 in the IGDS9P, IGDS27D, and IGDS27P). Although each contributed a substantial number of participants ($n_{\text{participants}} > 2000$), the accumulation of more studies may be required to reach more reliable conclusions about the α_{mean} and sources of heterogeneity. Secondly, the interpretation of the PI can be reliable in the IGDS9D, but with caution in the conclusions of the IGDS9P, IGDS27D, and IGDS27P, due to the small size of the studies included in these three versions. Thirdly, the conclusions about the α_{mean} in each version analyzed must be contextualized by the degree of heterogeneity found, especially in the versions where the number of studies was less than six (i.e., IGDS9P, IGDS27D, and IGDS27P). Adding to this general situation, in our analyzes the number of retrieved studies was small (particularly for the IGDS9P, IGDS27D, and IGDS27P versions), and few studies cannot serve to reliably identify sources of heterogeneity [100]; for this reason, heterogeneity was conducted in an exploratory manner, combining quantitative and qualitative means to maximize the opportunity to recognize these sources. Fourthly, it is possible that, within a general framework of sensitivity, it is necessary to implement new estimators [101], but it is adapted to the study of reliability generalization, or to take advantage of the Bayesian approach [102] in the area of the generalization of the reliability of the IGDS.

4.2. Practical Implications and Future Research

The continuous evolution of video game consumption, the increase in rates of problematic consumption, and the expansion of consumption beyond adolescence highlight the social relevance of the IGD study. Carrying out a reliability generalization meta-analysis of evaluation or diagnostic instruments guides professionals on which scales are more reliable to evaluate a certain construct, as well as in what circumstances [25]. Given that psychological intervention in social settings covers all social sectors (children, adolescents, young adults, etc.), the availability of reliable instruments can be helpful in prevention, diagnosis, evaluation, and psychological intervention, as well as in choosing therapeutic strategies. Therefore, due to the onset and prevalence of IGD in adolescence, the results of this study have implications for clinical practice, confirming the accuracy of the instrument for the early detection and intervention of this disorder. All of this has a direct positive impact on the promotion of well-being in this vital sector and beyond, as well as the promotion of prevention at earlier ages.

On a practical level, after the results are obtained, the IGDS27P is shown to be the most recommendable version for contexts where high reliability is required. However, despite the more frequent use of the IGDS9D, the use of its polytomous version is also recommended when the use of an abbreviated version is required.

For future research, it is proposed to continue with the study of the IGD in different countries with differential video game consumption or to analyze variables that could positively or negatively influence the development of IGD. Moreover, after the sample size is achieved, it would be important to re-perform a meta-analysis to generalize the reliability of the same instrument or even include more instruments measuring this construct, in order to corroborate the results found, as well as to study the psychometric properties of these instruments.

5. Conclusions

The present work carried out a reliability generalization meta-analysis of the IGDS from 2015 to June 2022, considering its four versions, original and abbreviated with dichotomous and polytomous responses. In the meta-analysis, it was observed that a large part of the sample of studies reviewed lacked some data and presented high heterogeneity, which made it difficult to correctly interpret the generalization of its reliability. The results of the study suggested that to achieve high-reliability scores it was advisable to use the

IGDS with ordinal response, for both the 9-item and 27-item versions, the latter being the most appropriate when high precision is required. In contrast, the IGDS9D version had the lowest reliability and could compromise the interpretation of its scores, and was, therefore, the least recommended. These conclusions are dependent, however, on the size of the meta-analyzed studies in each version, and considering that the version with nine dichotomous items was the one with the largest meta-analyzed studies, this conclusion may be more generalizable. Regarding the exploration of heterogeneity, high variability was found, and it was not possible to classify the studies based on the characteristics of the registered data (language of the scale, mode of application, age characteristics of the sample, and status of gamers in the sample). For this reason, a qualitative analysis was carried out that highlighted as a possible cause of variability the use of samples of only gamers in the original and abbreviated polytomous and original dichotomous versions, but this apparent source of differentiation was trivial. Regarding other sources of heterogeneity, the studies did not include information to identify methodological variability (e.g., response bias control, outliers, etc.), which could play an important role in the heterogeneity found. Finally, the need to strengthen adequate reliability reporting practices in primary studies to optimize their reporting is highlighted.

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Appendix A

The main difference between this study and Yoon et al. study [31] is that Yoon et al. focus only on the nine-item dichotomous response version of the IGDS. In our study, the four original versions [9] are analyzed, including the 9-item and 27-item versions with polytomous and dichotomous response.

The election of this instrument by Yoon et al. [31] is based on the results of the systematic review by King et al. [103], in which only the 9-item dichotomous and 27-item dichotomous and polytomous versions [103] were included (p. 4, Table 1). Therefore, not considering the four versions could mean an error in the search, since our sample (made in 2021 and updated in June 2022, consulting Scopus, WoS, PsycInfo, and Dialnet databases) already contains articles that use the not-included version (when the review was conducted in these and other databases by King et al. [103]).

All four versions of the IGDS report adequate reliability values in all four versions according to our systematic search. Although the nine-item dichotomous version is the most widely used in studies, some of them report inadequate reliability values, being the only version in which this occurs.

It should be noted that in our study, gray literature was included due to the small sample size. This fact can be both a strength, because it allows greater generalization of results by having a larger sample, and a weakness if it implies a reduction in quality. In the study by Yoon et al. [31], the quality criterion used was that the journal of publication had peer review, and therefore, we reviewed our gray literature and concluded that it also

met this criterion. All the articles that formed part of the gray literature were published in peer-reviewed journals, thus providing a larger sample and more generalizable results.

Regarding the meta-analytic model used, Yoon et al. [31] used the random effects model while we used two models: the random coefficients model and the varying coefficients model. These two models were employed because the former is the generally accepted and preferred model in research, and the latter was appropriate because of the characteristics of the sample (the unlikely fulfillment of the assumption of normality of the hypothetical population of α coefficients, the actual absence of random selection of the manuscripts, and the small number of the selected studies).

Regarding heterogeneity assessment, in the study by Yoon et al. [31] Tau (τ), Tau-squared (τ^2), and I^2 were reported, whereas this study reported these measures plus the Q-statistic test and estimators of heterogeneity size R_b and CV_b and CV_w .

Regarding the sources of heterogeneity analyzed, Yoon et al. [31] focus on sample type, study location, and instruments for measuring video game addiction. In our study, it is considered the language of the instrument, the mode of application, the type of sample, the total number of sample, and the presence of gamers/non-gamers in the sample. We also include a cluster analysis and a qualitative analysis of the significance of these clusters.

All of this highlights a greater rigor in conducting the meta-analysis and in assessing heterogeneity, as well as in exploring all versions of the IGDS. Thus, this study implies greater depth in the meta-analytic study of reliability with more focused generalizability.

Appendix B

Table A1. Checklist for the corroboration of the meta-analytical report according to the REGEMA.

TITLE	Yes	No	NA
1. Title	X		
ABSTRACT			
2. Abstract	X		
INTRODUCTION			
3. Background	X		
4. Objectives	X		
METHOD			
5. Selection criteria	X		
6. Search strategies	X		
7. Data extraction	X		
8. Reported reliability	X		
9. Estimating the reliability induction and other sources of bias	X		
10. Data extraction of inducing studies	X		
11. Reliability of data extraction	X		
12. Transformation method	X		
13. Statistical model	X		
14. Weighting method	X		
15. Heterogeneity assessment	X		
16. Moderator analyses	X		
17. Additional analyses	X		
18. Software	X		
RESULTS			
19. Results of the study selection process	X		
20. Mean reliability and heterogeneity	X		
21. Moderator analyses	X		
22. Sensitivity analyses	X		
23. Comparison of inducing and reporting studies			X
24. Data set	X		

Table A1. Cont.

TITLE	Yes	No	NA
DISCUSSION			
25. Summary of results	X		
26. Limitations	X		
27. Implications for practice	X		
28. Implications for future research	X		
FUNDING			
29. Funding	X		
PROTOCOL			
30. Protocol	X		

NA: not applicable. Source: Adapted and based on the REGEMA checklist of Sanchez-Meca et al. [104].

Appendix C

Table A2. Characteristics of the selected studies.

No.	Study	Version	Reported Reliability		Study Validity	Method	Reliability	Retest
			Available	Not Avail.				
1	Lemmens et al. (2015) [9]	IGDS9D	X		Empirical	α	0.83	
2	Sioni et al. (2017) [59]	IGDS9D	X		Induced	α	0.85	
3	Wartberg et al. (2017) [61]	IGDS9D	X		Induced	α	0.82	
4	Baiumy et al. (2018) [20]	IGDS9D	X		Induced	α	0.61	
5	Buiza-Aguado et al. (2018) [62]	IGDS9D	X		Induced	ω	0.81	
6	Koning et al. (2018) [71]	IGDS9D	X		Induced	α	0.74	
7	Van Den Eijnden et al. (2018) [73]	IGDS9D	X		Induced	α	0.73	
8	Brooks and Clark (2019) [63]	IGDS9D	X		Induced	α	0.82	
9	Dedeaux (2019) [69]	IGDS9D	X		Induced	α	0.84	
10	Stockdale et al. (2019) [60]	IGDS9D	X		Induced	α	0.81	
11	Grajewski et al. (2020) [64]	IGDS9D	X		Induced	α	0.69	
12	Lei et al. (2020) [18]	IGDS9D	X		Empirical	α	0.81	0.83
13	Wartberg et al. (2020) [24]	IGDS9D	X		Induced	α	0.66	
14	Zendle (2020) [74]	IGDS9D	X		Induced	α	0.79	
15	Booth et al. (2021) [68]	IGDS9D	X		Induced	α	0.74	
16	Liu et al. (2021) [65]	IGDS9D	X		Induced	α	0.83	
17	Oka et al. (2021) [15]	IGDS9D	X		Induced	α	0.84	
18	Paschke et al. (2021) [21]	IGDS9D	X		Empirical	α	0.78	
19	Paschke et al. (2021) [21]	IGDS9D	X		Empirical	α	0.72	
20	Paschke et al. (2021) [21]	IGDS9D	X		Empirical	α	0.56	
1	Lemmens et al. (2015) [9]	IGDS9P	X		Empirical	α	0.95	
2	Evren et al. (2017) [19]	IGDS9P	X		Empirical	α	0.93	0.756
3	Mills et al. (2018)	IGDS9P	X		Induced	α	0.85	
4	Lei et al. (2020) [18]	IGDS9P	X		Empirical	α	0.89	0.84
1	Lemmens et al. (2015) [9]	IGDS27D	X		Empirical	α	0.93	
2	Reyes et al. (2019) [72]	IGDS27D	X		Induced	α	0.9	
3	Ait Daoud (2020) [57]	IGDS27D	X		Induced	α	0.93	
4	Zemestani et al. (2021) [67]	IGDS27D	X		Induced	α	0.81	
1	Lemmens et al. (2015) [9]	IGDS27P	X		Empirical	α	0.94	
2	Evren et al. (2017) [19]	IGDS27P	X		Empirical	α	0.97	0.759
3	Allen and Anderson (2018) [22]	IGDS27P	X		Induced	α	0.96	
4	Gibbons and Bouldin (2019) [70]	IGDS27P	X		Induced	α	0.96	
5	Mills and Allen (2020) [66]	IGDS27P	X		Induced	α	0.96	

Table A3. Characteristics of the selected studies (frequency table).

No.	Study	V	Lang	English Language	Application Mode	N Sample	Sample	Gamer Condition
1	Lemmens et al. (2015) [9]	IGDS9D	Dutch	N	Self-report	989	Gen. Comm	Gamers
2	Sioni et al. (2017) [59]	IGDS9D	English	Y	Self-report	394	Gen. Comm	Gamers
3	Wartberg et al. (2017) [61]	IGDS9D	German	N	Interview	1020	Adolescents	Mixed
4	Baiumy et al. (2018) [20]	IGDS9D	Arabic	N	Self-report	204	Young	Gamers
5	Buiza-Aguado et al. (2018) [62]	IGDS9D	Spanish	N	Self-report	708	Adolescents	Mixed
6	Koning et al. (2018) [71]	IGDS9D	Dutch	N	Self-report	354	Adolescents	NR
7	Van Den Eijnden et al. (2018) [73]	IGDS9D	Dutch	N	Self-report	538	Adolescents	NR
8	Brooks and Clark (2019) [63]	IGDS9D	English	Y	Self-report	257	Gen. Comm	Mixed
9	Dedeaux (2019) [69]	IGDS9D	English	Y	Self-report	310	Gen. Comm	NR
10	Stockdale et al. (2019) [60]	IGDS9D	English	N	Encuesta	855	Adults	Mixed
11	Grajewski et al. (2020) [64]	IGDS9D	Polish	N	Self-report	1306	Gen. Comm	Gamers
12	Lei et al. (2020) [18]	IGDS9D	Chinese	N	Self-report	351	Gen. Comm	NR
13	Wartberg et al. (2020) [24]	IGDS9D	German	N	Interview	1001	Adolescents	Mixed
14	Zendle (2020) [74]	IGDS9D	English	Y	Self-report	1081	Gen. Comm	Mixed
15	Booth et al. (2021) [68]	IGDS9D	English	Y	Self-report	2078	Adults	Mixed
16	Liu et al. (2021) [65]	IGDS9D	Chinese	N	NR	1121	Adolescents	Mixed
17	Oka et al. (2021) [15]	IGDS9D	Japanese	N	Self-report	3938	Gen. Comm	Mixed
18	Paschke et al. (2021) [21]	IGDS9D	German	N	Interview	762	Adolescents	Gamers
19	Paschke et al. (2021) [21]	IGDS9D	German	N	Interview	777	Adolescents	Gamers
20	Paschke et al. (2021) [21]	IGDS9D	German	N	Interview	784	Adolescents	Gamers
1	Lemmens et al. (2015) [9]	IGDS9P	Dutch	N	Self-report	923	Gen. Comm	Gamers
2	Evren et al. (2017) [19]	IGDS9P	Turkish	N	Self-report	457	Young	Mixed
3	Mills et al. (2018)	IGDS9P	English	Y	Self-report	1029	Gen. Comm	Gamers
4	Lei et al. (2020) [18]	IGDS9P	Chinese	N	Self-report	378	Gen. Comm	NR
1	Lemmens et al. (2015) [9]	IGDS27D	Dutch	N	Self-report	989	Gen. Comm	Gamers
2	Reyes et al. (2019) [72]	IGDS27D	NR	NR	Self-report	1026	Gen. Comm	Gamers
3	Ait Daoud (2020) [57]	IGDS27D	English	Y	Self-report	423	Gen. Comm	Gamers
4	Zemestani et al. (2021) [67]	IGDS27D	Persian	N	Self-report	481	Gen. Comm	Mixed
1	Lemmens et al. (2015) [9]	IGDS27P	Dutch	N	Self-report	923	Gen. Comm	Gamers
2	Evren et al. (2017) [19]	IGDS27P	Turkish	N	Self-report	457	Young	Mixed
3	Allen and Anderson (2018) [22]	IGDS27P	English	Y	Self-report	315	Young	Gamers
4	Gibbons and Bouldin (2019) [70]	IGDS27P	English	Y	Self-report	272	Young	NR
5	Mills and Allen (2020) [66]	IGDS27P	English	Y	Self-report	487	Gen. Comm	Gamers

N: no; Y: yes; NR: not reported; V: version; Lang: language; Gen. Comm.: general community.

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Gender differences in internet gaming among university students: a discriminant analysis

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Introduction: Research on gaming and gaming habits has predominantly focused on younger populations, particularly males. The main objective of this study was to analyze gender-based differences in gamer profiles, considering variables related to gaming habits and the gaming community.

Methods: A total of 180 Spanish university students currently engaged in video gaming ($M = 21.51$ years, $SD = 3.09$, 57.4% male) participated in the study by completing an online questionnaire addressing gaming characteristics such as the age of onset, gaming hours, motives of gaming, and perceived toxicity in the video gaming community.

Results: The results revealed statistically significant gender differences in the age of gaming initiation, weekly gaming hours, community toxicity, and several gaming motivations, including customization, cognitive challenge, violent gratification, and social interaction. Linear discriminant analysis identified that higher scores in the age of initiation and customization, along with lower scores in violent gratification and community toxicity, formed the combination of predictor variables that most strongly distinguished between genders.

Conclusion: Understanding these gender differences is essential for capturing current gaming trends and addressing the needs of diverse gamers. Finally, the potential clinical implications of these findings are discussed.

KEYWORDS

gaming, gender differences, gaming motivations, toxicity, higher education, educational innovation

Introduction

Historically, video gaming and males have been closely associated. Video games are interactive digital experiences that immerse players in virtual environments through gameplay mechanics, often centered around challenges, goals, and competition (Jenkins, 2009). These games are available on various platforms, including consoles, computers, and mobile devices, and span a wide range of genres, from action and adventure to simulation and role-playing. Despite this diversity, video gaming has traditionally been male-dominated. Professional esports players are overwhelmingly male (Paaßen et al., 2017), and the video game industry comprises mainly male developers (Kuss and Griffiths, 2012). In the early days of gaming, men created many games for a predominantly male audience (Lopez-Fernandez et al., 2019), which fostered a male-centric gaming culture. This culture has often overshadowed the presence of female gamers, even though women now represent 45% of gamers in Western markets (Entertainment Software Association, 2018).

Despite significant progress in promoting inclusivity and diversity within video games, persistent stereotypes and gender-related perceptions continue to affect the gaming community. Female gamers are often influenced by gaming-related stigmas that shape their self-perception. Some video game content still features the excessive sexualization and objectification of female characters, which can contribute to a hostile environment for women (Lopez-Fernandez et al., 2019; Lynch et al., 2016). As a result, female gamers frequently experience sexism, harassment, gender-based violence, and objectification (Belskie et al., 2023; Kuss et al., 2022). This stereotypical culture impedes the recognition of women as legitimate and skilled gamers (Vermeulen et al., 2017), limiting their ability to identify fully with the gaming community (Vermeulen et al., 2017; Lopez-Fernandez et al., 2019). Consequently, many women struggle to see themselves as gamers. Only 35% of women identify as gamers, compared to 51% of men (Le Ngoc, 2022).

Given video games' male-centric design and the persistence of gender stigma, gender-related differences in gaming patterns are to be expected. This situation raises important questions about how gender influences game selection, the gaming experience, and the potential psychological effects of these differences.

Several studies have investigated the variables related to gaming preferences among male and female gamers. Research consistently shows that males tend to exhibit higher levels of engagement, resulting in differences in gaming frequency between genders. For example, Miezah et al. (2020) reported that males averaged 14.18 h of gaming per week, compared to 8.88 h for females. Similarly, van Rooij et al. (2014) found that males spent 15 h per week playing online video games, while females averaged 7 h. Homer et al. (2012) reported even more significant disparities, with males gaming for 43 h per week compared to 30 h for females and daily gaming durations of 6 versus 4 h, respectively. Although higher video game consumption is often linked to earlier initiation of gaming (Nakayama et al., 2020), studies specifically examining gender-based differences in this area remain limited.

Similarly, prevalence rates of Internet gaming disorder (IGD) differ by gender (Kuss et al., 2022). Stevens et al. (2021) conducted a meta-analysis of 53 studies published between 2009 and 2019. Their analysis revealed significant gender differences, with a male-to-female ratio 2.5:1 across 31 studies. Only 3 of these 31 studies (9.6%) reported a higher prevalence of IGD among females.

Research on gender preferences in video game genres (Wohn et al., 2020) has shown that female gamers participate in various genres (Lopez-Fernandez et al., 2019; Hassan et al., 2019; Lewis and Griffiths, 2011). However, the findings are mixed, with some studies suggesting that women tend to gravitate toward less aggressive or competitive games than men (Lange et al., 2021; López-Fernández et al., 2020; Phan et al., 2012). This discrepancy may stem from the addictive nature of competitive games and the sometimes toxic behavior within their communities. In competitive gaming, the use of verbal communication can expose players, especially women, to harassment and toxicity (Belskie et al., 2023; Bopp et al., 2022). As a result, many women choose not to identify as gamers, conceal their gender while playing, or avoid social and online games altogether, potentially missing out on the social and psychological benefits that gaming can offer (Kuss et al., 2022).

Players' motivations for gaming differ by gender, as highlighted in a systematic review by Martucci et al. (2023). The review found that male players are more likely to engage in gaming for competitive

reasons, while female players tend to use games for social and relational purposes. Interestingly, these motivations also vary by region. In Europe, women are more inclined to play for competition and to showcase their skills (Lewis and Griffiths, 2011; Laconi et al., 2017), whereas men often turn to gaming as a coping mechanism or to achieve success. In contrast, studies involving Spanish participants suggest that women's primary motivation is to have fun (Labrador et al., 2022). In Asia, research indicates that women are more drawn to gaming for social interactions, while men play to pass the time. Meanwhile, in the United States, women are more likely to game for achievement, empowerment, fun, or to strengthen social relationships (Lopez-Fernandez et al., 2019).

In conclusion, few studies have thoroughly analyzed female gaming behavior, leading to mixed findings (Lopez-Fernandez et al., 2019; Kuss et al., 2022; Vermeulen et al., 2017; Lopez-Fernandez et al., 2019; Labrador et al., 2022; McLean and Griffiths, 2019). Given the disparities observed in recent research, a more comprehensive investigation into gender differences among gamers is essential.

The discrepancies identified in previous research may result from various methodological factors, such as using different instruments to measure study variables, sometimes without sufficient validation of their reliability and accuracy (Hassan et al., 2019; Lange et al., 2021; Labrador et al., 2022). Additionally, many studies have included samples with a broad age range, from preadolescents to adults or the general population, which can introduce further variation (Lange et al., 2021; Labrador et al., 2022). To address these issues, our study adopts a two-pronged approach: (1) focusing on a population with specific age and characteristics and (2) utilizing an instrument with well-established reliability and internal consistency. This approach ensures that our findings are more accurate and reliable for the target population.

Understanding these gender differences is crucial for grasping current gaming trends, reducing stereotypes, and fostering healthier gaming communities. Additionally, this insight can inspire more diverse and inclusive game design ideas, enabling the creation of gaming experiences that cater to the preferences and needs of all players, regardless of gender. This study is particularly relevant at the etic and emic levels, as variables like gaming motivations have been explored across cultures (Bäcklund et al., 2022). Applying an etic/emic approach in gender studies within gaming allows for the identification of universal patterns while also acknowledging the specific gender-related experiences that shape players' preferences and behaviors.

Aims of this study

Given the mixed results regarding gaming preferences and motivations, the main objective of this study is to analyze the differences in gamer profiles based on gender, focusing on gaming habits and community-related variables. Additionally, the research seeks to determine whether trends observed in larger populations hold within a university demographic. Specifically, we propose the following hypotheses:

Hypothesis 1 (H1): A higher proportion of males engage in video gaming compared to females. This hypothesis is based on the observed discrepancy in statistical data regarding the number of

male and female gamers (Kuss and Griffiths, 2012) and the tendency for video games to be designed with predominantly male-oriented content (Lopez-Fernandez et al., 2019).

Hypothesis 2 (H2): Significant differences exist between male and female players regarding age of gaming initiation, weekly gaming hours, and experiences of community toxicity. Due to the gender-biased content of video games (Lopez-Fernandez et al., 2019), disparities in gaming habits are expected among college students, similar to those found in younger populations (Miezahl et al., 2020; Homer et al., 2012; Phan et al., 2012). Specifically, we anticipate the following:

- a *Females will report a later age of gaming initiation.*
- b *Males will report more hours of gaming per week.*
- c *Males will report experiencing higher levels of toxicity within gaming communities.*

Hypothesis 3 (H3): There are notable differences in the gaming motivations of male and female players. Given the gendered nature of video game content (Lopez-Fernandez et al., 2019), it is expected that motivations for gaming will vary by gender, although existing literature presents mixed findings (Lewis and Griffiths, 2011; Laconi et al., 2017; Labrador et al., 2022).

Hypothesis 4 (H4): Gaming motives are critical factors in distinguishing male and female gamer profiles.

Materials and methods

Research design and procedure

A cross-sectional research design was employed using an online survey distributed through social media platforms. The study adhered to the ethical principles outlined in the 1964 Declaration of Helsinki and its subsequent amendments or comparable ethical standards. Approval was obtained from the Institutional Review Board of the University of Valencia (UV-INV_ETICA-3179584).

The target population for this study consisted of university students, specifically active video game players. The inclusion criteria required participants to be Spanish-speaking university students, at least 18 years old, and actively engaged in playing video games during the study.

Participants

The convenience sample consisted of 180 Spanish students, primarily from higher education, actively engaged in video gaming. The participants had an average age of 21.52 years ($SD=3.08$, range: 18–33). The sample had a male representation of 58.3% (see Table 1). There was no statistically significant age difference between genders

[$t(178)=0.14$, $p=0.893$, Hedges' $g=0.02$, 95% CI: -0.28 , 0.32]. On average, participants began playing video games at 9.06 years ($SD=3.42$, range: 3–18), with a mean weekly gaming time of 4.08 h ($SD=1.81$, range: 1–7).

Regarding educational background, 2.2% ($n=4$) had completed secondary education, 38.9% ($n=70$) had finished high school, 12.2% ($n=22$) had completed vocational training, 36.1% ($n=65$) held a university degree, and 10.6% ($n=19$) had completed a master's or postgraduate program (Table 2).

Most students, 86.1% ($n=155$), reported enrolling in public institutions, whereas 6.7% ($n=12$) attended private institutions. Most study centers were in the Valencian community, representing 92.8% ($n=167$) of the sample. Smaller proportions were from Castilla La Mancha and Andalusia (2.2%, $n=4$) and other autonomous communities (0.6%, $n=1$).

In terms of monthly family income, 32.8% of participants reported an income between €2001 and €3,000, 26.1% had an income between €1,001 and €2000, 17.2% reported earning either less than €1,000 or between €3,001 and €4,000, and 6.7% had a monthly income exceeding €4,000.

Variables and instruments

Sociodemographic and gaming information

Participants provided demographic information, including age, biological sex, income, and educational level. Additionally, gaming-related characteristics were assessed, such as the age of gaming initiation, weekly hours spent gaming, and the perceived level of toxicity within the gaming community.

The scale of motives for video game playing (e-MUV)

The e-MUV instrument (López Fernández et al., 2019) consists of 32 items, each rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). These items assess eight dimensions of gaming motivations: immersion (e.g., “I feel immersed in a fantasy/fictional world”), customization (e.g., “I enjoy designing things in-game”), violent gratification (e.g., “I enjoy violence in games; the more, the better”), coping (e.g., “I forget my worries when I play”), fun (e.g., “I enjoy gaming”), cognitive challenge (e.g., “The games challenge me mentally”), competition (e.g., “I like to win”), and social interaction (e.g., “I make new friends”). Higher scores in each dimension indicate a stronger motivation for that particular gaming aspect.

In the current sample, the integrity of the e-MUV measurement model was preserved, with ULMSV $\chi^2=471.866$ ($p<0.0$, $df=436$), CFI=0.996, RMSEA=0.021 (90% CI=0.00, 0.034), SRMR=0.060. As reported by López Fernández et al. (2019), Cronbach's alpha for the dimensions ranged from 0.79 (cognitive challenge) to 0.89 (social interaction). In this study, omega reliability (BCA bootstrap 95% CI, 1000 samples) confirmed internal consistency across all dimensions: immersion=0.818 (95% CI=0.757, 0.866), customization=0.887 (95% CI=0.884, 0.915), violent gratification=0.898 (95% CI=0.866, 0.921), coping=0.859 (95% CI=0.811, 0.891), fun=0.901 (95% CI=0.833, 0.952), cognitive challenge=0.861 (95% CI=0.818, 0.894), social interaction=0.831 (95% CI=0.779, 0.867), and cognitive challenge=0.855 (95% CI=0.809, 0.888).

TABLE 1 Descriptive statistics for variables under study.

	<i>M</i>	<i>SD</i>	Min.	Max.	<i>Sk</i>	<i>Kr</i>
Age	21.52	3.08	18	33	1.25	1.39
Age of gaming initiation	9.06	3.42	3	18	0.50	−0.45
Gaming hours per week	4.08	1.81	1	7	0.14	−1.13
Video game toxicity	2.86	1.35	1	5	−0.02	−1.25
Motives of gaming						
Immersion	14.66	3.47	4	20	−0.48	0.11
Customization	14.86	3.86	4	20	−0.54	−0.20
Violent Gratification	11.42	4.25	4	20	−0.17	−0.72
Coping	14.11	3.61	4	20	−0.47	0.01
Fun	18.24	2.20	4	20	−1.90	8.37
Cognitive challenge	14.16	3.58	4	20	−0.66	0.42
Competition	12.88	3.91	4	20	−0.31	−0.49
Social Interaction	14.17	4.11	4	20	−0.78	0.08

TABLE 2 Descriptive statistics for sociodemographic characteristics.

	<i>N</i>	%
Educational background completed		
Secondary education	4	2.2
High school education	70	38.9
Vocational training	22	12.2
University degree	65	36.1
Master's or postgraduate	19	10.6
Institution type		
Public	155	86.1
Private	12	6.7
Location study center		
Valencia	167	92.8
Castilla La Mancha	4	2.2
Andalusia	4	2.2
Others	1	0.6
Monthly family income		
<€1,000	30	26.1
€1,001–2,000	47	17.2
€2001–3,000	59	32.8
€3,001–4,000	31	17.2
>€4,000€	12	6.7

Procedures

Data collection

The online survey was conducted using LimeSurvey and distributed through various social and academic networks. Participants were thoroughly informed about the study's objectives, and before beginning the survey, they provided electronic, written consent. Only those who consented were able to proceed with the

questionnaire. Participation was entirely voluntary, anonymous, and without compensation.

Statistical analysis

Descriptive statistics were first used to summarize the study's demographic characteristics and critical variables. For continuous variables, means, standard deviations, and minimum and maximum values were calculated, while categorical variables were reported as frequencies and percentages. Skewness and kurtosis statistics were also examined to assess the distribution shape of continuous variables, helping to determine whether they followed a normal distribution (Kline, 2022).

Group comparisons assume the instrument's psychometric properties are equivalent to the compared groups. To ensure this equivalence, we conducted a preliminary analysis of the e-MUV scores for males and females (using sex as a covariate) by detecting differential item functioning (DIF). Given the small group sizes, a non-parametric DIF analysis based on contingency tables was used (Fidalgo et al., 2004). Two tests for polytomous variables were applied, using the observed score (i.e., the sum of item responses) as the matching variable: the Mantel test χ^2 ($M\text{-}\chi^2$) (Mantel, 1963; Zwick et al., 1993) and Generalized Mantel-Haenszel χ^2 ($GMH\text{-}\chi^2$) (Zwick et al., 1993). These tests effectively identify different types of DIF (Zwick et al., 1993; Elosua and Wells, 2013; Fidalgo and Bartram, 2010): uniform DIF (related to scalar invariance of thresholds or intercepts) and non-uniform DIF (related to metric invariance of factor loadings). *p*-values were corrected by multiple testing using the Bonferroni adjustment (Penfield, 2001), resulting in a significance threshold of 0.002 for the four items in each e-MUV dimension.

Subsequently, a chi-square (χ^2) test was used to compare the distribution of males and females in the player sample. Independent samples *t*-tests were conducted to examine gender differences across the variables under study. Before performing these analyses, we ensured that all statistical assumptions were met. Hedges' *g* was used to measure effect size, providing an unbiased estimate of the standardized mean difference. Effect sizes of 0.15, 0.36, and 0.65 were interpreted as small, moderate, and large, respectively (Lovakov and Agadullina, 2021).

Finally, linear discriminant analysis (LDA) was conducted using the forward stepwise selection method (Tabachnick and Fidell, 2014) to

identify the gaming-related variables that most effectively differentiate between men and women. Only statistically significant variables associated with the participant's gender in prior analyses were included as predictors in the LDA. The selection criterion for predictor variables was based on minimizing Wilks' Lambda (tolerance <0.001, entry $F=3.84$, and removal $F=2.71$). This stepwise method progressively added predictor variables to the discriminant function, optimizing the distinction between groups by minimizing within-group variation and maximizing between-group variation. The discriminant function was then used to classify participants into one of the two groups.

Several tests were used to evaluate the discriminant function's fit (Tabachnick and Fidell, 2014): (1) Wilks' Lambda and the χ^2 significance test were employed to assess whether the group centroid scores were equal; (2) the percentage of variance explained by the discriminant function in group differences was measured using Canonical R^2 ; (3) the predictive accuracy was evaluated by examining the percentage of correct classifications made by the discriminant function; and (4) the quality, stability, and generalizability of the discriminant function were tested using the "leave-one-out classification" technique, a cross-validation method (data resampling method). In this technique, all but one sample observation is used to develop the discriminant function, which is then applied to predict the group membership of the omitted observation. This process is repeated for each observation in the dataset, ensuring that every observation is classified by a function derived from the remaining data.

The LDA was performed using SPSS statistical software version 28 for Windows, with a significance level of 0.05 (two-tailed) assumed for all interpretations. The R packages used included *lavaan* (Rosseel, 2012), *MeasInv* (Wells, 2022), and *MBESS* (Kelley, 2023).

Results

Descriptive statistics

Table 1 presents the descriptive statistics for the variables under study. Notably, the univariate skewness and kurtosis values for all analyzed variables fall within the conventional normality threshold (Kline, 2022).

In terms of the perceived toxicity level of the video game community most frequented by the sample, 22.8% ($n=41$) rated it as low, 18.3% ($n=33$) as medium-low, 20.6% ($n=37$) as medium, 26.7% ($n=48$) as medium-high, and 11.7% ($n=21$) as high.

Differential item functioning

During the preliminary evaluation of the psychometric equivalence of the e-MUV between males and females, p -values for the $M-\chi^2$ (uniform DIF) and GHM- χ^2 (non-uniform DIF) tests exceeded 0.002. These results indicate that no item exhibited significant uniform or non-uniform DIF (see Supplementary Table S1).

Differences by gender in variables under study

Table 3 illustrates the outcomes of the Student's t -test examining gender differences in the study variables. Initially, a statistically

significant difference was found in the distribution of males and females in the sample [$\chi^2(1)=5.00$, $p=0.025$], indicating that the proportion of males (58.3%) and females (41.7%) deviated from what would be expected by chance. A significant difference was also observed in the age of video game initiation ($p<0.001$), with males starting at a younger age ($M=7.84$, $SD=2.60$) compared to females ($M=10.76$, $SD=3.64$). Additionally, there were statistically significant differences in weekly gaming hours ($p=0.009$) and perceived toxicity in the video gaming community ($p<0.001$), with males reporting more weekly gaming hours and experiencing higher levels of toxicity. No significant differences between males and females were found in monthly family income [$\chi^2(4)=1.25$, $p=0.869$].

Regarding the e-MUV dimensions, statistically significant differences were found in customization ($p<0.001$), violent gratification ($p<0.001$), cognitive challenge ($p=0.002$), competition ($p<0.001$), and social interaction ($p=0.023$) (see Figure 1). Specifically, males showed higher motivations for violent gratification, cognitive challenge, competition, and social interaction, while females reported higher motivations for customization. No statistically significant differences were found between groups for the remaining variables.

Linear discriminant analysis

A forward stepwise discriminant analysis was carried out, using the minimization of Wilks' Lambda as the criterion for selecting predictor variables. Before the analysis, the statistical assumption was verified. The Box's M test indicated a violation of the assumption of equality of covariance matrices (Box's $M=36.70$, $F=3.58$, $p<0.001$). However, this problem is not considered problematic (Tabachnick and Fidell, 2014) given the large sample size.

Since only two groups were analyzed, a single discriminant function was derived. The function demonstrated a statistically significant association between the groups and all predictor variables, accounting for 36.7% of the between-group variability. The overall Wilks' lambda was statistically significant [Wilks' lambda = 0.63, $\chi^2(4)=80.16$, $p<0.001$], indicating that the predictors effectively differentiated between the gender groups. Women had higher discriminant function scores ($M=0.69$, $SD=0.46$) compared to men ($M=0.12$, $SD=0.33$), and this difference was statistically significant [$t(125.70)=-9.10$, $p<0.001$, Hedges' $g=-1.45$, 95% IC: -1.78 , -1.11].

Table 4 displays the within-group correlations among the predictors, the discriminant function, and the standardized weights. The correlation coefficients represent Pearson correlations between the predictors and the discriminant function. Notably, all coefficients exceeded 0.30, a commonly accepted threshold indicating the relevance of predictor variables in discriminant function analysis (Burns and Burns, 2008). The strongest relationships with the discriminant function were observed for the age of gaming initiation ($r=0.61$) and the violent gratification dimension ($r=-0.51$), followed by community toxicity ($r=-0.49$) and customization ($r=0.41$). Specifically, a later age of gaming initiation and higher customization, along with lower levels of violent gratification and community toxicity, were associated with higher discriminant function scores.

Table 5 shows the classification results using the "leave-one-out" cross-validation method (jackknifed classification). The overall accuracy rate was 80.0%, correctly classifying 80.0% of respondents

TABLE 3 Differences by gender in variables under study.

	Males		Females		<i>t</i>	<i>df</i>	<i>p</i>	<i>g</i>	95% CI
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>					
Age	21.54	3.08	21.48	3.10	0.14	178	0.893	0.02	−0.28, 0.32
Age of gaming initiation	7.84	2.68	10.76	3.64	−5.91	128.76	<0.001	−0.94	−1.24, −0.62
Gaming hours per week	4.39	1.78	3.66	1.78	2.66	177	0.009	0.40	0.10, 0.70
Video game toxicity	3.27	1.24	2.29	1.29	5.10	178	<0.001	0.77	0.46, 1.07
Immersion	14.41	3.28	15.01	3.71	−1.15	178	0.251	−0.17	−0.47, 0.12
Customization	13.86	3.67	16.25	3.70	−4.31	178	<0.001	−0.65	−0.95, −0.35
Violent gratification	12.75	3.54	9.56	4.49	5.13	135.38	<0.001	0.80	0.50, 1.11
Coping	14.04	3.43	14.21	3.86	−0.32	178	0.749	−0.48	−0.34, 0.25
Fun	18.31	1.96	18.13	2.51	0.54	178	0.588	0.08	−0.21, 0.38
Cognitive challenge	14.90	3.04	13.13	4.02	3.20	131.23	0.002	0.50	0.20, 0.80
Competition	14.10	3.24	11.19	4.14	5.08	134.68	<0.001	0.80	0.49, 1.10
Social Interaction	14.77	3.72	13.32	4.94	2.29	140.17	0.023	0.36	0.06, 0.65

M, mean; SD, standard deviation; df, degree of freedom; g, Hedge's *g*.

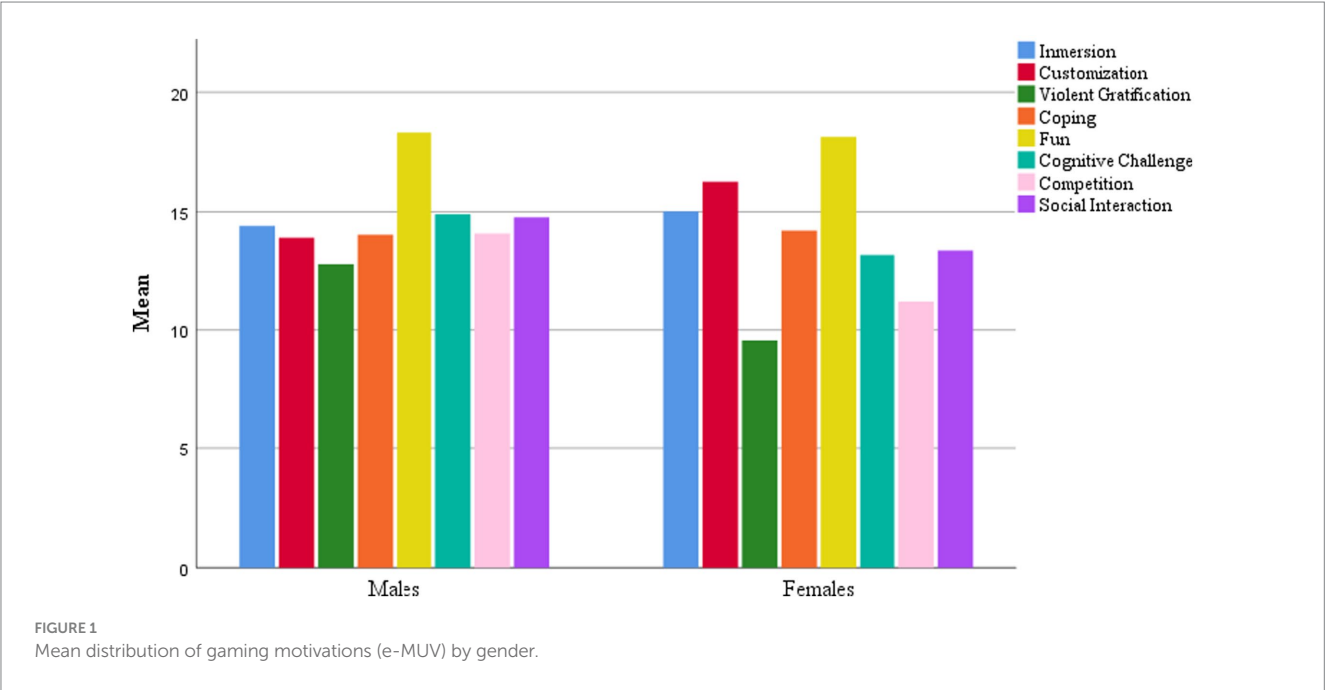


TABLE 4 Results of discriminant analysis.

Predictors	Structure coefficients	Standardized coefficients	Pooled within-group correlations among predictors		
			Video game toxicity	Customization	Violent gratification
Age of gaming initiation	0.61	0.67	0.14	−0.02	−0.05
Video game toxicity	−0.49	−0.47		−0.07	0.23
Customization	0.41	0.40			0.02
Violent gratification	−0.51	−0.38			
Canonical <i>R</i>	0.61				
Eigenvalue	0.58				

TABLE 5 Classification results using the “leave-one-out” cross-validation method.

Sample	Gender	Predicted group membership		% cases
		Men	Women	Correctly classified
Original	Men	92	13	87.6
	Women	23	52	69.3
	% Total cases correctly classified			80.0
Cross-validated	Men	92	13	87.6
	Women	23	52	69.3
	% Total cases correctly classified			80.0

into “male” or “female” groups. Males were classified with slightly higher accuracy (87.6%) than females (69.3%). These results were consistent in the cross-validated classification (Table 5).

Discussion

This study explores the differences between male and female gamer profiles, focusing on variables related to gaming habits, motivations, and characteristics such as community toxicity. The video game industry and its content reflect inherent gender disparities, possibly contributing to divergent gaming profiles and outcomes (Kuss et al., 2022). While certain factors like game genre preferences and gaming motivations, have been extensively studied, the findings remain inconsistent (Lopez-Fernandez et al., 2019; Lopez-Fernandez et al., 2019). Less examined variables, like gaming community toxicity, may have a distinct gendered influence and deserve further investigation (Belskie et al., 2023).

The results support hypothesis 1 (H1), revealing a higher proportion of male gamers in the sample (58.3%). These findings align with previous studies (Lopez-Fernandez et al., 2019; Phan et al., 2012), challenging the notion that female gamers constitute a minority (Entertainment Software Association, 2018). While many video games still target primarily male audiences (Lopez-Fernandez et al., 2019), these results may suggest that the industry is gradually shifting toward creating games that also appeal to women.

The results also support Hypothesis 2 (H2), highlighting differences between males and females in the age of gaming initiation, weekly gaming hours, and the perceived toxicity of video gaming communities. As expected, female gamers reported a later gaming onset than males (H2a). This delay may be attributed to the widespread belief that video games are primarily designed for a male audience (Lopez-Fernandez et al., 2019). Consequently, males reported more weekly gaming hours (H2b), consistent with Nakayama et al.’s findings (Nakayama et al., 2020), which link earlier gaming initiation to increased gaming activity. Additionally, male gamers were more likely to engage in toxic gaming communities than their female counterparts (H2c).

This trend may be related to the traditional association of males with competitive and violent video games (Lange et al., 2021; Bopp et al., 2022). Female gamers, on the other hand, may avoid toxic communities in competitive games due to the risk of encountering sexism or harassment, prioritizing their psychological well-being over gaming interests (Belskie et al., 2023; Kuss et al., 2022). For women, the decision to play certain video games is often influenced by the need for psychological safety rather

than purely personal preferences, given the potential risks associated with toxic gaming environments (Belskie et al., 2023).

Our findings partially support Hypothesis 3 (H3), revealing significant differences in gaming motivations between male and female players. Distinctions were observed in customization, violent gratification, cognitive challenge, competition, and social interaction. Consistent with previous research (López-Fernández et al., 2020; Gursesli et al., 2024), male gamers exhibited higher motivation for competition, violent gratification, and social interaction, whereas female gamers were more motivated by customization and creative aspects of video games. This discrepancy may be due to female gamers’ tendency to avoid competitive, toxic, or socially interactive games, particularly those that require revealing their identity, such as through audio channels (Belskie et al., 2023). Additionally, male gamers demonstrated a greater motivation for cognitively challenging video games.

Male gamers’ motivations often align with genre preferences, such as shooters (Phan et al., 2012; Kim et al., 2016). Shooters and massively multiplayer online role-playing games (MMORPGs) are frequently associated with gaming disorder (Na et al., 2017), with social interaction motivation linked to increased time spent in online games (Király et al., 2017). Both social interaction and the pursuit of violent gratification have been implicated in the development of problematic gaming behaviors (Lopez-Fernandez et al., 2019). In contrast, female gamers’ preference for customization and creation is typically associated with construction and role-playing games. Notably, customization has been found to have a negative relationship with the development of problematic gaming (López-Fernández et al., 2020).

The findings supporting H2 and H3 are consistent with gender socialization theory (Bem, 1993) and social identity theory (Tajfel and Turner, 1979). Gender socialization theory (Bem, 1993) suggests that from an early age, boys and girls socialize differently regarding their interests and activities. Due to cultural and social stereotypes, video games are often more closely associated with male interests. This situation may explain why females start playing video games later and spend fewer hours per week gaming. Social identity theory (Tajfel and Turner, 1979) also posits that individuals tend to identify with groups that reinforce their sense of identity. Men may be more attracted to specific video games because they provide an opportunity to strengthen their masculine identity, particularly in genres that emphasize competition and action. This tendency to seek out competitive and action-oriented games could also explain the greater participation of men in toxic gaming communities, where competition and aggression are more prevalent.

Building on these findings, Hypothesis 4 (H4) is supported. The study suggests that distinct gender patterns emerge based on gaming motivations, the age of gaming initiation, and the perceived toxicity of video gaming communities. Through linear discriminant analysis, the variables most strongly associated with the discriminant function were the age of initiation and the gaming motive of violent gratification, followed by community toxicity and the gaming motive of customization. Higher scores for age of initiation (indicating older ages) and customization, combined with lower scores for violent gratification and toxicity, represent the most practical combination of predictor variables for distinguishing between genders.

Several conclusions can be drawn from these findings. First, there is an apparent gender disparity in the age of video game initiation, with male gamers being exposed to the positive and negative effects of video gaming at an earlier age. Second, gaming motivations differ by gender, suggesting that male and female gamers have distinct reasons for engaging in video games. Consequently, it can be inferred that they may not gravitate toward the same types of games (Lange et al., 2021; López-Fernández et al., 2020; Bopp et al., 2022). Third, this difference in video gaming preferences leads to varied exposure to toxic communities. Women may avoid certain video games that involve female objectification or communities where they are likely to encounter sexism or harassment due to high toxicity levels (Belskie et al., 2023). While this avoidance highlights the persistence of gender stereotypes in video gaming, it can also have positive outcomes. It promotes healthier video gaming habits among female players, characterized by a later onset of gaming, more creative motivations, and participation in less toxic communities.

Finally, the predictor variables associated with male gamers, such as higher scores in violent gratification and community toxicity, are positively linked to the development of gaming disorder. In contrast, the predictor variables associated with female gamers show the opposite effect (Lopez-Fernandez et al., 2019; Kim et al., 2016).

Limitations and future avenues of research

Several limitations of the current study should be acknowledged. First, there may be selection bias in the sample, as the accessibility of the questionnaires may have favored certain groups, such as those with access to computers. The sample, composed predominantly of university students, also limits the generalizability of the findings to broader age populations. Additionally, the study relies solely on observed variables, introducing some measurement error by not incorporating unobservable variables that could be estimated through Structural Equation Modeling (SEM) or Item Response Theory (IRT). Using latent variables would help control for variance unrelated to the construct.

Furthermore, future research could benefit from a more extensive and diverse sample, including gamers of various ages, to examine the stability of gender-related predictor variables across different age groups. Exploring the consistency of results in multicultural samples would also be valuable. Lastly, the development and validation of questionnaires specifically designed to assess constructs related to video games, such as toxicity, is recommended.

Practical implications

Understanding the disparities between male and female gamers is crucial for gaining insights into current gaming trends. The findings, which highlight gender differences, stress the importance of reducing gender stereotypes and fostering healthier gaming communities to promote more equitable gaming experiences. This perspective also underscores the need for more inclusive game design, offering gaming experiences that align with the preferences and needs of players across genders.

The study has clinical implications as well, suggesting that gender-specific profiles may be linked to problematic gaming. This notion highlights the importance of developing tailored prevention programs that address the unique challenges faced by individuals with diverse gender identities in the context of gaming-related disorders. Such targeted interventions could lead to more effective, personalized strategies for mitigating the risks of excessive gaming behaviors.

Addressing the toxicity in gaming communities is also essential, as it can have severe psychological effects. Specific actions must be taken from both educational and familial perspectives. Schools and communities should implement educational programs that promote gender equity in gaming spaces, including workshops to teach young people about the importance of diversity, inclusion, and respect in gaming, with family involvement. While video game design is becoming more inclusive, the gaming community must also embrace these initiatives. Cultivating a culture of respect and equity early on is crucial for creating lasting behavioral change within gaming communities.

Conclusion

This study provides new insights into the impact of gender on gaming behaviors. The results highlight gender differences in the age of gaming initiation, gaming hours, motivations for gaming, and the toxicity levels within gaming communities. Additionally, the identified predictor variables—age of gaming onset, gaming motivations (customization and violent gratification), and community toxicity—further underscore the distinctions between male and female gamers. These findings emphasize the importance of examining the gaming population, focusing on gender differences and the underlying factors that contribute to them.

In conclusion, fostering more inclusive game design and taking concrete steps in education and community involvement can help create a healthier and more equitable gaming environment. Addressing these issues is essential for players' mental well-being and cultivating a more positive and enriching gaming culture.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by The Ethics Committee of Research in Humans of the Ethics Commission in Experimental Research of University of Valencia. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

JG-P: Writing – original draft, Resources, Investigation, Conceptualization. MM-V: Validation, Writing – review & editing, Visualization, Supervision, Resources, Project administration. CM-S: Software, Formal analysis, Investigation, Data curation, Writing – review & editing, Visualization, Funding acquisition. GC: Writing – review & editing, Visualization, Funding acquisition, Conceptualization. LB-R: Writing – original draft, Resources, Methodology, Formal analysis, Data curation.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2024.1412739/full#supplementary-material>

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Psychosocial Factors Linked to Online Gaming: Differences Between Current Gamers, Non-current Gamers and Non-gamers

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Abstract

The rise of gaming and gaming-related problems has led to an interest in finding differences between gamers and non-gamers. The present study investigates whether there are differences in psychological variables (prosociality, emotional intelligence, social support, and mental health) between current gamers, non-current gamers, and non-gamers. For this purpose, a quantitative study was conducted with a convenience sample of Spanish university students ($N = 798$, $\text{Mean}_{\text{age}} = 21.48$, $\text{SD}_{\text{age}} = 5.01$). One-way ANOVAs and MANOVAs were performed to compare the psychological variables between the three groups. Additionally, a binomial logistic regression was conducted with statistically significant variables to identify the most relevant predictors of gaming onset. Results indicated statistically significant differences in sex, prosociality, the

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appraisal of others' emotions component of emotional intelligence, general social support, and family social support between the three groups. The results of the binomial logistic regression indicated that male sex and having lower levels of prosociality were associated with a higher probability of gaming. These results may imply that there are baseline differences in those who start gaming. Addressing these differences may be key in the prevention of gaming disorder.

Keywords

Gaming, differences, prosociality, emotional intelligence, social support

Introduction

Gaming is a popular and rapidly growing leisure activity, mainly among young ages. In 2016, one billion gamers were reached; by 2024, this figure will triple, reaching 3.09 billion gamers worldwide (Georgiev et al., 2024). Thus, current gamers account for almost half of the current world population. This growth has led to academic interest in exploring the influence of psychological variables associated with gaming behavior.

To begin with, what is gaming? Gaming is characterized by interactive elements, skill-based gameplay and contextual progress indicators (King et al., 2015). Engagement in gaming is generally viewed as an activity that provides personal benefits, such as enjoyment, achievement, and a sense of belonging (Billieux et al., 2019). However, a portion of gamers may develop pathological behaviors. Pathological gaming is characterized by excessive time spent playing video games and difficulty in disengaging from gaming, leading to functional impairment due to excessive gaming (Coyne et al., 2020). This dysfunction exists on a continuum, with varying levels of impairment in crucial areas of an individual's life. At the more dysfunctional end of the spectrum is Internet Gaming Disorder, which is included in the DSM-V-TR (APA; 2022) as a potential disorder that requires further study.

There are multiple approaches to the concept of gamer. The term "gamer" can be used to designate people who play video games and to designate people with gamer identity. Gamer identity is a social construct that includes elements such as knowledge about videogames and their related contents (gaming capital; Consalvo, 2007), performance, and characteristics and types of gaming consumption established as typical of gamers (e.g., being male and adolescent; Shaw, 2013). Within the typical characteristics of gamers, there are negative connotations that may lead people not to identify themselves as gamers and even not to play video games (Shaw, 2012). Therefore, in academic studies, gamers are usually considered to be those people who currently consume video games, that is, those who count as gamers (Alsaad et al., 2022; Macur & Pontes, 2021). For this reason, it is important to differentiate between counting as a gamer and identifying oneself as a gamer.

Several studies have explored the differences in mental health between gamers and non-gamers, yielding mixed results. The relationship between gaming and mental health is complex, with no clear link between gaming and anxiety or depression. [Kowal et al. \(2021\)](#) found that playing commercial video games reduced symptoms of depression and anxiety. Similarly, [Allaire et al. \(2013\)](#) reported that adult gamers exhibited lower levels of depression and higher well-being compared with coetaneous non-gamers. However, when examining mental health and maladaptive gaming behaviors, [Chung et al. \(2020\)](#) reported that problematic gamers exhibited significantly higher scores of depression and anxiety compared to casual gamers and non-gamers, with non-gamers showing the lowest levels of these mental health issues. Gaming disorder in adolescents and young adults may be associated with elevated depression and anxiety scores ([Wang et al., 2017, 2019](#); [Wartberg et al., 2017a](#)). Consequently, mental health seems to be a concern in gaming, particularly in cases involving problematic gaming behavior.

Another variable related to video games has been social support. Traditionally, there was an image of gamers as isolated people without friends outside the virtual world ([PaaBen et al., 2017](#)). However, video games also present an opportunity to generate new social ties online. [Frederick and Zhang \(2021\)](#) analyzed the online and offline social relationships of college gamers. They concluded that the quality of their online relationships was significantly higher than offline ones, contrary to the non-gamer population. However, in the general young adult population, the quality of offline friendships was significantly higher. [Yoo \(2024\)](#) found that social support was a factor that was inversely related to gaming time. Likewise, [Boson et al. \(2024\)](#) found similar results regarding emotional closeness with parents and hours of gaming. Social support has also been linked to excessive gaming ([Wartberg et al., 2017b](#)), relating greater social interaction with less gaming time. In summary, while social support is reduced in cases of problem gaming, it has not been clearly associated with video game consumption.

Other relevant psychological variables in the study of video games are prosociality and emotional intelligence. Several reviews and meta-analyses indicated that these variables could be protective for the development of gaming disorder since this clinical population presents lower scores than the general population ([Esparza-Reig et al., 2021](#); [Gisbert-Pérez et al., 2024](#)). Given the increasing percentage of problematic gaming in adolescents and adults (8.8% and 10.4%, respectively, [Gao et al., 2022](#)), there is a need to examine whether gamers are enrolled in this activity because they present different scores from the onset or whether these scores get reduced when this activity becomes a habit or problematic behavior. The growing concern about gaming disorder and the still prevalent stereotypes related to gaming highlight the importance of analyzing whether there are root differences between those who play and those who do not.

Aim of the Study

This study aimed to explore factors associated with gaming in a sample of Spanish university young adults. Specifically, this study was focused on prosocial behavior,

mental health, perceived social support, and emotional intelligence due to their relationship with the development of gaming disorder. The sample was divided into three groups based on current or non-current gaming (current gamers, non-current gamers, and non-gamers) to examine whether associations were maintained even when gaming ceases. Based on the previous literature, the hypotheses were:

H1: There are more male gamers than female gamers.

H2: People who engage in gaming have lower levels of prosociality.

H3: There are differences in mental health between current gamers, non-current gamers, and non-gamers.

H4: There are differences in social support between current gamers, non-current gamers, and non-gamers.

H5: People who engage in gaming have lower levels of emotional intelligence.

Material and Methods

Sample and Procedure

A cross-sectional research design was applied using an online survey. The online survey was distributed through university classrooms, and students provided informed consent prior to data collection. The research was conducted according to the declaration of Helsinki of 1964 and its later amendments or comparable ethical standards, and the approbation of the Institutional Review Board (protocol no. 2023-MAG-2988759) of the University of Valencia was obtained.

The sample comprised the university community. Inclusion criteria were defined as follows: individuals had to be Spanish-speaking university students aged at least 18 years. No exclusion criteria were applied. In total, 798 participants were recruited.

Measures

Sociodemographic variables (sex, age) and current video gaming were asked (“*Do you currently play video games?*”) with response options “*Yes,*” “*No, but used to,*” and “*No*”).

Prosocialness Scale for adults (PBS; Caprara et al., 2005; Spanish version of Rodríguez et al., 2017). This instrument assesses individual tendencies to perform a series of prosocial behaviors in four areas: sharing, helping, caretaking, and feeling empathy for other needs and requirements (Badenes Ribera et al., 2023). This scale consists of 16 items that give a total score of prosocial behavior. Responses are given using a five-point Likert scale, ranging from (1) *never/almost never* to (5) *always/almost always*. Higher scores indicate a higher presence of prosocial behaviors. In the present study, total PBS score had a Cronbach’s alpha and a McDonald’s omega of .916.

GHQ-12 (Goldberg & Williams, 1988; Spanish version of Brabete, 2014). This instrument measures general mental health through 12 items describing mood states, six of which are positive and six of which are negatively worded. Responses were given using a 4-point Likert scale, ranging from (0) *never* to (3) *always*, and the scoring method used was bimodal (0-0-1-1). The total scores ranged from 0 to 12. Higher scores in GHQ-12 indicated higher general mental health. In the present study, the total GHQ-12 score had a Cronbach's alpha of .792 and a McDonald's omega of .779.

Wong Law Emotional Intelligence Scale (WLEIS-S, Wong & Law, 2002; Spanish version of Pacheco et al., 2019). In this instrument, emotional intelligence (EI) is conceptualized based on Mayer and Salovey's (1997) definition, that is, as a set of interrelated skills related to "the ability to accurately perceive, appraise, and express emotion; the ability to access and/or generate feelings when they facilitate thinking; the ability to understand emotion and emotional knowledge; and the ability to regulate emotions to promote emotional and intellectual growth". This scale consists of 16 items that assess four aspects of EI: appraisal of one's own emotions (SEA), appraisal of others' emotions (OEA), use of emotion (UOE), and regulation of emotion (ROE). Responses are given using a seven-point Likert scale, ranging from (1) *totally disagree* to (7) *totally agree*. Higher scores indicate higher emotional intelligence ability. In the present study, the total WLEIS score had a Cronbach's alpha of .893 and a McDonald's omega of .889. SEA subscale had a Cronbach's alpha of .827 and a McDonald's omega of .832, OEA subscale had a Cronbach's alpha of .814 and a McDonald's omega of .820, UOE subscale had a Cronbach's alpha of .796 and a McDonald's omega of .804, and ROE subscale has a Cronbach's alpha of .836 and a McDonald's omega of .835.

The multidimensional scale of perceived social support (MSPSS; Zimet et al., 1988; Spanish version of Santos-Vega et al., 2021). The scale comprises 12 items that measure three dimensions of perceived social support: (1) support from significant others, (2) family support, and (3) peer support. The items have a four-point Likert-type response scale ranging from (1) *never or almost never* to (4) *always or almost always*. Higher scores indicate higher perceived social support. In the present study, the total MSPSS score had a Cronbach's alpha of .884 and a McDonald's omega of .847. Support from significant others dimension had a Cronbach's alpha of .971 and a McDonald's omega of .971, Family support dimension had a Cronbach's alpha of .920 and a McDonald's omega of .923, and Peer support had a Cronbach's alpha of .922 and a McDonald's omega of .922.

Statistical Analysis

Data were double-checked for accuracy. Before conducting the analyses, three groups were formed: 'non-gamers', 'non-current gamers', and 'current gamers'. IBM SPSS Statistics 28 was used for the statistical analyses. The univariate skewness and kurtosis values for all the variables analyzed were within the conventional normality criteria (-3 to 3 for skewness and -10 to 10 for kurtosis), per the guidelines Kline recommended (2015). Given that missing values were $<1\%$ for each of the variables, they are

not considered to cause bias in the estimates (Graham, 2009). Therefore, no adjustments were made to the scores for the variables measured in this study.

Descriptive statistics were computed for sociodemographic characteristics in the overall sample and the three groups. Pearson's chi-square tests and Cramer's V were performed to analyze sex differences between groups. Cramer's V was used as an effect size measure. Means and standard deviation were used for continuous variables and frequencies and percentages for categorical variables.

Differences between groups of participants in terms of prosocial behavior, mental health, perceived social support, and overall emotional intelligence were examined using a One-Way Analysis of Variance (ANOVA), while a Multivariate Analysis of Variance (MANOVA) was conducted for the emotional intelligence components. In these analyses, partial eta square was used as effect size measure (η^2). Pillai's Trace and Wilks' Lambda were used to determine if there are significant differences in MANOVA, depending on whether the assumption of normality was met. For pairwise comparisons, Bonferroni and Games-Howell post hoc tests were used.

Finally, a forward stepwise binary logistic regression analysis (Silva & Barroso, 2004) was performed to predict differences between people who engage in gaming and those who do not. The variables identified as statistically significant between groups by ANOVA and MANOVA results were included as independent variables. Sex was also included since it has also been linked to the practice of gaming. To analyze the fit of the logistic regression model, different tests were used (Hahs-Vaughn & Lomax, 2020): (1) for the overall model fit we used the χ^2 test for statistical significance of the model using the change in deviance (-2LL); (2) for the goodness of fit of the model we used the Hosmer-Lemeshow test, and the substantive significance of the model or pseudovariance explained using Nagelkerke's R^2 index; (3) to analyze the predictive ability of the model we used the correct classifications made by the model (i.e., measures of accuracy, sensitivity and specificity), and (4) the comparison of the accuracy of the null model and the final model using the Z statistic (Pardo & Ruiz, 2012). To determine whether the regression coefficients of the independent variables were statistically significantly different from 0, the Wald statistic was used. In addition, the Odds Ratio (OR) index and its 95% confidence interval were estimated as a measure of the effect size, which tests the hypothesis that the effect of the independent variable at the population level is different from the null effect ($OR = 1$). We conducted a prior power analysis with a sample-size calculator for regression using an algorithm by Westland (Soper, 2024). With a conservative effect size of 0.02 and 9 estimated predictors, a minimum sample size of 788 participants is recommended with a statistical power of 0.80.

Results

Comparison of Sociodemographic Characteristics Between Groups

Participants' socio-demographic characteristics by group are included in Table 1. Age of participants across groups did not differ significantly ($F = .498, p = .608, \eta^2 = .001$). Furthermore, sex significantly differed across the three groups ($\chi^2 = 134.809, p < .001$,

Table 1. Demographics of the Three Groups of Participants.

	Non-gamers	Non-current Gamers	Current Gamers	Total
N	286	237	275	798
Female (%)	92.3	65.4	37.1	65.3
Mean age (SD)	21.25 (6.10)	21.58 (5.44)	21.64 (2.92)	21.48 (5.01)

Note. SD = Standard Deviation.

Cramer's V = .412). Females predominated in the non-gamer and non-current gamer group (92.3% and 65.4%, respectively), while males predominated in the current gamer group (62.9%).

Differences in Study Variables Between Groups

Differences in Prosociality Between Gaming Groups. Statistically significant differences were found between the three groups on prosociality ($F = 15.848, p < .001, \eta^2 = .038$). Previously, the homogeneity of variances was tested with Levene's statistic ($F [2792] = .492, p = .612$). Bonferroni post hoc tests indicated statistically significant differences between current gamers and non-gamers ($M_{CG} = 62.82, SD_{CG} = 9.50; M_{NG} = 67.00, SD_{NG} = 9.10; p < .001$), and non-gamers and non-current gamers ($M_{NCG} = 63.69, SD_{NCG} = 9.09; p < .001$).

Differences in Mental Health Between Gaming Groups. Non-statistically significant differences were found between the three groups on general mental health ($F = .144, p = .866, \eta^2 = .000$).

Differences in Emotional Intelligence Between Gaming Groups. Non-statistically significant differences were found between the three groups in general emotional behavior ($F = 1.238, p < .290, \eta^2 = .003$). A MANOVA 3 (gaming groups) $\times$ 4 (emotional intelligence components) was performed to estimate whether there are differences in emotional intelligence components between non-gamers, non-current gamers, and current gamers. Previously, we examined the assumption of homogeneity of variances using Levene's test (SEA $F [3793] = .016, p = .984$); OEA $F [3793] = 10.651, p < .001$); UOE $F [3793] = 2.063, p = .128$); ROE $F [3793] = 1.163, p = .313$). The assumption of homogeneity of covariance was tested using Box's M test (56.65, $F = 2.81, p < .001$).

Using Pillai's trace, there was a statistically significant difference in emotional intelligence components between groups ($V = 0.33, F [8,1582] = 3.34, p < .001$). Statistically significant differences were found in the appraisal of others' emotions (OEA $F [2791] = 7.226, p < .001, \eta^2 = .018$). Post hoc tests showed differences in the appraisal of others' emotions between non-gamers and non-current gamers ($M_{NG} = 22.58, SD_{NG} = 3.12; M_{NCG} = 21.98, SD_{NCG} = 3.33; p = .006$), and non-gamers and current gamers ($M_{CG} = 21.77, SD_{CG} = 4.21; p = .002$).

Differences in Social Support Between Gaming Groups. Marginally significant differences were found between the three groups in perceived social support ($F = 2.873, p = .057, \eta^2 = .007$). Homogeneity of variance was tested with Levene's statistic ($F [2792] = .240, p = .787$). A MANOVA 3 (gaming groups) $\times$ 3 (social support components) was performed to estimate whether there are differences in total perceived social support and its components between non-gamers, non-current gamers, and current gamers. The assumption of homogeneity of variances was tested using Levene's test (Family $F [2792] = 1.494, p = .234$); Friends $F [2792] = .958, p = .384$; Other significant $F [2792] = 1.729, p = .178$). The assumption of homogeneity of covariance was tested using Box's M test ($14.307, F = 1.186, p = .286$).

Using Wilks Lambda, there was a statistically significant difference in perceived social support components between groups ($V = .977, F [6,1582] = 3.017, p = .006$). Separate univariate ANOVAs on the outcome variables revealed statistically significant differences in family social support (Family $F [2792] = 7.961, p < .001, \eta^2 = .020$). Post hoc tests showed differences in perceived family social support between current gamers and non-current gamers ($M_{CG} = 12.07, SD_{CG} = 3.65; M_{NCG} = 13.06, SD_{NCG} = 3.33; p < .001$), and non-gamers and current gamers ($M_{NG} = 13.15, SD_{NG} = 3.44; p = .004$).

Predictor Variables of Gaming Initiation

A binomial logistic regression analysis was performed since statistically significant differences were found between the non-gamers group and the other groups (non-current gamers and current gamers; Table 2). Sex was included as an independent variable in the regression model. For the first step of the regression analysis, sex (model 1) was selected; its incorporation in the model entailed a statistically significant reduction in the misfit of the null model ($\chi^2 (1) = 158.51, p < .001$). In the second and final step, the variable prosociality (model 2) was selected and led to a statistically significant reduction in misfit concerning model 1 ($\chi^2 (2) = 165.19, p < .001$). These improvements in model fit were also seen in the increase in the pseudovariance statistics explained by the models (R^2) and in the accuracy of the models (total percentage of cases correctly classified in each model). This better fit was verified by Hosmer and Lemeshow's test, which was not statistically significant ($\chi^2 (8) = 8.925, p = .349$). The Nagelkerke R^2 coefficient indicated that approximately 26% of the variability in the probability of being or having been a gamer is explained by the independent variables included in the model.

In addition, in the matrix of case classifications according to the observed value and the predicted value of the final model (model 2), it is observed that the final model presented an adequate predictive capacity in terms of sensitivity (77.3%), but not in terms of specificity (49.7%). Thus, people who were or are gamers were better classified (sensitivity) than the people who were not (specificity).

Final model equation was: $\text{logit}(\text{Gameplaying} = 1) = 1.621 + -.025(\text{Prosociality}) + 2.44(\text{Male Sex})$. The final model basically indicated that being male and having lower levels of prosociality characterized the profile of

Table 2. Measures of Global Adjustment and Results of the Final Binary Logistic Regression Model for Predicting Gaming Initiation (N = 798).

	-2LL	χ^2	df	R ² Cox y Snell	R ² Nagelkerke	Accuracy	95% CI for OR	
	871.73	165.19**	2	.188	.258	67.3		
Final model	β	SE	df	Wald	p	OR	LL	UL
Male sex	2.438	.262	1	86.337	<.001	11.455	6.85	19.16
Prosociality	-.024	.009	1	6.547	.011	0.976	0.958	0.994
Intercept	1.621	.634	1	6.536	.011	5.056		

Note. Final Model (Model 2) = $\text{logit}(\text{Gamers} = 1) = \beta_0 + \beta_1 \text{Male sex} + \beta_2 \text{Prosociality} + \varepsilon$. β = regression coefficient. SE = Standard Error. Df = degrees of freedom of Wald test. P = probability value associated with the Wald test. OR = Odds Ratio. 95% CI = 95% Confidence Interval for OR. LL = Lower limit. UL = Upper limit.

individuals who started playing video games. Furthermore, sex had a greater influence on gameplaying ($OR = 11.455$) than prosociality ($OR = 0.976$). Regarding the male sex variable and once the influence of the covariate prosociality on the probability of being/having been a gamer has been controlled, its regression coefficient ($\beta = 2.44$) and its odds ratio ($OR = 11.45$, 95% CI: 6.85, 19.16) indicate that males are 11.45 times more likely to be gamers compared to females. Regarding the variable prosociality, controlling for the influence of the covariate male sex, its regression coefficient ($\beta = -.025$) and its odds ratio ($OR = 0.975$, 95% CI: 0.958, 0.994) indicate that for each unit increase in prosociality, the odds of being a gamer are reduced by 2.5%.

Discussion

Video game playing is a growing habit among adolescents and young adults. However, the prevalence of problems associated with gaming is also growing. Studying variables in general gaming, that are also related to gaming disorder, may facilitate the prevention of gaming disorder. Study hypotheses H1, H2 and H4 were fully supported, H5 was partially supported and H3 was not supported.

Regarding H1, males predominated in the group of current gamers, while females predominated in the group of non-current gamers and non-gamers. These findings are consistent with gaming from a male-centric culture, as men have traditionally developed video games for a male audience (Lopez-Fernandez et al., 2019). However, these results contradict the fact that girls and women now play digital games at almost the same rate as boys and men (Melzer, 2018; PaaBen et al., 2017). The differences found could be due to an overrepresentation of competitive video game players, which represent a more male audience, as well as communities with higher gender stereotypes (Lange et al., 2021). It should be noted, however, that while gender stereotypes in video games are often accurate, actual sex differences tend to be overestimated.

Regarding H2, statistically significant differences were found between current gamers and non-gamers and non-current gamers and non-gamers. However, the longitudinal study by Lobel et al. (2017) indicated that gaming per se was not related to a change in the level of prosocial behavior of pre-adolescent child gamers. These results may indicate that individuals who have started playing video games have lower levels of prosociality than non-gamers, or that having played negatively impacts an individual's prosociality in later stages, such as early adulthood. The second possible explanation could be based on the General Learning Model, which predicts that video games can evoke short- and long-term effects through associations triggered by the content of a game (Buckley & Anderson, 2006). However, only those who play violent video games (Greitemeyer & Mügge, 2014), high-frequency competitive games (Lobel et al., 2017), and problematic gaming (Lemmens et al., 2015; Tomei et al., 2021) have been examined for reduced prosocial behavior, although some studies reported no relationship (Groves et al., 2015). The differences found in this study suggest a lower tendency for prosociality in those who have played or play video games, which opens new avenues for further research.

Regarding H3, no differences were found between the three groups. These results are in line with the idea that video game consumption itself is not a recreational habit linked to mental health problems, even though comorbidity with gaming disorder has been found (Richard et al., 2020). These similar results in the three groups may be due to several reasons. First, video games as a recreational activity facilitate recovery and contribute to mental health (Rieger et al., 2014). Second, there is a non-gamer population with lower mental health scores, which in turn does not encourage interest in playing video games and omits the potential benefit and enjoyment of this activity (Braun et al., 2015). Third, within the gamer groups, there is also a sector with low mental health scores, which are more associated with problematically inclined gaming (Wang et al., 2017, 2019). All this variability may indicate that no differences were found between groups.

Regarding H4, marginally significant differences were found between the groups. When examining its components, only differences in perceived family support were found between current and non-current gamers, and between non-gamers and current gamers. These findings are similar to those reported by Yoo (2024) with peer social support, who classified gamers according to their pattern of video game use over 5 years. This study found that the group with the highest peer social support scores were those gamers who had high initial hours of play and a subsequent decline in hours of gaming, compared to those with the reverse pattern (low initial hours and increasing over the years) and those who maintained high hours of gaming over the years. Similarly, the variable of family social support has been explored in groups of high-risk gamers, finding a negative relationship between general social support (von der Heiden et al., 2019) and family social support (Shan et al., 2023; Wang et al., 2023). These findings suggest that, in general, gaming behavior is related to variables that are also associated with gaming disorder. It is, therefore, necessary to explore the causes of these similarities to prevent problematic behavior.

Regarding H5, non-statistically significant differences between groups have been found regarding general emotional intelligence. However, when exploring the components of emotional intelligence, differences were found in the appraisal of others' emotional dimensions between the non-gamers and non-current gamers and non-gamers and current gamers groups. These results are in line with those found in the variable prosocial behavior, as the individual pays attention to whether others need help, which implies the perception and evaluation of EI's ability to perceive and express emotionally about others' environment and others' emotions (Wang et al., 2021). Thus, lower levels of the ability to understand others' emotionality are related to lower levels of prosocial behavior.

Finally, the binomial regression results indicated differences between the general group of gamers and non-gamers on sex and prosocial behavior. Thus, it highlights the importance of two relevant factors in gaming, male sex and levels of prosocial behavior. These results may indicate that people with lower levels of prosocial behavior are more likely to start or maintain gaming habits. These findings contrast with previous literature (Teng, 2008), as no differences were found between gamers and non-gamers on personality variables associated with prosociality, such as agreeableness (Hilbig et al., 2014). However, the review and meta-analysis by Akbari et al. (2021) found a small negative association between gaming and levels of agreeableness ($r = -.19$, 95CI $-.25$ to $-.12$).

It is important to highlight that prosociality has been identified as a protective factor against addictions. Specifically, regarding Internet addiction, Kasap et al. (2023) reported a negative association between Internet addiction and prosocial behavior. A systematic review by Esparza-Reig et al. (2021) pointed out that some studies suggest that prosocial behavior serves as a protective factor against gambling addiction, while others indicate that addiction can lead to prosocial behavior deficits. Additionally, the meta-analysis of Memmott-Elison et al. (2020) showed similar findings in the relationship between prosocial behavior and both externalizing and internalizing symptoms. They concluded that higher levels of prosocial behavior are associated with lower levels of these symptoms, which include risky behavior and substance use. Given the relevance of prosociality as a protective factor for different addictions, it is important to promote prosocial behaviors from these and previous life stages to reduce the likelihood of developing a pathology associated with gaming.

Limitations and Future Directions

This study has several limitations. Firstly, it is a cross-sectional study, so it lacks an experimental design that enables the establishment of causal relationships. Other potential limitations are the inability to collect data at multiple levels and the use of a national sample, limiting the generability of results. Likewise, the lack of considering differences in the number of hours of gaming among current gamers or not having previously asked whether the participants had psychopathological diagnoses may have been a source of bias in the study. Lastly, other potential limitations may be related to

the self-reported nature of the study. Future research may benefit from studies with similar variables but using a longitudinal design and collecting transcultural data at multiple levels.

Practical Implications

Among the practical implications of this study, two key aspects stand out. On the one hand, knowing what variables are related to gaming provides a baseline for understanding the generic particularities of this population. If the gamer population tends to have lower levels of prosociality compared to the non-gamer population, the gaming industry could generate video games that foster these abilities. On the other hand, this type of study can benefit social and health professionals by learning about possible characteristics of gamers and thus anticipating and facilitating preventive strategies for problem gaming adapted to the characteristics of the population.

Conclusion

The present study examines differences in sociodemographic and psychological variables between current gamers, non-current gamers, and non-gamers. The results indicate statistically significant differences in sex, prosociality, the appraisal of others' emotions component of emotional intelligence, general social support, and family social support between the three groups. When analyzing the relationship between being/having been a gamer and not being a gamer, differences were found in sex and prosociality, indicating that male sex and having lower levels of prosociality are associated with a higher probability of having started gaming.

Author Contributions

Júlia Gisbert-Pérez: Conceptualization, Data curation, Formal analysis, Methodology, Software, Writing – original draft. **Elena Cejalvo:** Conceptualization, Data curation, Methodology, Writing – original draft. **Manuel Martí-Vilar:** Investigation, Project administration, Resources, Visualization. **Laura Badenes-Ribera:** Data curation, Formal analysis, Methodology, Software, Supervision, Writing – review and editing.

Declaration of Conflicting Interests

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Ethical Statement

Ethical Approval

The Institutional Review Board of the University of Valencia approved the protocol (no. 2023-MAG-2988759).

Informed Consent

Respondents gave written consent for review and signature before starting interviews.

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Data Availability Statement

Data will be made available on request.

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Exploring Psychosocial Traits Across Italian Current Gamers, Non-Current Gamers, and Non-Gamers

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ABSTRACT

The increasing prevalence of gaming and the problems associated with it have sparked interest in examining the differences between gamers and non-gamers. This study aims to investigate whether psychological variables, such as prosociality, emotional intelligence, social support, and mental health, differ among current gamers, non-current gamers, and non-gamers. A quantitative study was conducted using a convenience sample of Italian university students ($N=717$, $Mean_{age} = 22.15$, $SD_{age} = 3.49$; 49.4% female). One-way analyses of variance (ANOVAs) and multivariate analyses of variance (MANOVAs) were employed to compare the three groups. In addition, two binomial logistic regressions were conducted using statistically significant variables to identify the most important predictors of gaming initiation and gaming maintenance. Results indicate that males, particularly older males, and those exhibiting lower levels of prosociality were more likely to initiate gaming. Furthermore, being male, older, and having greater ability to assess one's own emotions were associated with a higher likelihood of maintaining gaming behavior.

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Introduction

Gaming is a popular leisure activity enjoyed by people of all ages. Video games provide interactive experiences that immerse players in virtual environments, featuring a variety of genres and objectives (Jenkins, 2009). Furthermore, gaming serves as an effective means of stress relief, relaxation, and social interaction (Stockdale & Coyne, 2018). With its growing influence, the number of gamers is expected to exceed 3 billion by 2024 (Georgiev et al., 2024). This surge in popularity has also prompted academic interest in examining the psychosocial factors associated with gaming, particularly in areas such as education and well-being.

There are primarily two ways to conceptualize what it means to be a gamer. From an objective standpoint, the term gamer refers to individuals who play video games (Alsaad et al., 2022; Macur & Pontes, 2021), which is the most commonly used approach in academic contexts. However, from a subjective perspective, being a gamer is more about identity. Gamer identity focuses on the social construction of the gamer, including attachment to specific types of gaming, performance, and knowledge (Shaw, 2013). This perspective highlights that many people who

play video games do not consider themselves gamers because they do not feel represented by these characteristics.

Video games have traditionally been associated with both benefits and harms, including conditions such as gaming disorder (American Psychiatric Association, 2022; Sublette & Mullan, 2012). Previous literature has highlighted controversial relationships with gaming, especially regarding the influence of the gaming disorder, such as age and sex (Buono et al., 2020), prosocial behavior (Greitemeyer, 2022), emotional intelligence (Villani et al., 2018), social support (Lobel et al., 2017), and mental health (Sauter et al., 2021).

Gaming is traditionally associated with male children and adolescents. However, recent statistics suggest that young adults are increasingly engaging in gaming (Entertainment Software Association, 2018). In this context, the prevalence of internet gaming disorder (IGD) is rising among adolescents and adults (8.8–10.4%; Gao et al., 2022). Within this age group, university students are an at-risk population for developing IGD (Ohayon & Roberts, 2021). In a sample of 221 Italian university students, it was estimated that approximately 85% of the students were at risk for IGD, and 15% met the criteria for a diagnosis of IGD (De Pasquale et al., 2018). According to previous studies, the prevalence of IGD in university students from different countries ranged from 3.8% to 11% (Chiang et al., 2021; Ohayon & Roberts, 2021). The variability found across studies emphasizes the need for country-specific research to ensure accuracy.

Sex also plays a significant role in gaming. The gaming industry has historically catered to a predominantly male audience, generating content that often reflects this bias (Lopez-Fernandez et al., 2019). Female characters are frequently portrayed in an objectified manner, contributing to a misogynistic environment (Lopez-Fernandez et al., 2019). Despite this, female gamers account for an estimated 45% of the gaming community (Entertainment Software Association, 2018). In summary, the gaming industry is becoming more inclusive. This highlights the need to explore potential sociodemographic differences between individuals who do not play games, those who begin but then stop, and those who continue gaming regularly.

Two systematic reviews and meta-analyses suggest that prosocial behavior and emotional intelligence could act as protective factors against the development of gaming-related problems (Esparza-Reig et al., 2021; Gisbert-Pérez et al., 2024). Prosocial behavior has mostly been examined in relation to prosocial video games, assessing whether these games promote prosocial actions (Greitemeyer, 2022; Greitemeyer & Osswald, 2010). Emotional intelligence has been reported as a factor negatively associated with IGD; individuals with lower emotional intelligence are more likely to experience psychological issues, which can contribute to problematic gaming (Kircaburun et al., 2020). However, the relationship between the recreational consumption of commercial video games and these two variables is less understood. This raises the question of whether individuals with lower emotional intelligence and prosocial behavior tend to play more video games or whether the habit of gaming itself amplifies these differences.

There are two perspectives on the relationship between gaming and perceived social support. Video games provide opportunities for virtual social connections. Research indicates that virtual friends within the gaming community often have higher quality interactions than offline friendships, highlighting the social potential of video games (Frederick & Zhang, 2022). Nevertheless, problematic gaming has also been linked to a lack of social support and skills (Paaßen et al., 2017). In this regard, studies have shown that the number of hours spent gaming is negatively correlated with perceived general and family social support (Wartberg et al., 2017). Therefore, it is essential to explore whether individuals begin playing video games due to a need for social support and to examine the differences between those who continue gaming and those who have never engaged in it.

Considering the increasing problems associated with gaming, another relevant variable in the study of gaming is mental health. In terms of depression and anxiety, video games appear to be a positive means of reducing symptoms (Allaire et al., 2013; Kowal et al., 2021). However, other studies have indicated higher levels of depression and anxiety in gamers compared to non-gamers, although this association is more pronounced in problematic gaming (Chung et al.,

2020; J. L. Wang et al., 2019; Wartberg et al., 2017). Thus, though there is evidence of a positive relationship between mental health and gaming, this relationship can shift to a negative one when unhealthy gaming patterns develop (C. Wang et al., 2017). Investigating whether this shift occurs during the initiation or maintenance of gaming could provide valuable insights into the evolving relationship between gaming and mental health.

The increasing prevalence of gaming disorder and the controversial results of studies on variables associated with gaming underscore the importance of analyzing which variables are associated with the initiation and maintenance of gaming behavior in university students.

Aim of the study

This aim of this study was to investigate the factors associated with the initiation and maintenance of gaming among Italian university students. In particular, it focuses on prosocial behavior, mental health, perceived social support, and emotional intelligence. In line with the aforementioned literature, these variables were selected because they have been differentially linked to gaming and gaming disorder to assess whether differences emerge at the onset of gaming or during its maintenance.

Methods

Sample and procedure

A cross-sectional study was conducted through the administration of an online survey. The survey was distributed in university classrooms, and informed consent was obtained from all participants prior to data collection. The study was conducted in accordance with the ethical principles outlined in the 1964 Declaration of Helsinki and its subsequent amendments, as well as with comparable ethical standards. Ethical approval was granted by the Institutional Review Board of the University of Turin (Protocol No. 0592473).

The target population consisted of university students. Inclusion criteria specified that participants be Italian-speaking university students aged 18 years or older. A total of 717 participants were recruited. The mean age of the sample was 22.15 years ($SD = 3.49$), and 49.4% ($n = 354$) of the participants identified as female. Participants were categorized into three groups based on their gaming status: current gamers, non-current gamers, and non-gamers. This categorization enabled an examination of whether associations with psychological variables persist following the cessation of gaming activity.

Measures

Demographic variables such as sex, age, age of gaming onset, and current gaming status were recorded. Current gaming behavior was assessed with the question “Do you currently play video games?” with the following response options: “Yes,” “No, but used to,” and “No.”

The Adult Prosocialness Behavior Scale (APBS; original Italian version of Caprara et al., 2005) was used to assess individuals’ propensity to engage in prosocial behaviors. The scale evaluates four specific dimensions: sharing, helping, caretaking, and empathizing with others’ needs (Badenes-Ribera et al., 2022). It consists of 16 items rated on a 5-point Likert scale, from 1 (*never/almost never*) to 5 (*always/almost always*). Higher values indicate a stronger presence of prosocial behavior. In the present study, Cronbach’s alpha was .933, and McDonald’s omega was .932.

The General Health Questionnaire–12 (Goldberg & Williams, 1988; Italian validation of Politi et al., 1994) was used to assess general mental health. The scale consists of 12 items describing various mood states, rated on a 4-point Likert scale, from 0 (*never*) to 3 (*always*). Higher scores

on the General Health Questionnaire–12 indicate better general mental health. In the present study, Cronbach's alpha was .848, and McDonald's omega was .835.

The Wong Law Emotional Intelligence Scale (Wong & Law, 2002; Italian validation of Iliceto & Fino, 2017) was employed to assess emotional intelligence. Based on the definition of Mayer and Salovey (1997), this scale measures four dimensions: appraisal of one's own emotions (SEA), appraisal of others' emotions (OEA), emotion awareness (EA), and emotion regulation (ER). This scale consists of 16 items rated on a 7-point Likert scale, from 1 (*totally disagree*) to 7 (*totally agree*). Higher scores indicate higher emotional intelligence. In the present study, the Cronbach's alpha was .927, and the McDonald's omega was .921 for the total scale. The SEA subscale had a Cronbach's alpha of .700 and a McDonald's omega of .699. The OEA subscale had a Cronbach's alpha of .718 and a McDonald's omega of .724. The EA subscale had a Cronbach's alpha of .659 and a McDonald's omega of .657. The ER subscale had a Cronbach's alpha of .744 and a McDonald's omega of .747.

The Multidimensional Scale of Perceived Social Support (Zimet et al., 1988; Italian validation of Di Fabio & Busoni, 2008) was used to assess perceived social support across three dimensions: family support (FS), peer support (PS), and support from significant others (OS). This scale comprises 12 items rated on a 4-point Likert-type response scale ranging from 1 (*never or almost never*) to 4 (*always or almost always*). Higher scores indicate higher perceived social support. In the present study, the Cronbach's alpha was .898, and the McDonald's omega was .876 for the total scale. The FS subscale had a Cronbach's alpha of .770 and a McDonald's omega of .641. The PS subscale had a Cronbach's alpha of .710 and a McDonald's omega of .698. The OS subscale had a Cronbach's alpha of .690 and a McDonald's omega of .699.

Statistical analysis

The data were double-checked for accuracy. Prior to analysis, participants were categorized into three groups: non-gamers (NGs), non-current gamers (NCGs), and current gamers (CGs). Univariate skewness and kurtosis values for all variables fell within conventional ranges for normality (−2 to 2 for skewness and −7 to 7 for kurtosis; George & Mallery, 2010; Hair et al., 2010). Missing values for each variable were below 1%, indicating that they are unlikely to bias the estimates (Graham, 2009). Therefore, no imputation procedures were applied.

Descriptive statistics were calculated for the sociodemographic characteristics of the overall sample and each of the three groups. Pearson's chi-square and Cramer's *V* tests were used to examine sex differences across groups, with Cramer's *V* serving as the effect size measure. Means and standard deviations are reported for continuous variables, and frequencies and percentages are used for categorical variables.

To assess group differences in prosocial behavior, mental health, perceived social support, and overall emotional intelligence, one-way analyses of variance (ANOVAs) were conducted. When the assumption of homogeneity of variances was violated, the Welch test was applied. A multivariate analysis of variance (MANOVA) was performed to examine differences across the dimensions of emotional intelligence. Partial eta squared was used as the effect size measure (η^2). Depending on the assumption of normality, either Pillai's trace or Wilks' lambda was used to evaluate MANOVA significance. Post hoc comparisons were conducted using Bonferroni and Games-Howell tests, depending on the equality of variances.

Finally, two stepwise binomial logistic regression analyses (Silva & Barroso, 2004) were conducted to examine which variables predicted the onset of gaming and the maintenance of gaming. Variables found to be statistically significant in the ANOVA and MANOVA were included as predictors, along with sex and age.

To assess the fit of the logistic regression model, several tests were performed (Hahs-Vaughn & Lomax, 2020): (a) the χ^2 test assessed the overall model fit based on changes in deviance (−2LL); (b) the Hosmer-Lemeshow test evaluated goodness of fit, and Cox-Snell R^2 and Nagelkerke's R^2 indices measured the proportion of variance explained (pseudo R^2); (c) model

classification performance was assessed in terms of accuracy, sensitivity, and specificity; and (d) the Z-statistic compared the predictive accuracy of the final model against the null model (Pardo & Ruiz, 2012). The Wald statistic was used to determine whether each regression coefficient differed significantly from zero. In addition, odds ratios (ORs) with 95% confidence intervals (CIs) were calculated as measures of effect size to test whether the effect of each independent variable significantly differed from the null effect ($OR = 1$).

All statistical analyses were conducted using IBM SPSS Statistics v28 (IBM Corp., 2021).

Results

Comparison of sociodemographic characteristics between the groups

Table 1 presents the sociodemographic characteristics of participants by group. Significant differences in age were observed across the groups, $F = 19.469$, $p < .001$, $\eta^2 = 0.052$. Sex distribution also differed significantly among the three groups, $\chi^2 = 170.715$, $p < .001$, Cramér's $V = 0.488$. Specifically, females were overrepresented in the non-gamer and non-current gamer groups (95.3% and 58.3%, respectively), and males were the majority in the current gamer group (69.3%).

Differences between the groups in the study variables

Differences in prosociality between gaming groups

Statistically significant differences between the groups were found, $F(2, 324) = 13.047$, $p < .001$. Differences in prosociality were found between the group of current gamers and non-gamers ($M_{CG} = 60.11$, $SD_{CG} = 11.85$; $M_{NG} = 65.11$, $SD_{NG} = 9.36$; $p < .001$) and between non-current gamers and non-gamers ($M_{NCG} = 60.22$, $SD_{NCG} = 13.11$; $p < .001$).

Differences in mental health between gaming groups

Nonstatistically significant differences were found between the three groups in mental health, $F = 1.451$, $p = .235$, $\eta^2 = 0.004$.

Differences in emotional intelligence between gaming groups

Statistically significant differences among groups were found, $F(2, 296) = 9.176$, $p < .001$. A 3 (gaming groups) $\times$ 4 (components of emotional intelligence) MANOVA showed statistically significant differences in the variances in appraisal of one's own emotions, emotional awareness, and emotional regulation (SEA $F[2, 713] = 6.664$, $p = .001$; EA $F[2, 713] = 4.402$, $p = .013$; ER $F[2, 713] = 3.611$, $p = .028$). Using Pillai's trace, there was a statistically significant difference in the components of emotional intelligence between the groups, $V = 0.49$, $F(8, 1,422) = 4.44$, $p < .001$. Separate univariate ANOVAs on the outcome variables revealed statistically significant differences in the appraisal of other emotions (OEA $F[2, 713] = 5.578$, $p = .004$, $\eta^2 = 0.015$), the appraisal of one's emotions (SEA $F[2, 713] = 13.840$, $p < .001$, $\eta^2 = 0.037$), emotional awareness (EA $F[2, 713] = 8.239$, $p < .001$, $\eta^2 = 0.023$), and emotional regulation (ER $F[2, 713] = 8.629$, $p < .001$, $\eta^2 = 0.024$).

Post hoc tests showed differences in OEA between current and non-current gamers ($M_{CG} = 19.11$, $SD_{CG} = 4.76$, $M_{NCG} = 17.83$, $SD_{NCG} = 5.29$; $p = .009$). Differences in SEA were found

Table 1. Demographic data by gaming groups.

	Non-gamers	Non-current gamers	Current gamers	Total
<i>N</i>	128	187	402	717
Female (%)	95.3	58.3	30.6	49.4
Mean age (<i>SD</i>)	20.94 (2.43)	21.50 (3.41)	22.83 (3.65)	22.15 (3.49)
Mean age gaming onset (<i>SD</i>)		9.34 (3.05)	8.25 (3.13)	

between current and non-current gamers ($M_{CG} = 19.39$, $SD_{CG} = 4.56$, $M_{NCG} = 17.21$, $SD_{NCG} = 5.55$; $p < .001$) and between current gamers and non-gamers ($M_{NG} = 17.98$, $S_{NG} = 4.73$; $p = .010$). Differences in EA were found between current and non-current gamers ($M_{CG} = 18.43$, $SD_{CG} = 4.74$, $M_{NCG} = 16.76$, $SD_{NCG} = 5.41$; $p = .001$) and between current gamers and non-gamers ($M_{NG} = 17.29$, $S_{NG} = 4.51$; $p = .039$). Differences in ER were found between current and non-current gamers ($M_{CG} = 19.29$, $SD_{CG} = 4.81$, $M_{NCG} = 17.54$, $SD_{NCG} = 5.64$; $p < .001$) and between current gamers and non-gamers ($M_{NG} = 18.02$, $S_{NG} = 5.02$; $p = .034$).

Differences in social support between the gaming groups

Statistically significant differences in social support were found among groups, $F(2, 329) = 4.713$, $p = .010$. A 3 (gaming groups) $\times$ 3 (components of social support) MANOVA revealed significant differences in all dimensions of social support (family $F[2, 714] = 9.557$, $p < .001$; peers $F[2, 714] = 7.862$, $p < .001$; other significant $F[2, 714] = 4.379$, $p = .013$). Using Pillai's trace, there was a statistically significant difference in the components of social support between the groups, $V = 0.14$, $F(6, 1,426) = 1.65$, $p = .000$. Separate univariate ANOVAs on the outcome variables revealed statistically significant differences in social support from family, $F(2, 714) = 3.219$, $p = .041$, $\eta^2 = 0.009$, social support from peers, $F(2, 714) = 2.350$, $p = .096$, $\eta^2 = 0.007$, and other significant social support, $F(2, 714) = 3.309$, $p = .037$, $\eta^2 = 0.009$.

Post hoc tests showed differences in FS between current gamers and non-gamers ($M_{CG} = 12.53$, $SD_{CG} = 3.08$, $M_{NG} = 13.30$, $SD_{NG} = 2.43$; $p = .010$). Differences in PS were found between current gamers and non-gamers ($M_{CG} = 11.85$, $SD_{CG} = 2.93$, $M_{NG} = 12.47$, $SD_{NG} = 2.26$; $p = .034$). Differences in OS were found between non-gamers and current gamers ($M_{NG} = 13.17$, $SD_{NG} = 2.29$, $M_{CG} = 12.51$, $SD_{CG} = 2.85$; $p = .021$) and between non-gamers and non-current gamers ($M_{NCG} = 12.42$, $SD_{NCG} = 2.95$; $p = .030$).

Predictor variables of gaming onset

A binomial logistic regression analysis using the forward selection likelihood ratio (LR) method was conducted to assess the relationship between predictor variables and the likelihood of gaming initiation. The stepwise forward selection LR procedure is summarized in Table 2. Age and sex were included as independent variables in the regression model.

Sex (Model 1) was selected for the first step of the regression analysis, and its inclusion in the model resulted in a statistically significant reduction in the misfit of the null model, $\chi^2(1) = 154.309$, $p < .001$. In the second step, age (Model 2) was selected and resulted in a statistically significant reduction in misfit compared to model 1, $\chi^2(2) = 161.576$, $p < .001$. In the third step, prosociality (Model 3) was selected and resulted in a statistically significant reduction in the misfit of Model 2, $\chi^2(3) = 166.637$, $p < .001$. These improvements in model fit were also evident in the increase in the pseudovariance statistic explained by the models (R^2) and in the accuracy of the models (overall percentage of cases correctly classified in each model). This better fit was verified by Hosmer and Lemeshow's test, which was not statistically significant

Table 2. Variable selection process: Measures for global adaptation of the models.

	−2LL	χ^2	<i>df</i>	R^2 Cox-Snell	R^2 Nagelkerke	Accuracy
Model 0	675.83	—	—	—	—	82.3
Model 1	514.99	154.30*	1	.194	.319	82.3
Model 2	507.72	161.57*	2	.202	.333	82.3
Model 3	502.66	166.63*	3	.208	.342	82.1

* $p < .001$.

Model 0 = $\text{logit}(\text{Gamers}=1) = \beta_0 + \varepsilon$

Model 1 = $\text{logit}(\text{Gamers}=1) = \beta_0 + \beta_1 \text{Malesex} + \varepsilon$

Model 2 = $\text{logit}(\text{Gamers}=1) = \beta_0 + \beta_1 \text{Malesex} + \beta_2 \text{Age} + \varepsilon$

Model 3 = $\text{logit}(\text{Gamers}=1) = \beta_0 + \beta_1 \text{Malesex} + \beta_2 \text{Age} + \beta_3 \text{Prosociality} + \varepsilon$

(Model 3: $\chi^2[8]=13.363$, $p = .100$). The Nagelkerke R^2 coefficient showed that approximately 34.2% of the variability in the probability of being or having been a gamer is explained by the independent variables included in the model.

Table 3 contains the estimates of the regression coefficients. The final model equation is $\text{logit}(\text{GamingInitiation}=1) = -0.046 + 0.105(\text{Age}) + 3.241(\text{MaleGender}) + -0.024(\text{Prosociality})$. The results show that males are 25.55 times more likely to be gamers than females, which has the greatest influence on gaming initiation. Furthermore, for every unit increase in age and prosociality, the likelihood of gaming initiation increases by 11% and decreases by 2.4%.

Predictor variables of gaming maintenance

A second binomial logistic regression analysis was performed using the forward selection LR method to assess the relationship between predictor variables and the likelihood of maintaining the current gaming. The stepwise forward selection LR procedure is summarized in Table 4. Age and sex were included as independent variables in the regression model.

Sex (Model 1) was selected for the first step of the regression analysis; its incorporation in the model resulted in a statistically significant reduction in the misfit of the null model, $\chi^2(1) = 40.317$, $p < .001$. In the second step, age (Model 2) was selected and resulted in a statistically significant reduction in misfit compared to model 1, $\chi^2(2) = 60.135$, $p < .001$. In the third step, SEA (Model 3) was selected and resulted in a statistically significant reduction in misfit relative to model 2, $\chi^2(3) = 70.537$, $p < .001$. These improvements in model fit were also evident in the increase in the pseudovariance statistic explained by the models (R^2) and in the accuracy of the models (total percentage of cases correctly classified in each model). This better fit was verified by Hosmer and Lemeshow's test, which was not statistically significant (Model 3: $\chi^2[8]=4.982$, $p = .759$). The Nagelkerke R^2 coefficient indicates that approximately 15.8% of the variability in the probability of being or having been a gamer is explained by the independent variables included in the model.

Table 5 contains the estimates of the regression coefficients. The final model equation is $\text{logit}(\text{ContinuedGaming}=1) = -3.168 + 0.087(\text{Age}) + 1.063(\text{Malegender}) + 0.077(\text{SEA})$. The results show that males are 2.89 times more likely to be gamers than females, which has the greatest impact on gaming maintenance. In addition, the likelihood of gaming maintenance increases by 9.1% and by 8% for each unit increase in age and appraisal of one's emotions, respectively.

Table 3. Results of the binary logistic regression model predicting gaming initiation ($N=717$).

	β	SE	df	Wald	p	OR	95% CI for OR	
							Lower limit	Upper limit
Age	0.105	0.039	1	7.316	.007	1.110	1.029	1.198
Male sex	3.241	0.030	1	56.821	<.001	25.549	11.001	59.334
Prosociality	-0.024	0.011	1	4.817	.028	0.976	0.956	0.997
Intercept	-0.046	1.042	1	0.002	.965	0.955		

Table 4. Variable selection process: Measures of global fit of the models.

	-2LL	χ^2	df	R^2 Cox-Snell	R^2 Nagelkerke	Accuracy
Model 0	735.596	—	—	—	—	68.2
Model 1	695.122	40.317*	1	.066	.093	68.2
Model 2	675.903	60.135*	2	.097	.136	71.6
Model 3	668.569	70.537*	3	.113	.158	70.4

* $p < .001$.

Model 0 = $\text{logit}(\text{Gamers}=1) = \beta_0 + \varepsilon$

Model 1 = $\text{logit}(\text{Gamers}=1) = \beta_0 + \beta_1 \text{Malesex} + \varepsilon$

Model 2 = $\text{logit}(\text{Gamers}=1) = \beta_0 + \beta_1 \text{Malesex} + \beta_2 \text{Age} + \varepsilon$

Model 3 = $\text{logit}(\text{Gamers}=1) = \beta_0 + \beta_1 \text{Malesex} + \beta_2 \text{Age} + \beta_3 \text{SEA} + \varepsilon$

Table 5. Results of the binary logistic regression model predicting the maintenance of gaming ($N=589$).

	β	SE	df	Wald	p	OR	95% CI for OR	
							Lower limit	Upper limit
Age	0.087	0.027	1	9.982	.002	1.091	1.033	1.151
Male sex	1.063	0.189	1	31.658	<.001	2.894	1.999	4.191
SEA	0.077	0.019	1	16.846	<.001	1.080	1.041	1.121
Intercept	-3.168	0.683	1	21.503	<.001	0.042		

Discussion

Gaming continues to rise in popularity among adolescents and young adults. Although gaming can serve as a leisure activity, the prevalence of problems associated with excessive gaming, such as gaming disorders, is also increasing. This study aimed to identify the predictors of gaming behavior, focusing on factors influencing both the initiation and continuation of gaming. By examining these predictors, the study sought to highlight potential pathways leading to problematic gaming and to inform prevention efforts.

Findings revealed that males predominated among current gamers, and females were more prevalent in the non-current gamer and non-gamer groups. These results align with prior research suggesting that gaming is embedded in a predominantly male culture (Lopez-Fernandez et al., 2019), with males more likely to engage in gaming behavior (Spilková et al., 2017). However, other studies have reported a more sex-balanced gaming population (Melzer, 2018; Paaßen et al., 2017). Such discrepancies may be explained by the social nature of certain games and the dominance of competitive genres, which often have a lower proportion of female players due to prevailing gender stereotypes (Lange et al., 2021). Interestingly, current gamers in this sample were older than participants in the other two groups, contradicting previous findings that younger individuals are typically more engaged in video game use (Festl et al., 2013).

Regarding psychological variables, significant differences were observed across the groups in prosociality, emotional intelligence, and perceived social support. Differences in prosociality emerged between non-gamers and both current and non-current gamers. For emotional intelligence, significant differences were found between current gamers and both non-current gamers and non-gamers. Similarly, current gamers reported different levels of perceived social support compared to non-gamers. These findings are consistent with previous research demonstrating psychological differences between gamers and non-gamers (Braun et al., 2016) and extend the literature by showing distinctions not only between gamers and non-gamers but also between those who continue and those who discontinue gaming. No significant differences were found in general mental health across the groups. This contrasts with earlier findings suggesting that recreational gamers tend to report better mental health than non-gamers, with reversed results among female gamers (Finserås et al., 2022). The lack of significance in this study could be due to the overrepresentation of females in the non-gamer group, which may have elevated average mental health scores, or the presence of participants with gaming disorder, which may obscure the potential benefits of recreational gaming.

The first binomial logistic regression analysis indicated that being male, being older, and having lower levels of prosocial behavior were associated with a higher likelihood of having initiated gaming. These findings are in line with previous research suggesting that individuals who begin playing video games often exhibit lower prosocial tendencies than non-gamers (Gisbert-Pérez et al., 2025). However, longitudinal data from Lobel et al. (2017) showed no significant changes in children’s prosocial behavior associated with gaming. Notably, previous research has linked reduced prosociality to specific types of games, such as violent (Greitemeyer & Mügge, 2014) and competitive (Lobel et al., 2017) games. This suggests that the relationship between gaming and prosocial behavior may be moderated by game content and individual characteristics, underlining the need for further research.

The second binomial regression analysis showed that being male, being older, and having a greater ability to recognize one's own emotions were associated with the continuation of gaming in young adulthood. These results diverge from those observed in individuals with problematic gaming behaviors, who tend to exhibit lower emotional competence (Seo et al., 2012). It is possible that regular, nonproblematic gaming may serve as an adaptive coping mechanism for individuals with higher emotional awareness, potentially enhancing their emotional regulation abilities (Villani et al., 2018).

Taken together, the findings suggest that individuals with lower levels of prosociality are more likely to initiate gaming, and continued gaming may be associated with greater emotional intelligence. Given that both prosociality and emotional intelligence are recognized as protective factors against various behavioral and substance-related addictions (Esparza-Reig et al., 2021; Gisbert-Pérez et al., 2024; Tolga et al., 2023), promoting these skills during adolescence and early adulthood may be critical in reducing the risk of problematic gaming (Lemmens et al., 2015; Tomei et al., 2021). Moreover, encouraging the adaptive use of video games could offer psychological and emotional benefits to players, supporting a healthier relationship with gaming.

Limitations and future directions

This study has several limitations that should be acknowledged. First, the sample consisted exclusively of university students, which may limit the generalizability of the results to the broader population of young adults. Second, the cross-sectional design precludes the establishment of causal relationships between variables. Third, information such as the duration of gaming among non-current gamers was not collected, limiting the interpretation of factors related to gaming cessation. Future research should aim to address these gaps by identifying variables that predict the maintenance of gaming behavior. Finally, the reliance on self-report measures may introduce biases, such as social desirability, potentially affecting the accuracy of the results. Future studies would benefit from employing longitudinal designs and more diverse samples of young adults to enhance the robustness and applicability of the findings.

Practical implications

Understanding the factors that predict the onset and continuation of gaming behavior is crucial, because it establishes a baseline for identifying the characteristics of the gaming population. If individuals who begin gaming tend to exhibit lower levels of prosocial behavior, this presents an opportunity for the gaming industry to develop and promote content that fosters these skills. In addition, these findings can be valuable to social and health professionals because they provide insight into the potential characteristics of gamers. Such knowledge can inform the design of targeted prevention and intervention strategies for problematic gaming, tailored to the specific needs of this population.

Conclusion

The present study examined differences in sociodemographic and psychological variables among current gamers, non-current gamers, and non-gamers. The findings indicate that being male, being older, and exhibiting lower levels of prosociality are associated with a greater likelihood of initiating gaming behavior. Furthermore, being male, being older, and having a stronger ability to assess one's own emotions were linked to a higher likelihood of maintaining gaming behavior. These results highlight the existence of distinct profiles between individuals who initiate gaming and those who sustain it over time, an important consideration for the development of targeted interventions aimed at preventing problematic gaming.

Code availability

We used SPSS 29 software available from our university.

Disclosure statement

No potential conflict of interest was reported by the authors.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants included in the study.

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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RESEARCH

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Gaming onset and engagement among university students: a question of mismanaged emotions?

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Abstract

Background Gaming and associated psychological concerns have become increasingly prevalent among young adults in Latin America. However, little is known about the psychosocial factors that distinguish current, former, and non-gamers in this population.

Methods A cross-sectional survey design was used with a convenience sample of 1,318 university students in Mexico ($M_{age} = 19.90$, $SD = 1.67$; 46.5% female). Participants completed measures of prosocial behavior, emotional intelligence, perceived social support, and mental health. One-way ANOVAs and MANOVAs were conducted to examine group differences across gamer profiles. Additionally, three binomial logistic regressions were performed to identify predictors of gaming onset and sustained engagement.

Results Significant differences were found across the three gamer profiles, particularly between current gamers and the other groups. Current gamers were more likely to be male and exhibited lower levels of emotional intelligence and prosocial behavior. Sex was the only significant predictor of gaming onset, with males being approximately eight times more likely to begin gaming ($OR = 8.08$, 95% CI [5.61, 11.64]). Maintenance of gaming was associated with being male ($OR = 1.57$, 95% CI [1.22, 2.02]) and having lower emotional awareness ($OR = 0.95$, 95% CI [0.92, 0.97]). Being a current gamer was significantly predicted by male sex ($OR = 9.67$, 95% CI [6.61, 14.15]) and lower emotional intelligence ($OR = 0.98$, 95% CI [0.97, 0.99]).

Conclusions These findings highlight distinct emotional and sociodemographic profiles among current and former gamers. They suggest that emotional intelligence, particularly emotional awareness, may play a key role in maintaining gaming behavior. The results have potential implications for designing targeted prevention strategies for gaming disorder among university students.

Keywords Gaming, Differences, University, Emotional intelligence, Sex, Higher education, Innovational education

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Introduction

Video games have become one of the most prevalent and engaging forms of leisure in contemporary society. The gaming industry has witnessed rapid and sustained growth, leading to a wide array of genres and formats that appeal to an increasingly diverse global audience [1]. Objectively, the term *gamer* refers to individuals who engage in video gaming [2, 3]. While the stereotypical image of gamers often evokes white, heterosexual adolescent males, the actual gaming population is far more heterogeneous [4, 5]. For instance, gaming has gained substantial popularity across other demographic segments, including adults [6]. Yet, this raises the question: Is gaming experienced and characterized similarly across different life stages?

Young adulthood is a critical period of biological, psychological, and social development. In early adulthood stages, important processes that began in adolescence, such as brain maturation, identity formation, and the development of meaningful relationships, are still in progress [7]. Although young adulthood signifies more advanced maturation, it is often characterized by a distinct period of instability and vulnerability [7]. Adolescents frequently use video games as a cathartic activity—to disconnect from school or family duties, or to deal with negative emotions [8]. These developmental differences could mean that gaming may be used for different purposes. Therefore, analyzing the psychosocial aspects of gaming in young adults may reveal differences compared to earlier stages.

The expansion of the gaming industry is occurring heterogeneously worldwide. While the main video game powerhouses are the US and China [9], other regions are also experiencing growth. Notably, Latin America has emerged as the fastest-growing area in the global video game market, with Brazil and Mexico playing significant roles in this progression [10]. In 2024, Mexico leads the region in video game consumption, boasting 76 million gamers [11]. This differential development has sparked interest due to its economic impact and the potential psychosocial implications for emerging gaming countries.

Gaming is associated with both benefits and drawbacks, including the risk of Internet Gaming Disorder (IGD) [12, 13]. However, research on the factors related to gaming has produced mixed results, particularly concerning sociodemographics [4]. Additionally, psychosocial variables such as prosocial behavior [14], emotional intelligence [15], perceived social support [16], and mental health [17] also show varied findings.

As mentioned above, gaming has been traditionally associated with younger male individuals; however, more females and young adults are now part of the gaming community [18, 19]. It is estimated that female gamers now make up 45% of this population [18]. Meanwhile,

the prevalence of IGD is rising among both adolescents and adults, with prevalence estimates ranging from 8.8% to 10.4% [20]. University students appear to be an at-risk group for developing IGD [21]. A pre-COVID study in Mexico estimated the prevalence of IGD among university students at 5.2% (95% CI: 4.7–5.8%) [22], while international estimates range from 3.8% to 11% [20, 21]. The variability observed across studies, along with the increasing inclusiveness of the gaming industry, highlights the need for country- and age-specific research that investigates potential differences between gaming and non-gaming conditions.

Previous systematic reviews and meta-analyses suggest that prosocial behavior and emotional intelligence may serve as protective factors against the development of gaming-related issues [23, 24]. Prosocial behavior has largely been studied in prosocial video games to explore their influence on positive social actions [14, 25]. Emotional intelligence, meanwhile, has been identified as negatively associated with IGD [26]. Individuals with lower emotional intelligence are more likely to experience psychological difficulties that could increase their vulnerability to problematic gaming [27]. However, the relationship between emotional intelligence, prosocial behavior, and recreational gaming is less understood. It remains unclear whether emotional intelligence plays a role in the initiation or maintenance of gaming behavior.

The relationship between social support and gaming has also been studied from two perspectives. On the one hand, video games provide a platform to develop new social connections. Frederick and Zhang [28] studied the quality of social relationships inside and outside video games. Their results indicated that online relationships among college gamers were of better quality than offline relationships, whereas the opposite results were found for non-gamers. However, they found a higher quality of offline relationships in gamers and non-gamers in a larger non-university sample. Moreover, problematic gaming has also been linked to lower social skills and support [29]. Research has shown that the number of hours spent gaming is negatively correlated with perceived general and family social support [30]. Therefore, it is important to explore whether individuals start gaming out of a need for social support and to examine the differences between those who continued gaming as young adults and those who have never played.

Mental health exhibits a complex, non-linear relationship with gaming. On one hand, recreational gaming has been associated with reductions in symptoms of depression and anxiety [31, 32]. On the other hand, several studies report that gamers—particularly those who engage in problematic or excessive gaming—often experience elevated levels of depression and anxiety relative to non-gamers [33–35]. These divergent findings suggest

that while gaming may offer mental health benefits under certain conditions, it may also have detrimental effects when gaming habits become dysregulated or maladaptive [36]. However, gamers are sometimes stigmatized due to negative societal perceptions, often shaped by media narratives that emphasize rare but extreme cases such as violence, addiction, or social dysfunction [37]. These portrayals may contribute to a pathologizing view of gaming behavior, regardless of its actual impact on functioning. Consequently, it is important to examine whether negative psychological outcomes emerge at the onset of gaming or develop over time as gaming becomes a persistent behavior in adulthood. Such insights could clarify the temporal dynamics between gaming and mental health, informing strategies for early detection and intervention.

Aim of the study

The uneven global expansion of the gaming industry, alongside the increasing prevalence of video game use and its potential negative consequences across broader population sectors, underscores the need to examine gaming through a context-specific lens, particularly one that considers age and geography. Accordingly, the primary aim of this study was to investigate psychosocial factors associated with gaming behavior among young adults enrolled in a Mexican university. The study focused on prosocial behavior, general mental health, perceived social support, and emotional intelligence, given their relevance to recreational gaming and the potential development of gaming-related problems.

Participants were categorized into three groups based on their current gaming status: current gamers (CG), former gamers (FG), and non-gamers (NG). This classification allowed for a nuanced analysis of differences in psychosocial profiles related to the initiation and maintenance of gaming. Specifically, the study aimed to determine whether specific psychological characteristics distinguish individuals before gaming involvement or whether these traits emerge and evolve as gaming becomes a sustained behavior in young adulthood.

Drawing on existing literature, the following hypotheses were proposed:

- H1. A higher proportion of males will be identified among current gamers compared to females.
- H2. Current gamers will demonstrate lower levels of prosocial behavior compared to non-gamers.
- H3. Emotional intelligence will differ significantly among the three gamer groups.
- H4. Perceived social support will differ significantly among the three gamer groups.
- H5. No significant differences in mental health will be observed among the three gamer groups.

H6. Sex, prosocial behavior, and emotional intelligence will be the main predictors of both gaming initiation and maintenance.

Materials and methods

Sampling procedure

A cross-sectional research design was implemented using an online survey administered at a private university in Mexico between August 2024 and April 2025. All participants provided informed consent before participation. The study adhered to the ethical principles outlined in the Declaration of Helsinki (1964) and its subsequent amendments and other applicable ethical standards. Ethical approval was granted by the university's Institutional Research Ethics Committee (Protocol No. EHE-2023-08). The target population consisted of young adults currently enrolled in higher education in Mexico. Inclusion criteria required participants to be Spanish-speaking students aged 18 or older. The final sample comprised 1,318 students ($M_{\text{age}} = 19.90$, $SD = 1.67$; age range: 18–30), of whom 46% identified as female.

Measures

Sociodemographic information

Participants reported their age and sex. The question, “Do you currently play video games?” assessed their current gaming status, offering three response options: “Yes,” “No, but used to,” and “No, never.”

Prosocial Behavior Scale for adults (PBS [38, 39])

This 16-item scale measures the tendency to engage in prosocial behaviors, including sharing, helping, providing care, and expressing empathy [40]. Responses were rated on a 5-point scale ranging from (1) *never/almost never* to (5) *always/almost always*. Total scores were calculated by summing all item responses, with higher scores indicating a greater tendency toward prosocial behavior. In the current sample, the scale showed excellent reliability (Cronbach's alpha and McDonald's omega: $\alpha/\omega = 0.94$).

General Health Questionnaire (GHQ-12 [41, 42])

This instrument comprises 12 items assessing general mental health, with half positively worded and the other half negatively worded. Responses were given on a 4-point scale from (0) *never* to (3) *always*. Higher total scores indicate better perceived mental health. In the current sample, reliability was acceptable ($\alpha = 0.76$, $\omega = 0.72$).

Wong & Law's Emotional Intelligence Scale (WLEIS-S [43, 44])

This 16-item scale assesses four components of emotional intelligence: self-emotion appraisal (SEA; items 1, 5, 9, 13), other-emotion appraisal (OEA; items 2, 6, 10, 14), emotional use or awareness (EA; items 3, 7, 11, 15), and emotion regulation (ER; items 4, 8, 12, 16). The scale

conceptualizes emotional intelligence as a set of abilities related to the perception and expression of emotions, the access to emotions that facilitate cognition, and the regulation of emotional states [45]. Responses were rated on a 7-point Likert scale ranging from (1) *totally disagree* to (7) *totally agree*. Total scores were calculated by summing the item responses, with higher scores reflecting greater emotional intelligence. In the present sample, reliability was excellent (Cronbach's alpha and McDonald's omega: total scale $\alpha/\omega = 0.95$; SEA $\alpha/\omega = 0.85$; OEA $\alpha/\omega = 0.84$; EA $\alpha/\omega = 0.86$; ER $\alpha/\omega = 0.87$).

Multidimensional Scale of Perceived Social Support (MSPSS [46, 47])

This 12-item scale measures perceived social support from three sources: family (PSS-Fam; items 1–4), friends (PSS-Peer; items 5–8), and significant others (PSS-Other; items 9–12). Response options ranged from (1) *never or almost never* to (4) *always or almost always*. Total scores were calculated by summing all item responses, with higher scores indicating greater perceived social support. In the current sample, reliability was high (Cronbach's alpha and McDonald's omega: total scale $\alpha/\omega=0.93$; PSS-Fam $\alpha/\omega=0.87$; PSS-Peer $\alpha/\omega=0.91$; PSS-Other $\alpha/\omega=0.94$).

Statistical analysis

Two researchers independently verified the data for accuracy and categorized participants into three gaming groups: non-gamers, former gamers, and current gamers. All analyzed variables met standard univariate normality criteria, with skewness values within ± 3 and kurtosis values within ± 10 following Kline's criteria [48]. Missing data were minimal ($< 1\%$ per variable) and were not adjusted, as such levels are unlikely to bias parameter estimates [49].

Means and standard deviations were computed for continuous variables, and frequencies and percentages were reported for categorical variables. Descriptive statistics were calculated for age and sex across the three gaming groups and the full sample. Pearson's chi-square tests assessed group differences in sex, with Cramer's V as a measure of effect size. One-way ANOVAs were used to evaluate differences in continuous variables

across gaming groups. Two MANOVAs were conducted to examine group differences in perceived social support and emotional intelligence components. Partial eta squared (η^2) was reported as the effect size, and Pillai's Trace was used for multivariate significance testing due to covariance matrix inequality (Box's M test). Bonferroni *post hoc* tests were applied for pairwise comparisons, given the assumption of homogeneity of variances.

Binomial logistic regression analyses were performed using the forward stepwise method to identify gaming onset and maintenance predictors [50]. Independent variables included sex and those found to be statistically significant in the ANOVA and MANOVA analyses. Model fit was evaluated using several criteria (Hahs-Vaughn & Lomax, 2020): (1) χ^2 test on the change in deviance (-2 log-likelihood or $-2LL$), (2) Hosmer-Lemeshow goodness-of-fit test, (3) Nagelkerke's R^2 for pseudo-variance explained, (4) measures of classification accuracy, sensitivity, and specificity, and (5) Z-statistic comparison between the null and final models [51]. Wald statistics assessed the significance of regression coefficients. Odds Ratios (ORs) with 95% confidence intervals were calculated to estimate the effect size and test whether each predictor differed significantly from the null effect ($OR = 1$).

A priori power analysis for logistic regression was conducted using Westland's algorithm [52]. With a conservative effect size of 0.02 and nine predictors, the recommended minimum sample size to achieve a statistical power of 0.80 is 788 participants. All statistical analyses were performed using IBM SPSS Statistics, version 28.

Results

Sociodemographic differences between gaming groups

Table 1 presents the sociodemographic characteristics of each gaming group. No statistically significant differences were observed in age distribution among the groups ($F=2.53$, $p=0.079$, $\eta^2=0.004$). However, sex distribution differed significantly across the three groups ($\chi^2=169.44$, $p<0.001$, Cramer's $V=0.359$). In the non-gamer group, 83.5% of participants were female, whereas in the current gamer group, 65.7% were male.

Differences in psychosocial variables between gaming groups

Differences in prosociality between gaming groups

Statistically significant differences were found among the three gaming groups in prosociality scores ($F=3.934$, $p=0.020$, $\eta^2=0.006$). *Post hoc* comparisons indicated that current gamers scored significantly lower than non-gamers ($M_{CG}=60.99$, $SD_{CG}=11.6$; $M_{NG}=63.24$, $SD_{NG}=12.6$; $p=0.031$).

Table 1 Sociodemographic characteristics of the three gaming groups

	Non-gamers	Former gamers	Current gamers	Total
N	236	431	651	1318
Female (%)	83.5	44.8	34.3	46.5
Mean age (SD)	20.03 (1.58)	19.99 (1.77)	19.80 (1.62)	19.90 (1.67)

SDStandard deviation

Differences in mental health between gaming groups

No statistically significant differences were observed among the three groups in mental health scores ($F=0.269, p=0.770, \eta^2=0$).

Differences in emotional intelligence between gaming groups

Statistically significant differences emerged in overall emotional intelligence ($F=5.824, p=0.003, \eta^2=0.009$). Additionally, multivariate analysis revealed significant differences across the four emotional intelligence components ($F[8,2656]=2.33; p=0.017$).

Follow-up univariate ANOVAs showed statistically significant differences in each component: SEA ($F[2, 53]=3.422, p=0.033, \eta^2=0.005$); OEA ($F[2137]=6.39, p=0.002, \eta^2=0.010$); EA ($F[2137]=6.27, p=0.002, \eta^2=0.009$); ER ($F[2, 54]=3.314, p=0.037, \eta^2=0.005$). *Post hoc* tests showed that current gamers scored lower than both former gamers and non-gamers in appraisal of others' emotions (OEA: $M_{CG}=20.88, SD_{CG}=4.56; M_{FG}=21.75, SD_{FG}=4.51, p=0.007; M_{NG}=21.85, SD_{NG}=5.10, p=0.017$).

Current gamers also reported lower scores than former gamers in emotional awareness and emotional regulation (EA: $M_{CG}=21.03, SD_{CG}=4.52; M_{FG}=22.05, SD_{FG}=4.63, p=0.001$; ER: $M_{CG}=20.81, SD_{CG}=4.54; M_{FG}=21.53, SD_{FG}=4.58, p=0.041$).

Differences in perceived social support between gaming groups

No statistically significant differences were found between the three groups in overall perceived social support ($F=2.729, p=0.066, \eta^2=0.004$), or in its subdimensions ($F[6,2656]=1.081, p=0.372$).

Predictor variables of gaming patterns

Predictor variables of gaming onset

A binomial logistic regression with forward selection (likelihood ratio method, LR) was conducted to examine which variables predict the likelihood of initiating gaming. Sex, prosociality, and emotional intelligence components were included as independent variables.

In the first and final step of the regression analysis, only sex was retained as a significant predictor (model 1). Its inclusion led to a statistically significant improvement in model fit compared to the null model ($\chi^2(1)=167.44, p<0.001$). The classification matrix indicated that model 1 achieved perfect sensitivity (100%) but lacked specificity. The Nagelkerke R^2 coefficient showed that sex accounted for approximately 20% of the variance in the likelihood of initiating gaming.

Specifically, being male significantly increased the odds of gaming onset. The regression coefficient for male sex was $\beta=2.09$, and the corresponding odds ratio was $OR=8.08$ (95% CI [5.61, 11.64]), indicating that males were over eight times more likely than females to begin gaming (Table 2).

Predictor variables of gaming maintenance

A second binomial logistic regression analysis using the forward selection LR method was conducted to examine which variables predict the likelihood of maintaining gaming behavior. Sex was included as an independent variable, while appraisal of others' emotions, emotional awareness, and emotional regulation were potential predictors.

In the first step of the analysis, emotional awareness was selected (model 1), resulting in a statistically significant improvement in model fit compared to the null model ($\chi^2(1)=12.369, p<0.001$). In the second and final step, sex was added to the model (model 2), leading to a further statistically significant improvement in fit over model 1 ($\chi^2(2)=24.789, p<0.001$). These enhancements in model fit were reflected in increased pseudo- R^2 values and improved classification accuracy. The Hosmer–Lemeshow test yielded a non-significant result ($\chi^2(8)=13.57, p=0.094$), indicating an improvement in model fit. The Nagelkerke R^2 coefficient showed that the included predictors could explain approximately 4% of the variance in gaming maintenance.

The classification matrix of observed versus predicted values showed that the final model (model 2) had high sensitivity (92.6%), correctly identifying most current

Table 2 Model fit indices and final binary logistic regression results predicting gaming onset

Model gaming onset	−2LL	χ^2	df	R^2 Cox & Snell	R^2 Nagelkerke	Accuracy		
	1071.38	167.44**	1	0.119	0.196	82.1		
	β	SE	df	Wald	p	OR	95% CI for OR	
							LL	UL
Male sex	2.09	0.19	1	129.193	<0.001	8.08	5.61	11.64
Intercept	0.74	0.08	1	8.72	<0.001	2.11		

Model gaming onset = $\text{logit}(\text{Current and non-current gamers} = 1) = \beta_0 + \beta_1 \text{Male sex} + \epsilon$

β Regression coefficient, SE Standard error, df Degrees of freedom of the Wald test. p = probability value associated with the Wald test. OR Odds ratio, 95% CI 95% Confidence interval for OR, LL Lower limit, UL Upper limit

**p < 0.01

Table 3 Model fit indices and final binary logistic regression results predicting gaming maintenance

Model gaming maintenance	−2LL	χ ²	df	R ² Cox & Snell	R ² Nagelkerke	Accuracy		
	1430.14	24.79**	2	0.025	0.039	60.7		
	β	SE	df	Wald	p	OR	95% CI for OR	
							LL	UL
Male sex	0.451	0.128	1	12.40	< 0.001	1.57	1.22	2.02
EA	−0.050	0.014	1	12.35	< 0.001	0.95	0.93	0.98
Intercept	1.208	0.316	1	14.33	< 0.001	3.34		

Model gaming maintenance = $\text{logit}(\text{Current gamers} = 1) = \beta_0 + \beta_1 \text{Male sex} + \beta_2 \text{EA} + \epsilon$
β Regression coefficient, SE Standard error, df Degrees of freedom of the Wald test, p = probability value associated with the Wald test. OR Odds ratio, 95% CI 95% Confidence interval for OR, LL Lower limit, UL Upper limit
**p < 0.01

Table 4 Model fit indices and final binary logistic regression results predicting gaming onset and maintenance

Model gaming onset and maintenance	−2LL	χ ²	df	R ² Cox & Snell	R ² Nagelkerke	Accuracy		
	843.51	184.17**	2	0.19	0.28	76.2		
	β	SE	df	Wald	p	OR	95% CI for OR	
							LL	UL
Male sex	2.27	0.194	1	136.47	< 0.001	9.67	6.61	14.15
Emotional intelligence	−0.012	0.005	1	5.30	0.021	0.98	0.97	0.99
Intercept	1.16	0.461	1	6.31	0.012	3.18		

Model gaming maintenance = $\text{logit}(\text{Current gamers} = 1) = \beta_0 + \beta_1 \text{Male sex} + \beta_2 \text{EI} + \epsilon$
β Regression coefficient, SE Standard error, df Degrees of freedom of the Wald test, p = probability value associated with the Wald test, OR Odds ratio, 95% CI 95% confidence interval for OR, LL Lower limit, UL upper limit
**p < 0.01

gamers, but low specificity (12.5%), with poor classification of non-gamers.

Table 3 presents the regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals. As shown, the final model equation was: $\text{logit}(\text{Current gaming} = 1) = 1.21 + 0.451(\text{Male sex}) - 0.050(\text{EA})$

Results indicate that individuals of male sex with lower emotional awareness were more likely to maintain gaming behavior. Specifically, sex had a stronger predictive value (OR=1.57) than emotional awareness (OR=0.95). When controlling for sex, emotional awareness was negatively associated with gaming maintenance, with a regression coefficient of β = −0.50 and OR=0.95 (95% CI: 0.93, 0.98), suggesting that each unit increase in emotional awareness reduced the odds of being a current gamer by 5%. Conversely, after adjusting for emotional awareness, male participants were significantly more likely to be current gamers than female participants (β=0.451, OR=1.57, 95% CI: 1.22, 2.02), indicating that males are 1.57 times more likely to maintain gaming habits than females.

Predictor variables of current gaming vs. non-gaming

A binomial logistic regression analysis using the forward selection (likelihood ratio) method was conducted to examine the relationship between selected predictor variables and the likelihood of initiating and maintaining gaming during this stage of life. The model included sex,

prosociality, and general emotional intelligence as potential predictors.

In the first step of the regression analysis, sex was included as the sole predictor (model 1). Its inclusion significantly improved model fit compared to the null model, as indicated by a chi-square test ($\chi^2(1) = 178.75, p < 0.001$). In the second and final step, emotional intelligence was added to the model (model 2), resulting in a further significant improvement in model fit ($\chi^2(2) = 184.17, p < 0.001$). Improvements were also seen in the increase of explained variance (Nagelkerke $R^2 = 0.28$) and in the overall classification accuracy of the model.

Model fit was further supported by the Hosmer and Lemeshow goodness-of-fit test, which yielded a non-significant result ($\chi^2(8) = 5.98, p = 0.649$), indicating adequate model calibration. The final model explained approximately 28% of the variance in the likelihood of being a current gamer.

The classification matrix for the final model (model 2) revealed high sensitivity (94%) but low specificity (28%). This suggests that the model more accurately identified individuals who were current gamers than those who were not.

Table 4 presents the regression coefficients, Wald statistics, odds ratios, and their corresponding 95% confidence intervals. The logistic regression equation for the final model was: $\text{logit}(\text{Current gaming} = 1) = 1.15 + 2.27(\text{Male sex}) - 0.012(\text{EI})$. The results indicated that being male and having lower

levels of emotional intelligence significantly predicted current gaming status. Specifically, sex had a stronger effect on gaming behavior ($OR=9.67$) than emotional intelligence ($OR=0.98$). Controlling for emotional intelligence, males were approximately 10 times more likely to be current gamers than females ($\beta=2.27$, $OR=9.67$, 95% CI: 6.61, 14.15). Similarly, controlling for sex, each one-unit increase in emotional intelligence was associated with a 2% decrease in the odds of being a current gamer ($\beta=-0.012$, $OR=0.98$, 95% CI: 0.97, 0.99).

Discussion

Gaming has become increasingly popular among young adults in Mexico; however, this trend also raises concerns about potential gaming-related issues within this demographic. The present study examined key psychosocial variables associated with gaming behavior in early adulthood and identified predictors of gaming onset and maintenance among Mexican university students. Understanding these relationships is crucial for designing targeted strategies to prevent IGD.

Regarding H1, statistically significant differences in sex distribution were found across the gaming groups. Males were overrepresented among current gamers (65.7%), whereas females predominated in the non-gamer group (83.5%). These results support the well-documented trend of male dominance in gaming [19, 55]. However, they appear to contradict recent reports indicating that female participation in digital gaming is approaching parity with males [29, 56]. This discrepancy may reflect the prevalence of competitive video games among participants, a genre historically characterized by greater male representation and stronger gender stereotypes [57]. Therefore, while our findings reflect a sex imbalance in gaming participation among Mexican university students, this may not represent the broader trend of increasing female involvement in digital gaming, but rather a subgroup-specific pattern influenced by sex preferences and cultural factors.

In relation to H2, current gamers reported significantly lower levels of prosocial behavior than non-gamers. This finding contrasts with Lobel et al. [16], who observed no association between gaming and prosocial behavior in preadolescents. Such discrepancies may reflect developmental differences, whereby prolonged gaming into early adulthood could lead to diminished prosocial tendencies. However, the sex imbalance in both the non-gamer and current gamer groups suggests that differences in prosociality may be due to sex differences. Previous empirical studies and meta-analyses have shown that sex differences in prosocial behavior can range from small to moderate, with females exhibiting higher levels of certain types of prosocial conduct [58, 59]. Previous research has primarily linked reduced prosocial behavior with violent

gaming [14], high-frequency competitive play [16], and problematic gaming patterns [60, 61]. The competitive and individualistic nature of many popular games may foster rivalry and undermine cooperative or helping behaviors [62]. This perspective is consistent with the General Learning Model [63], which posits that video game content can shape behavior through learned associations over time. Although some studies, such as Groves et al. [64], have failed to find a significant association, the present results suggest that sustained gaming in early adulthood may lead to lower levels of prosocial behavior. However, further research is needed to establish whether these associations are the result of an interaction effect between sex and gaming status.

Regarding H3, emotional intelligence significantly differed across gaming groups. Current gamers exhibited lower scores in the ability to appraise others' emotions, emotional awareness, and emotion regulation than former gamers. These findings suggest that ongoing engagement in gaming may be associated with a reduced capacity to identify, understand, and manage emotional experiences. As such, gaming may function as a form of emotional avoidance or escape, a hypothesis supported by previous studies [65]. Notably, diminished emotional regulation and awareness have been linked to IGD [27], and difficulties in these domains may underlie escapism-based coping and problematic gaming [66, 67].

The observed deficits in the ability to appraise others' emotions among current gamers also align with the reduced prosociality reported in this group. Emotional intelligence—particularly the capacity to recognize others' emotions—is a core component of prosocial behavior [33, 68]. It is plausible that ongoing engagement in competitive or violent games may impede the development of these interpersonal competencies, contributing to lower emotional appraisal and reduced prosocial responses [14].

For H4 and H5, no statistically significant group differences emerged in perceived social support or mental health. One explanation for the absence of significant group differences is that the sample was composed mostly of recreational gamers, whose gaming behaviors are non-problematic, thus not disrupting social functioning or mental health. Another possible explanation could be that the sample mainly play games with cooperative or team-based elements, which can foster social connectedness and offset any potential negative effects. These findings are consistent with studies that portray gaming as a social platform [69]. The evolution of digital socialization—especially after the COVID-19 pandemic—may have also reshaped relational dynamics in young adulthood, reducing disparities between online and offline relationships [70, 71]. Alternatively, the null findings may reflect a broader shift in how social support

is experienced and maintained in digital contexts, where gamers and non-gamers alike may rely on other similar platforms (e.g. social media) to maintain interpersonal connections.

Moreover, online social interactions have been identified as protective against psychological distress [72]. The present results suggest that recreational gaming is not inherently detrimental to mental health and may serve as a meaningful social outlet. Although IGD is associated with mental health difficulties [35, 73], gaming in this sample appears unrelated to mental health status. A possible explanation for the absence of significant group differences is that the sample was composed mostly of recreational gamers, whose gaming behaviors are non-problematic and may be integrated into a balanced lifestyle. Thus, mental health does not appear to be a differential variable based on gaming status. Additionally, some psychosocial effects of gaming may emerge after prolonged use. This suggests the need for longitudinal designs to better capture temporal dynamics.

Regarding H6, logistic regression analyses revealed that male sex was the only significant predictor of gaming onset. This finding supports previous research indicating that males are more likely to initiate gaming [19]. Despite ongoing efforts by the gaming industry to promote inclusion, issues such as discrimination and sexism persist [74], potentially discouraging female participation [54]. Interestingly, unlike findings in Spanish university populations where prosociality also predicted gaming onset [24], this variable was insignificant in the present study. This suggests that cultural context and gendered socialization may shape the relative influence of psychosocial predictors. The absence of psychological predictors of gaming onset in this sample implies that gaming may initially be driven by entertainment or social motives rather than underlying emotional difficulties [68].

Additional logistic regressions were conducted to differentiate between individuals who maintained gaming habits and those who quit or never played. These analyses revealed that, alongside male sex, lower emotional awareness significantly predicted continued gaming into early adulthood. Prior studies have documented inverse associations between emotional awareness, emotion regulation, and gaming problems [75]. Although this study did not focus on disordered gaming, the findings support functional models suggesting that individuals may use games for unconscious emotional regulation [68]. Video games might offer an emotionally manageable environment that allows players to temporarily avoid or alleviate difficult emotions.

Finally, the combined model revealed that male sex and lower emotional intelligence predicted both the onset and maintenance of gaming. These findings resonate with prior research linking reduced emotional competencies

to preferences for solitary or escapist activities [76]. However, this does not necessarily imply pathology. In some cases, gaming may serve a compensatory role by offering a structured outlet for emotional expression or management [77]. Nonetheless, relying exclusively on gaming for emotional regulation may increase the risk of developing problematic patterns.

Notably, previous research has shown that males often receive fewer opportunities for emotional development compared to females [78]. This differential socialization may contribute to the emotional skill disparities observed in the present study. As emotional identification, awareness, and regulation are essential components of healthy coping, limited access to emotional education may lead some individuals to adopt gaming as an alternative coping strategy. However, if gaming becomes the sole emotional outlet, the risk of IGD may increase [66]. These results underscore the importance of examining the interplay between emotional competence, gender, and gaming habits to better inform prevention strategies during early adulthood.

Limitations and future directions

This study has several limitations that should be acknowledged. First, its cross-sectional design precludes causal inferences, as no temporal or experimental manipulation was applied. Second, the sample was limited to a university student population, and all data were self-reported, which may affect the generalizability and objectivity of the findings. Similarly, the uneven gender distribution within each group limited the possibility of conducting adequately powered subgroup analyses by sex. Future research should focus on more balanced samples to explore the potential interaction effects between sex and gaming status. Additionally, while some associations reached statistical significance, the explained variance was relatively modest, warranting cautious interpretation of these results.

Future studies would benefit from longitudinal designs that track participants over time to better capture developmental trajectories and causal mechanisms. Moreover, including more diverse and representative samples from different educational levels or regions would enhance the external validity of the findings. Despite these limitations, the study also presents important strengths, for instance, including a distinct former gamer group, which allowed for a more nuanced exploration of both the onset and maintenance of gaming behavior. This classification strategy avoided the common pitfall of grouping former gamers with true non-gamers, which can obscure key behavioral differences. Furthermore, the focus on specific components of emotional intelligence concerning gaming behavior provides a foundation for more targeted future investigations.

Practical implications

Three key implications can be drawn from the findings. First, male sex remains a significant factor in the initiation of gaming among young Mexican adults. To encourage broader female participation, the gaming industry should develop content that aligns with diverse interests and actively work to address issues of discrimination and sexism within gaming communities. At the public level, financial incentives could be offered to video game companies that develop inclusive content or include strategies to control discriminatory and harassing behavior. At the university level, just as video game clubs are encouraged, the creation of mixed gaming communities or gaming conferences could be promoted to raise awareness of these issues. Second, the cross-national differences observed in predictors of gaming onset underscore the importance of culturally sensitive approaches. Preventive strategies should be tailored to specific sociocultural contexts, as factors influencing gaming behavior may vary considerably across countries. Third, the association between emotional intelligence—particularly specific components such as emotional awareness—and sustained gaming engagement highlights the need to integrate emotional education into both university curricula and earlier educational stages. If individuals use gaming to manage unprocessed emotions, strengthening emotional competencies may enable them to engage with video games more healthily and recreationally, rather than as a form of emotional avoidance. To this end, the university curriculum could be adapted to include workshops that address digital habits, promote emotional and social skills, and encourage alternative leisure activities in this digital society.

Conclusions

This study examined the psychosocial factors associated with the onset and maintenance of gaming among young university students in Mexico. The findings indicate that the initiation of gaming is primarily influenced by sociodemographic characteristics—particularly sex—rather than by psychological variables. In contrast, the continued engagement in gaming during early adulthood appears to be associated with lower levels of emotional intelligence, especially emotional awareness and regulation.

These results suggest that while the initial decision to engage in gaming may be socially driven and not rooted in psychological vulnerability, sustained gaming behavior could reflect underlying difficulties in emotional management. Moreover, no significant differences were observed between gaming and non-gaming groups in terms of mental health or perceived social support, supporting the view that recreational gaming is not inherently detrimental to psychological well-being.

These findings underscore the importance of fostering emotional competencies from an early age and creating more inclusive and supportive gaming environments. Promoting emotional literacy may help individuals engage in gaming in healthier ways and reduce the risk of developing problematic gaming patterns later in life.

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Authors' contributions

J.G.-P. conceived the study, curated the data, performed the formal analysis, developed the methodology and software, and wrote the original draft. M.M.-V. contributed to the investigation, managed the project, provided resources and visualization, and participated in reviewing and editing the manuscript. G.M.C. contributed to data curation and investigation, reviewed and edited the manuscript, and secured funding for the study. L.B.-R. curated the data, conducted formal analysis, developed methodology and software, and contributed to supervision, validation, and manuscript review and editing. All authors reviewed and approved the final manuscript.

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Data availability

The authors will make the raw data supporting this article's conclusions available without undue reservation. Correspondence and requests for materials should be addressed to Guillermo Chans.

Declarations

Ethics approval and consent to participate

The Institutional Review Board of Tecnológico de Monterrey approved the protocol (no. EHE-2023-08). The procedures used in this study adhere to the tenets of the Declaration of Helsinki. Respondents gave written consent for review and signature before starting interviews.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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RESEARCH ARTICLE



Comparative analysis of internet gaming disorder prevalence and gaming-related and psychosocial correlates in Spain and Italy IGD approach in Spain and Italy

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ABSTRACT

Internet Gaming Disorder (IGD) represents a growing public health concern among young adults, yet cross-national evidence in this population remains limited, particularly among university students. This study examined the prevalence of probable IGD and its associated factors in two convenience samples of university students from Spain and Italy. Participants included 798 Spanish students (Mean age = 21.48, SD = 5.01; 67.2% female) and 717 Italian students (Mean age = 22.20, SD = 3.83; 49.4% female). Standardized self-report measures assessed IGD symptoms, gaming behaviors, impulsivity traits, emotional intelligence, and social and contextual factors related to gaming. The estimated prevalence of probable IGD was low in both countries (2.1% in Spain and 2.4% in Italy), but increased among active gamers (6.1% and 4%, respectively). Statistical analyses, including chi-square tests, correlations, and binomial logistic regressions, revealed different risk profiles across countries. In Spain, gaming with strangers, lower emotional intelligence, and low premeditation were associated with higher IGD risk. In Italy, positive urgency and a greater number of hours spent gaming emerged as significant predictors. Overall, findings support the multifactorial nature of IGD and highlight meaningful cross-national differences, underscoring the international relevance of preventive and targeted interventions.

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Introduction

The global gaming industry is rapidly expanding, reaching 3.02 billion active players by 2024 (Statista, 2024). Although gaming is widely acknowledged for its contributions to entertainment, stress reduction, and social interaction (Stockdale & Coyne, 2018), research has also linked it to some risks. The World Health Organisation (WHO, 2019) has identified Internet Gaming Disorder (IGD) as a behavioural pattern that can lead to significant functional impairment. Recent meta-analytic evidence estimated the worldwide IGD prevalence at 3.05% and 6.7%, with variability depending on the diagnostic criteria employed and the characteristics of the populations studied (Zhou et al., 2024). These estimates—along with cross-country differences—highlight the need to investigate IGD prevalence and its associated factors in different regions.

The Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR) categorises IGD as a pattern of persistent and recurrent gaming behaviour that leads to clinically significant impairment over 12 months (American Psychiatric Association APA, 2022). A diagnosis requires the presence of at least five out of nine criteria, reflecting cognitive, emotional, and functional symptoms.

Beyond its diagnostic definition, vulnerability to IGD is not uniform across the lifespan. Adolescence appears to be a particularly sensitive developmental stage (García-García et al., 2021; Wang et al., 2021), with meta-analytic evidence estimating a prevalence of 4.6% in this age group (Fam, 2018), higher than the

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3.05% reported in general population samples across 17 countries (Stevens et al., 2021). Young adulthood also represents a period of elevated risk, as intergenerational data from Hong Kong show higher prevalence among Millennials compared to Generation X (7.4% vs. 1.3%; Wang & Cheng, 2021).

Estimates of IGD prevalence varies across age groups and cultural contexts, with higher estimates in Asian and North American adolescent samples compared to Europe (Fam, 2018; Müller et al., 2014). However, little comparative evidence is available from Southern Europe. Spain and Italy share cultural similarities, but their gaming patterns may differ as well as their IGD prevalence estimates. In 2024, Spain had around 22.1 million gamers versus 14 million in Italy, with similar revenues (Spain: US \$2.6–2.7 billion; Italy: US \$2.5 billion; Steininger, 2025; Video Games Europe, 2025; Visual Capitalist, 2025). In the general population, IGD prevalence has been estimated at 2.6% in Spain and 1.4% in Italy (Di Carlo et al., 2023; Fuster et al., 2016). Among Spanish adolescents, prevalence estimates seem comparable to those reported in young adults (adolescents: 1.9%–8.3%; Buiza-Aguado et al., 2018; young adults: 2.3%–8.3%; Sprong et al., 2022). In Italy, studies on young adults have focused on university students, with prevalence estimates ranging from 5.3% to 14.9% (De Pasquale et al., 2020; De Pasquale et al., 2018). Given these differences, targeted research is needed to better understand IGD in both countries.

However, prevalence differences alone cannot explain why some individuals develop IGD while others do not, highlighting the need to examine psychological and social mechanisms that could shape vulnerability. Recent reviews have highlighted several gaming-related factors linked to IGD, such as the amount of time spent playing and exposure to violent content (Ji et al., 2021; Zhuang et al., 2023). Likewise, specific gaming motivations have been linked to the occurrence of IGD. Key motivations for gaming, including avoiding negative feelings, escapism, and coping mechanisms, are significantly associated with IGD symptoms (Bäcklund et al., 2022; Wang & Cheng, 2022). Additionally, motivations related to social interaction, achievement, and competition also play a role (Ji et al., 2021). In college populations, motivations like competition, escape, and fun have been linked to IGD (Biegun et al., 2021). Thus, these findings suggest that gaming motivations constitute a central psychological factor in understanding individual vulnerability to IGD.

Beyond gaming motivations, the social environment of gaming communities may also influence IGD. Studies suggest that perceptions of interdependence and power dynamics within online communities can foster both prosocial and toxic behaviours (Zhu et al., 2022). Toxic gaming environments—characterised by hostility, exclusion, or harassment—can exacerbate stress and negatively impact players' mental health and well-being (Gandolfi et al., 2023; Zhu et al., 2022). It is crucial to understand the interaction between motivational, behavioural, and social-contextual factors to thoroughly investigate the elements associated with IGD.

Several individual variables are significantly related to IGD. Impulsiveness is positively linked to IGD, possibly due to impaired cognitive functions and reduced ability to defer gratification from gaming (Ji et al., 2021). In contrast, higher self-control is negatively related to IGD development. Social support plays a protective role, helping individuals manage stress and emotional challenges linked to gaming (Ji et al., 2021; Zhuang et al., 2023). Additionally, emotional intelligence (EI)—understood as the ability to perceive, understand, and regulate one's own emotions as well as those of others—has been identified as a protective factor against maladaptive gaming behaviours. Individuals with lower EI may experience higher psychological distress and use gaming to regulate their emotions, thereby increasing their vulnerability to IGD (Kircaburun et al., 2019; Gisbert-Pérez et al., 2024).

International research showed cross-national variability in the prevalence and correlates of IGD (Van Der Neut et al., 2023; Stevens et al., 2021). Gaming motives and personality traits have been found to vary across countries (López-Fernández et al., 2024), and cultural orientations shape pathways to IGD (Chew et al., 2024). Varchetta et al., (2024) also stressed the importance of examining differences in Internet-related disorders across both similar and diverse cultures. Meta-analytic findings indicate that variability in IGD estimates often increases among different assessment instruments and methodological approaches (Stevens et al., 2021). Considering this evidence, comparing Spain and Italy offers a unique contribution by examining IGD within two culturally similar yet distinct European contexts, reducing broad cultural confounds while highlighting meaningful cross-national variation.

Aim of the study

The increasing prevalence of IGD in young adults, the variations between countries, and the study of risk factors at the community level suggest a need for specific research on IGD prevalence and related factors in a particular age group and geographic locations. Therefore, the main objectives of this study were (1) to explore the prevalence of IGD in Spanish and Italian university students, (2) to compare the relationship between IGD and potential risk and protective factors in Spain and Italy, and (3) to examine the relationship between the predictor variables and the probability of developing IGD in Spain and Italy. Based on the abovementioned literature, the following hypotheses were proposed:

H1. The prevalence of IGD among university students is higher in Spain than in Italy.

H2. The relationships between gaming time and toxicity and IGD will be statistically significant in Spain and Italy.

H3. The relationships between gaming mode and motivations and IGD will be statistically significant in Spain and Italy.

H4. The relationship between psychological variables (impulsivity, emotional intelligence, perceived social support) and IGD differs between Spain and Italy.

H5. The variables that predict IGD among university students differ between Spanish and Italian university students.

Materials and Methods

Sample and procedure

A quantitative cross-sectional research design was conducted through an online survey distributed in college classes in 2022–2024. A non-probabilistic convenience sampling was used. This sampling method was chosen due to the accessibility and availability of participants within the university environment. The recruitment process was initiated through on-site invitations during face-to-face lessons of students in different undergraduate courses. All eligible students were invited to participate voluntarily. No incentives were provided to avoid self-selection bias. To mitigate social desirability bias, participants were assured anonymity in their responses. Participants provided informed consent before data collection. The research adhered to the Declaration of Helsinki and its subsequent amendments and received approval from the Institutional Review Board of the University of XXX (protocol no. XXX) and the University of XXX (protocol no. XXX) for the Spanish and Italian research, respectively.

The study targeted the university community, focusing on Spanish and Italian-speaking students aged 18 and older. A total of 798 Spanish participants (average age: 21.48) and 717 Italian participants (average age: 22.15) were recruited. Among them, 67.2% of the Spanish sample and 49.4% of the Italian sample identified as female. Additionally, 64.3% of Spanish participants and 59.3% of Italian participants were exclusively students, while 34.5% of the Spanish sample and 56.1% of the Italian sample reported playing video games.

Measures

The online survey for both Spanish and Italian samples collected the following information. Supplementary Table A1 shows reliability coefficients (Cronbach's alpha and McDonald's omega) of all study instruments in both samples. A pilot study was conducted with a small sample of participants ($n = 10$) with those scales that lacked prior validation in Spanish or Italian. The aim was to assess the content validity of the items and to evaluate their clarity and comprehensibility. Participant feedback was collected and analysed, allowing refinement of item wording to optimise interpretability and reduce potential measurement error before the main data collection.

Sociodemographic and gaming-related data

Participants provided their age, gender, and current activity (studying, working, or both). Participants also answered questions about gaming hours, community toxicity levels, and gaming mode (alone, with family/friends, acquaintances, or strangers).

Gaming motivations

The Motives in Video Game Use scale (e-MUV; López-Fernández et al., 2019). The e-MUV comprises 32 items, assessed on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). These items measure eight dimensions of gaming motives: Immersion (items 1–4), Customisation (items 5–8), Violent gratification (items 9–12), Coping (items 13–16), Fun (items 17–20), Cognitive challenge (items 21–24), Competition (items 25–28), and Social interaction (items 29–32). Higher scores within each dimension indicate a greater significance of gaming motivation. The Spanish version (Gisbert-Pérez et al., 2025) has been validated in university students, whereas the Italian version was translated and evaluated following Wild et al. (2005) standardised procedure. The Spanish version has been validated in university students (Gisbert-Pérez et al., 2025). The Italian version was translated and assessed by native speakers using the standardised procedure outlined by Wild et al., (2005), and a pilot study was conducted to evaluate the items.

Internet gaming disorder

The Internet Gaming Disorder Scale (IGDS; Lemmens et al., 2015) was administered. This scale contains 9 items using a 6-point Likert-type scale ((0) *never*, (1) *one to four times in the last year*, (2) *five to 11 times in the last year*, (3) *about once to three times a month*, (4) *once or more a week*, and (5) *every day or almost every day*). A criterion was considered met when participants answered the question with a score of 4 or 5, and those with a score of 4 or 5 in more than five items are considered disordered gamers (Lemmens et al., 2015). Likewise, the approach of Evren et al., (2017), which considered response options 3 to 5 as fulfilled criteria, was also contemplated. IGDS was translated into Spanish and Italian and evaluated using the backward-forward translation method, following the eight steps reported by Wild et al., (2005), and a pilot study was conducted to evaluate the items.

Impulsive behaviour

The short Impulsive Behaviour Scale (UPPS-P; Billieux et al., 2012; Spanish short version of Cándido et al., 2012; Italian short version of D'Orta et al., 2015) consists of 20 items that measure five impulsivity traits (4 items each), namely, Negative urgency (NU; items 4, 7, 12 and 17), Lack of premeditation (LPM; items 1, 6, 13 and 19), Lack of perseverance (LPS; items 5, 8, 11 and 16), Sensation seeking (SS; items 3, 9, 14 and 18) and Positive urgency (PU; items 2, 10, 15 and 20). Higher scores indicate higher general or specific traits of impulsivity. The Spanish version (Cándido et al., 2012) has been validated in populations aged 18–45 in Spain, whereas the Italian version (D'Orta et al., 2015) has been validated in populations aged 17–69 in Italy.

Perceived social support

The Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1998; Spanish version of Santos-Vega et al., 2021; Italian version of Busoni & Di Fabio, 2008) comprises 12 items that measure three dimensions of perceived social support: 1) perceived family support (items 1–4), 2) perceived peer support (items 5–8), and 3) support from significant others (items 9–12). The items have a four-point Likert-type response scale ranging from (1) *never or almost never* to (4) *always or almost always*. Higher scores indicate higher perceived social support. The MSPSS has been validated in Spanish and Italian university populations (Gisbert-Pérez et al., 2025; Di Fabio & Busoni, 2008).

Emotional intelligence

Wong and Law's Emotional Intelligence Scale (WLEIS, Wong & Law, 2002; Spanish version of Extremera Pacheco et al., 2019; Italian version of Illiceto & Fino, 2017) considers EI as Mayer & Salovey, (1997) definition, that is, a set of interrelated skills related to 'the ability to accurately perceive, appraise, and express emotion; the ability to access and/or generate feelings when they facilitate thinking; the ability to understand emotion and emotional knowledge; and the ability to regulate emotions to promote emotional and

intellectual growth'. This scale consists of 16 items that assess four aspects of EI: appraisal of one's own emotions (SEA, items 1,5,9,13), appraisal of others' emotions (OEA, items 2,6,10,14), emotion awareness (EA, items 3,7,11,15), and emotion regulation (ER, items 4,8,12,16). Responses are given using a seven-point Likert scale, ranging from (1) *totally disagree* to (7) *totally agree*. Higher scores indicate higher emotional intelligence ability. The WLEIS has been validated in Spanish and Italian adult populations (Extremera Pacheco et al., 2019; Iliceto & Fino, 2017).

Statistical analysis

Frequencies and percentages were used to describe categorical variables and mean and standard deviation were used to describe quantitative variables. We estimated the prevalence of IGD among gamers using IGDS scores, based on DSM-5 criteria. The univariate skewness and kurtosis values for all the variables analysed were within the conventional normality criteria (-2 to 2 for skewness and -7 to 7 for kurtosis; George & Mallery, 2010; Hair et al., 2010). The Pearson chi-squared test was employed to analyse the correlations of categorical variables with IGD and Cramer's V was used as effect size measure. To evaluate whether sex imbalance could affect group comparisons, differences in sex distribution between participants with and without IGD were assessed using a chi-square test of independence. The Pearson correlation test was applied to evaluate correlations between quantitative variables. Finally, a forward selection binary logistic regression analysis using the LR method was performed to identify key predictors of IGD (Silva & y Barroso, 2004). Variables that were found statistically significantly correlated with IGD were included as independent variables. To analyse the fit of the logistic regression model, different tests were used (Hahs-Vaughn & Lomax, 2020): (1) for the overall model fit we used the χ^2 test for statistical significance of the model using the change in deviance ($-2LL$); (2) for the goodness of fit of the model we used the Hosmer-Lemeshow test and the substantive significance of the model or pseudovariance explained using Nagelkerke's R^2 index; and (3) to analyse the predictive ability of the model we used the correct classifications made by the model (measures of accuracy). To determine whether the regression coefficients of the independent variables were statistically significantly different from 0, the Wald statistic was used. In addition, the Odds Ratio (OR) index and its 95% confidence interval were estimated as a measure of the effect size, which tests the hypothesis that the effect of the independent variable at the population level is different from the null effect ($OR = 1$). A priori sample size calculation was estimated using G*Power, which yielded a minimum sample size of $n = 269$ ($\alpha = 0.05$, power = 0.80, event probability = 0.1). IBM SPSS Statistics 28.0 was used to calculate all the analyses.

Results

Estimated prevalence of Internet gaming disorder in university students

The estimated prevalence of IGD among Spanish ($n = 798$) and Italian university students ($n = 717$) was 2.1% and 2.4%, respectively, based on IGDS scores (Lemmens et al., 2015). Individuals were classified as having IGD if they responded (4) 'once or more a week' or (5) 'every day' to at least five of nine items from the DSM-5 criteria. Among current gamers ($n = 275$ for Spain, and $n = 402$ for Italy), the prevalence was higher: 6.1% in Spain and 4.0% in Italy. When considering those who answered (3) 'once to three times a month,' the prevalence increased to 3.5% in the Spanish general sample (10.2% in gamers) and 3.9% in the Italian sample (6.5% in gamers). Statistically significant differences in gaming modes were observed between IGD and non-IGD gamers, but varied across samples and IGD approaches. Non-significant differences in gender and current activity were found between non-IGD and probable IGD gamers in both countries Table 1.

Potential risk factors of Internet gaming disorder

Sociodemographic and gaming-related factors in Spanish university students

Age was not significantly correlated with IGD ($r = -.019$, $p = .749$). Statistically significant differences were found in gaming modes: playing with acquaintances ($\chi^2(1) = 16.813$, $p < .001$, $z_{IGD} = -4.1$, Cramer's $V = .247$), and playing with strangers ($\chi^2(1) = 26.382$, $p < .001$, $z_{IGD} = -5.1$, Cramer's $V = .310$). Higher scores on IGDS

Table 1. Characteristics of the Spanish gamer subgroups based on IGD criteria ($n = 275$).

	Answers 4/5 as criterion met					Answers 3/4/5 as criterion met				
	Non-IGD ($n = 258$)	IGD ($n = 17$)	χ^2	df	V	Non-IGD ($n = 247$)	IGD ($n = 28$)	χ^2	df	V
M Age (SD)	21.70 (2.95)	20.82 (2.48)				21.64 (2.94)	21.64 (2.83)			
Gender (% female)	37.6	47.1	.71	1	.05	38.9	32.1	.54	1	.04
Current act. (% study and work)	24.0	17.6	3.36	3	.11	24.7	14.1	2.15	3	.08
Mode Gaming										
Alone	70.5	64.7	.26	2	.03	70.9	64.3	.51	1	.04
Family/Friends	58.5	64.7	.25	1	.03	58.7	60.7	.04	1	.01
Acquaintances	11.6	47.1	16.81*	1	.24	11.7	32.1	8.7*	1	.17
Strangers	10.1	52.9	26.38*	1	.31	10.1	35.7	14.8*	1	.23
M(SD) H/w gaming	3.93 (1.82)	5.12 (1.53)				3.93 (1.84)	4.64 (1.62)			

Note: M = Mean; SD = Standard deviation; χ^2 = chi-square test statistic; df = degrees of freedom; V = Cramer's V (effect size estimate); Current act. = Current activity; H/w = hours per week. Statistically significant results ($p < .05$) are marked with an asterisk (*).

Table 2. Characteristics of the Italian gamer subgroups based on IGD criteria ($n = 402$).

	Answers 4/5 as criterion met					Answers 3/4/5 as criterion met				
	Non-IGD ($n = 385$)	IGD ($n = 17$)	χ^2	df	V	Non-IGD ($n = 376$)	IGD ($n = 28$)	χ^2	df	V
M Age (SD)	22.89 (3.67)	21.25 (2.76)				22.89 (3.69)	21.88 (3.02)			
Gender (% female)	31.3	12.5	2.57	1	.07	31.6	15.4	.46	1	.03
Current act. (% study and work)	18.4	37.5	3.96	3	.09	18.6	26.9	.81	3	.04
Mode Gaming										
Alone	53.9	43.8	.63	1	.04	54.0	46.2	.854	1	.04
Family/Friends	36.5	31.3	.18	1	.02	37.0	26.9	.588	1	.04
Acquaintances	6.7	18.8	3.31*	1	.09	6.4	19.2	.068	1	.01
Strangers	2.8	6.3	.61	1	.03	2.7	7.7	.027	1	.01
M(SD) H/w gaming	4.86 (1.93)	5.81 (1.55)				10.36 (9.30)	18.15 (12.70)			

Note: M = Mean; SD = Standard deviation; χ^2 = chi-square test statistic; df = degrees of freedom; V = Cramer's V (effect size estimate); Current act. = Current activity; H/w = hours per week. Statistically significant results ($p < .05$) are marked with an asterisk (*).

Table 3. Correlations between IGD and gaming-related factors.

	HG	TOX	IMM	CUS	VIO	COP	FUN	CHAL	COMP	SOC
Spanish sample ($N = 275$)										
IGDS r	.389*	.309*	.094	-.027	.245*	.336*	-.054	.142*	.247*	.234*
Italian sample ($N = 402$)										
IGDS r	.386*	.215*	.260*	.136*	.240*	.391*	.138*	.261*	.262*	.208*

Note: IGDS = Internet Gaming Disorder Scale; HG = Gaming hours/week; TOX = Toxicity; IMM = Immersion; CUS = Customisation; VIO = Violent Gratification; COP = Coping; FUN = Fun; CHAL = Cognitive Challenge; COMP = Competition; SOC = Social Interaction. Statistically significant results ($p < .05$) are marked with an asterisk (*).

were statistically significantly correlated with more gaming hours per week ($r = .389$, $p < .001$), and playing in toxic communities ($r = .309$, $p < .001$; Table 2). Regarding motivations, IGDS scores were significantly correlated with Violent Gratification ($r = .245$, $p < .001$), Coping ($r = .336$, $p < .001$), Cognitive challenge ($r = .142$, $p = .019$), Competition ($r = .247$, $p < .001$), and Social interaction ($r = .234$, $p < .001$; Table 3).

Sociodemographic and gaming-related factors in Italian university students

Age was not significantly correlated with IGD ($r = .027$, $p = .585$). Higher scores on IGDS were statistically significantly correlated with more gaming hours per week ($r = .386$, $p < .001$), and gaming with more toxic gamer communities ($r = .215$, $p < .001$). Regarding gaming motivations, IGDS scores were statistically significantly correlated with all gaming motivations: Immersion ($r = .260$, $p < .001$), Customisation ($r = .136$, $p = .006$), Violent Gratification ($r = .240$, $p < .001$), Coping ($r = .391$, $p < .001$), Fun ($r = .138$, $p = .006$), Cognitive challenge ($r = .261$, $p < .001$), Competition ($r = .262$, $p < .001$), and Social interaction ($r = .208$, $p < .001$; Table 3).

Psychological risk factors in Spanish university students

Non-statistically significant correlations were found between higher scores on IGDS and higher general impulsivity. Regarding impulsivity dimensions, higher levels of lack of premeditation ($r = .162$, $p = .007$) and lack of perseverance ($r = .120$, $p = .047$) statistically significantly correlated with higher IGD scores (Table 4).

Table 4. Correlations between IGD and psychological factors.

Variables	Correlation with IGDS in the Spanish sample ($n = 275$)	Correlation with IGDS in the Italian sample ($n = 402$)
Emotional Intelligence	-.183*	-.033
SEA	-.122*	-.042
OEA	-.187*	-.018
EA	-.094	-.057
ER	-.157*	-.009
Impulsivity	.117	.277*
NU	.026	.184*
LPM	.162*	.027
LPS	-.120*	.152*
SS	-.028	.110*
PU	.040	.208*
Perceived Social Support	-.194*	-.142*
FA	-.120*	-.120*
PE	-.168*	-.157*
OS	-.194*	-.118*

Note: IGDS = Internet Gaming Disorder Scale; SEA = appraisal of one's own emotions; OEA = appraisal of others' emotions; EA = emotion awareness; ER = Emotion regulation; NU = Negative urgency; LPM = Lack of premeditation; LPS = Lack of perseverance; SS = Sensation seeking; PU = Positive urgency; FA = Perceived family support; PE = Perceived peer support; OS = Perceived support of significant others.

Thus, only specific impulsive tendencies—acting without thinking and difficulties persisting in tasks—showed meaningful associations with IGD in the Spanish sample.

Psychological risk factors in Italian university students

Statistically significant correlations were found between IGDS scores and impulsivity levels ($r = .277$, $p < .001$). Regarding impulsivity dimensions, higher levels of negative urgency ($r = .184$, $p < .001$), lack of perseverance ($r = .152$, $p = .002$), sensation seeking ($r = .110$, $p = .028$), and positive urgency ($r = .334$, $p < .001$) statistically significantly correlated with IGD scores. Non-statistically significant differences were found between lack of premeditation and IGD scores ($r = .027$, $p = .587$; see Table 4). Thus, impulsivity correlates with IGD among Italian gamers, particularly emotion-driven impulsivity.

Potential psychosocial protective factors of Internet gaming disorder in Spanish university students

Statistically significant correlations were found between IGDS scores and perceived social support ($r = -.194$, $p = .001$) and emotional intelligence ($r = -.183$, $p = .002$). Regarding emotional intelligence dimensions, negative statistically significant correlations were found between IGDS and SEA scores ($r = -.122$, $p = .043$), OEA ($r = -.187$, $p = .002$), and ER ($r = -.157$, $p = .009$; Table 3). Thus, stronger emotional abilities and higher perceived support may protect against IGD in Spanish students.

Potential psychosocial protective factors of Internet gaming disorder in Italian university students

Statistically significant correlations were found between higher scores on IGDS and perceived social support ($r = -.142$, $p = .004$). Regarding emotional intelligence, no statistically significant correlations were found between IGDS scores ($r = -.033$, $p = .514$) and any specific dimensions or general emotional intelligence (SEA: $r = -.042$, $p = .404$; OEA: $r = -.018$, $p = .719$; EA: $r = -.057$, $p = .255$; ER: $r = -.009$, $p = .854$). Thus, emotional abilities do not play a substantial role in IGD among Italian students, although lower perceived social support appears to contribute modestly to IGD.

Predictors of IGD in university students

To summarise, in the Spanish sample, IGD was associated with higher gaming time, participation in toxic gaming communities, playing with acquaintances and strangers, several gaming motivations, specific impulsivity dimensions, and lower emotional intelligence and perceived social support. In the Italian sample, IGD was associated with higher gaming time, toxic community involvement, all gaming motivations, multiple impulsivity dimensions, and lower perceived social support.

Table 5. Variable selection process: Measures of global adjustment of the models in Spanish gamers ($n = 275$).

	-2LL	χ^2	df	R^2 Cox y Snell	R^2 Nagelkerke	Accuracy
Model 0	147.217	–	–	–	–	93.8
Model 1	109.985	17.455**	1	.062	.166	93.8
Model 2	101.333	26.106**	2	.091	.244	93.4
Model 3	97.411	30.029**	3	.104	.279	93.4

Note: df = degrees of freedom of χ^2 . ** $p < .001$.

Model 0 (Intercept-only model) = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \varepsilon$

Model 1 (Model 0 + play with strangers) = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \beta_1 \text{Play with strangers} + \varepsilon$

Model 2 (Model 1 + Emotional Intelligence) = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \beta_1 \text{Play with strangers} + \beta_2 \text{Emotional Intelligence} + \varepsilon$

Model 3 (Model 2 + Impulsivity dimension) = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \beta_1 \text{Play with strangers} + \beta_2 \text{Emotional Intelligence} + \beta_3 \text{Lackofforethought} + \varepsilon$.

Table 6. Variable selection process: Measures of global adjustment of the models in Italian gamers ($n = 402$).

	-2LL	χ^2	df	R^2 Cox y Snell	R^2 Nagelkerke	Accuracy
Model 0	177.327	–	–	–	–	96.0
Model 1	119.788	14.730**	1	.036	.127	96.0
Model 2	113.381	21.137**	2	.051	.180	96.0

Note: Df = degrees of freedom of χ^2 . ** $p < .001$.

Model 0 (Intercept-only model) = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \varepsilon$.

Model 1 (Model 0 + Impulsivity dimension) = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \beta_1 \text{Positive Urgency} + \varepsilon$.

Model 2 (Model 1 + Perceived Social Support dimension) = $\text{logit}(\text{Non} - \text{IGD} = 1) = \beta_0 + \beta_1 \text{Positive Urgency} + \beta_2 \text{Hours of Gaming} + \varepsilon$.

Table 7. Results of the final binary logistic regression model for predicting IGD in Spanish gamers ($n = 275$).

	β	SE	df	Wald	p -value	OR	95% CI for OR	
							LL	UL
Play with strangers	2.298	0.563	1	16.671	<.001	9.954	3.303	29.998
Lack of premeditation	.179	0.093	1	3.713	.054	1.196	0.997	1.436
Emotional Intelligence	-.064	0.021		9.251	.002	0.938	0.901	0.978
Intercept	-.287	1.680	1	0.029	.011	0.751		

Note: β = regression coefficient. SE = Standard Error. df = degrees of freedom of Wald test. p = probability value associated with the Wald test. OR = Odds Ratio. 95% CI = 95% Confidence Interval for OR. LL = Lower limit. UL = Upper limit.

Since statistically significant differences were found between the Spanish and Italian non-IGD and probable IGD gamers, two binomial logistic regression analyses were performed using the Forward Selection: LR method to evaluate the relationship between the predictor variables and the probability of developing IGD. Tables 5 and 6 display the results of the model fit measurements for both samples.

Spanish predictors of IGD

For the first step of the regression analysis, playing with strangers (model 1) was selected; its incorporation in the model entailed a statistically significant reduction in the misfit of the null model ($\chi^2(1) = 17.455$, $p < .001$). In the second step, the variable general emotional intelligence (model 2) was selected and led to a statistically significant reduction in misfit concerning model 1 ($\chi^2(2) = 26.106$, $p < .001$). In the third and final step, the variable lack of premeditation (model 3) was selected and led to a statistically significant reduction in misfit regarding model 2 ($\chi^2(3) = 30.029$, $p < .001$). These improvements in model fit were also seen in the increase in the pseudovariance statistics explained by the models (R^2) and in the accuracy of the models (total percentage of cases correctly classified in each model). This better fit was verified by Hosmer and Lemeshow's test, which was not statistically significant (model 1: $\chi^2(8) = 7.009$, $p = .536$; model 2: $\chi^2(8) = 10.480$, $p = .233$). The Nagelkerke R^2 coefficient indicated that the independent variables included in the model explain approximately 27.9% of the variability in the probability of having IGD.

Table 7 shows regression coefficients. For playing with strangers, the regression coefficient ($\beta = 2.30$) and odds ratio ($OR = 9.95$, 95% CI: 3.30, 29.99) indicate that gamers who play with strangers are 9.95 times more likely to develop IGD compared to those who do not. Playing with strangers was the strongest predictor of IGD in the Spanish sample. For lack of premeditation, controlling for the influence of playing with strangers, the regression coefficient ($\beta = .18$) and odds ratio ($OR = 1.20$) 95% CI: 0.997, 1.436), suggesting that each unit increase raises the odds of IGD by 1.19%. Thus, lack of premeditation showed only a marginal effect. For emotional intelligence, controlling for the influence of playing with strangers and lack of premeditation,

Table 8. Results of the final binary logistic regression model for predicting IGD in Italian gamers ($n = 402$).

	β	SE	df	Wald	p -value	OR	95% CI for OR	
							LL	UL
Hours of gaming	.052	0.020	6.877	1	.009	1.053	1.013	1.095
Positive Urgency	.339	0.102	11.118	1	<.001	1.404	1.150	1.714
Intercept	-7.624	1.280	35.505	1	<.001	0.000		

Note: β = regression coefficient. SE = Standard Error. df = degrees of freedom of Wald test. p = probability value associated with the Wald test. OR = Odds Ratio. 95% CI = 95% Confidence Interval for OR. LL = Lower limit. UL = Upper limit.

the regression coefficient ($\beta = -.064$) and odds ratio ($OR = 0.94$, 95% CI: 0.901, .978) indicate that each unit decrease increases the odds of IGD by 0.64%. Lower emotional intelligence has also been associated with an increased risk of IGD in the Spanish sample, suggesting that difficulties in understanding and regulating emotions may contribute to greater vulnerability.

Italian predictors of IGD

In the first step of the regression analysis, Positive Urgency (model 1) was selected; its incorporation in the model entailed a statistically significant reduction in the misfit of the null model ($\chi^2(1) = 14.730$, $p < .001$). In the second and final step, the variable hours of gaming per week (model 2) was selected, leading to a statistically significant reduction in misfit concerning model 1 ($\chi^2(2) = 21.137$, $p < .001$). These improvements in model fit were also reflected in the increase in the pseudovariance statistics explained by the models (R^2). This better fit was verified by Hosmer and Lemeshow's test, which was not statistically significant (model 1: $\chi^2(7) = 5.040$, $p = .655$; model 2: $\chi^2(8) = 4.689$, $p = .790$). The Nagelkerke R^2 showed the model explained about 18% of the variability in IGD probability.

Table 8 includes regression coefficients. For each additional hour of gaming, the odds of developing IGD increase by 5.3% ($\beta = .052$, $OR = 1.053$, 95% CI: 1.013, 1.095). In the Italian sample, IGD risk increased with greater daily gaming time, with each additional hour contributing to a higher likelihood of IGD. Each unit increase in positive urgency raises the odds by 40.4% ($\beta = .339$, $OR = 1.404$, 95% CI: 1.150, 1.714). Positive urgency was also a strong predictor, indicating that individuals who act impulsively when experiencing positive emotions are substantially more likely to develop IGD in the Italian sample.

Summary of results

IGD prevalence was similarly low in both countries, yet the pattern of associated factors differed. While intensive gaming behaviour appeared relevant in both groups, the strongest predictors varied by country. Playing with strangers, lower emotional intelligence, and low premeditation characterised Spanish IGD risk, whereas positive urgency and gaming time were the most salient predictors among Italian students. These cross-national differences suggest that IGD may involve shared behavioural risks but distinct psychological mechanisms.

Discussion

This study aims to explore the prevalence of gaming disorder in the Spanish and Italian university population, to compare risk and protective factors, and to examine which factors are shown to predict IGD in both countries.

The first objective of this study was to explore the prevalence of IGD in both samples. Contrary to H1, results estimated a 2.1% and 2.4% IGD prevalence in the Spanish and Italian university samples. These results are low compared to previous studies (3.3–4.18% in Spanish samples, and 15% in an Italian sample; De Pasquale et al., 2020; Mora-Salgueiro et al., 2022; Jiménez Tallón et al., 2011). IGD is more prevalent among males than females (Fam, 2018). This Spanish sample had a higher percentage of females (67%), which may have influenced the lower IGD rates. The estimated prevalence was also lower compared to studies using similar samples from other countries, such as among Chinese university students (5.5% and 6.4%, respectively; Shi et al., 2020; Li et al., 2020). However, when considering only current gamers, the prevalence increased to 6.1% and 4%, which aligns with findings from other research indicating higher IGD rates among active gamers (Borges et al., 2019). In this line, Varchetta et al., (2024) showed lower levels of

IGD in Italy compared to Spain. These differences underscore the importance of considering sample characteristics such as geographic location, the proportion of gamers, and gender distribution.

The second objective was to compare the relationship between IGD and potential risk and protective factors in both countries. First, gaming time emerged as an important predictor. In both groups, gaming time was positively correlated with IGD, supporting H2. This aligns with King et al. (2017), who found that high-risk IGD adolescents spent significantly more time gaming with strangers than general gamers (32.6% vs. 7.9%). Meta-analyses have similarly shown that gaming time is one of the strongest predictors of IGD (Zhuang et al., 2023). Second, some gaming patterns were also correlated in both samples. Playing with acquaintances and participating in more toxic gaming communities were significant risk factors in both samples, supporting H2 and partially rejecting H3. These findings are consistent with previous literature on adolescents and young adults. On one hand, young people may use video games to socialise anonymously with strangers to avoid the perceived risks of interacting with real-world peers (e.g. bullying or exclusion; Lo et al., 2005), and games can satisfy affiliation needs (Cole & Griffiths, 2007). Social elements of gaming may also encourage prolonged gaming sessions, contributing to excessive use (Longman et al., 2009). On the other hand, earlier research indicates that exposure to toxicity in gaming environments predicts IGD (Gandolfi et al., 2023). Intensive gaming may be associated with lower social skills and more disruptive behaviours (Prescott et al., 2018), although the direction of this relationship remains unclear. Greater exposure to toxic communities may foster higher toxicity and poorer social skills, leading to increased reliance on in-game social interactions (Bandura, 2001; Gandolfi et al., 2023). However, one cross-national difference in gaming mode emerged, partially confirming H3. While gaming-related risk patterns were similar across the two samples, playing with strangers was a significant predictor only in the Spanish sample. This suggests that social gaming dynamics may differ between countries and that this pattern may require specific preventive attention in Spain.

As expected in H3, differences were found in the relationship between gaming motivations and IGD across samples. Several gaming motivations—such as violent gratification, competition, coping, cognitive challenge, and social interaction—were significantly correlated with higher IGD scores in both samples, suggesting that specific motivations can increase the risk of developing IGD. However, all gaming motivations were statistically significantly related to IGD in the Italian sample. Meta-analytic evidence indicates that while various motives are statistically associated with gaming disorder, most effect sizes are small to moderate and show significant variability across different populations and settings (Bäcklund et al., 2022). This underscores the importance of being cautious when interpreting any single motive as a strong standalone risk factor. Understanding motivational patterns is valuable in clinical and preventive settings, as identifying students driven by specific motivations can help detect early vulnerabilities to IGD. Additionally, this highlights the need to consider how combinations of motives, rather than isolated ones, influence risk profiles in different contexts (Bäcklund et al., 2022).

Competitiveness was significantly linked to IGD, similar to gambling disorder (Bäcklund et al., 2022). Gamblers with higher competitiveness are less accepting of defeats and exhibit recurrent gambling patterns. Similarly, competitive gamers may struggle to accept defeat and prioritise gaming over other responsibilities. Recent research indicates that competitive game modes are associated with increased gaming disorder symptoms, highlighting a potential interaction between personal competitiveness and design-game features such as ranking systems and leaderboards (Flayelle et al., 2025). Therefore, competitiveness should be considered as part of a broader risk configuration.

Emotional escape motivation was associated with IGD. Research indicates that coping motivations may mediate the link between psychiatric distress, social anxiety, loneliness, and IGD symptoms (Bäcklund et al., 2022; Maroney et al., 2019). This suggests individuals using gaming to avoid negative emotions often struggle with effective coping strategies, leading to gaming as a maladaptive coping mechanism (Di Blasi et al., 2019; Bäcklund et al., 2022). Systematic reviews indicate that escapism and avoidance coping are linked to problematic gaming (Sinha et al., 2024), but there is a lack of longitudinal evidence, leaving causality unclear. Therefore, high emotional escape motivations may increase vulnerability to IGD or result from existing emotional difficulties.

Cognitive-challenge motivation was linked to IGD in this study. Previous studies did not identify it as a factor directly related to IGD (López-Fernández et al., 2019), although achievement- and performance-oriented motives (e.g. mastery, progression) have shown consistent associations with IGD symptoms

(Bäcklund et al., 2022; Wang & Cheng, 2022). Games that present mastery challenges can encourage cognitively challenged gamers to continue playing by fostering feelings of accomplishment. However, this pattern may indicate intense engagement rather than pathology in some gamers.

Social interaction motivations were also associated with IGD. Previous literature showed that social gaming motivations are associated with gaming time (Wu et al., 2017) and IGD symptomatology (Männikkö et al., 2016). Gamers may find social acceptance in gaming communities, leading to increased gaming habits (King et al., 2014). Complementarily, social support seems to be a protective factor against IGD (Zhuang et al., 2023). Thus, people with less perceived social support in real life may use gaming to meet people, spending more time on these activities than on other social activities. Narrative evidence highlights that the social context surrounding gaming—such as the norms, expectations, and dynamics within gaming groups—plays a crucial role in the development and maintenance of problematic gaming (Gelūnas, 2025). Social motives can be protective when part of supportive offline networks, but may pose risks when gaming communities are the primary social connection.

Fun, immersion, and customisation motives have also been linked to IGD in the present Italian sample. In the case of fun motivation, it has been linked to a higher frequency of gaming, which can generate excessive gaming patterns (Bäcklund et al., 2022). In the case of immersion and customisation, they are related to game elements itself, and their relationship with IGD is weaker compared to coping motives (Deleuze et al., 2015; Wang & Cheng, 2022). Consistent with this, recent meta-analytic work indicates that achievement and escape motives tend to show stronger associations with IGD than purely hedonic or customisation-related motives (Bäcklund et al., 2022). The fact that fun, immersion, and customisation emerged only in the Italian sample may reflect cultural or contextual differences in how students engage with games or sample-specific characteristics, and should therefore be interpreted cautiously rather than as universal risk factors. Results support the view that IGD is influenced by gaming-related, individual, and environmental factors (Wang & Cheng, 2022).

According to H4, differences in psychological variables related to IGD were observed between samples. In the Spanish sample, emotional intelligence and perceived social support were found to be protective factors against IGD, while in the Italian sample, only perceived social support played this role.

Previous research indicated that emotional intelligence and social competence are negatively associated with IGD (Gisbert-Pérez et al., 2024). Difficulties in emotional regulation may increase IGD risk, as gaming can be a way to escape emotional distress (Kircaburun et al., 2019). Evidence suggests that individuals who struggle to identify, express, or modulate their emotional states may rely on gaming as an avoidant coping strategy. Studies on emotion regulation have shown that players with IGD tend to use more maladaptive strategies (e.g. emotional suppression), and that these deficits are associated with higher depression and hostility, which in turn relate to IGD severity (Estupiñá et al., 2024). These findings suggest a possible maintenance cycle whereby emotional dysregulation promotes escapist gaming, and excessive gaming further limits opportunities to develop adaptive emotional skills, reinforcing vulnerability to IGD.

Similarly, perceived social support was previously identified as a protective factor against IGD (Malak et al., 2023; Meng et al., 2024). Among university students, lower perceived support is associated with greater IGD severity, and social support has been shown to mediate the impact of psychological distress on gaming-related problems (Malak et al., 2023). Evidence in adolescents also indicate that lower perceived support co-occurs with problematic gaming and emotional dysregulation (Uçur & Dönmez, 2021). Moreover, research comparing different gamer profiles suggests that perceived offline support (e.g. family, friends, and significant others) functions as a protective factor against behavioural addictions (Durak et al., 2023). However, the association may also operate in the opposite direction: Teng et al., (2020) propose that excessive gaming may erode offline social networks over time, thereby reducing perceived support. Consistent with this, individuals with IGD often report lower perceived support and greater loneliness (Liao et al., 2020). Together, these findings suggest that perceived social support may not only buffer against IGD development but may also be negatively affected by it, pointing to a potential bidirectional maintenance cycle.

However, the cross-country differences observed require a cautious interpretation. The lack of a protective effect of emotional intelligence in Italy may reflect sample-specific characteristics rather than structural cultural differences. For example, the Italian sample may display lower variability in emotional intelligence scores, reducing the power to detect associations. It is also possible that other unmeasured variables—such

as stress, academic pressure or academic performance—moderate the relationship differently across countries (Gao et al., 2022). Considering this, strengthening emotional intelligence in Spain and perceived social support in both countries may help prevent or reduce IGD symptoms.

A relationship between impulsivity and IGD was observed in both samples, partially rejecting H4. However, all impulsivity components correlated with IGD in Italy, while in Spain, only lack of premeditation and perseverance did. Previous studies suggest a dual relationship: higher impulsivity may result from reduced executive function linked to IGD, and IGD can lead to more impulsive decision-making (Kräplin et al., 2021; Şalvarlı & Griffiths, 2022; Zhuang et al., 2023). This suggests that individuals with higher impulsivity may struggle to control their gaming habits, particularly during IGD development (Ji et al., 2021). Recent conceptual models also indicate that impulsive traits may interact with game design characteristics, such as reward pacing or competitive structures, increasing vulnerability in certain player groups (Flayelle et al., 2025). These interactions could help explain why impulsivity showed a broader impact in Italy if participants there tended to engage more with fast-paced or competitive genres.

The third objective was to examine the predictors of IGD in both samples. Logistic regression analysis identified that playing with strangers, emotional intelligence, and lack of premeditation were key predictors in Spain, while positive urgency and hours of play were significant in Italy, supporting H5 cross-country expected differences. These findings suggest that cultural differences may influence the factors associated with IGD (O'Farrell et al., 2020; Wang & Cheng, 2022), despite both countries being individualistic cultures. Previous studies have noted differing correlates for Internet addiction between Spain and Italy, indicating that cultural attitudes towards gaming may affect IGD patterns (Varchetta et al., 2024). It should be noted that some predictors may reflect differences in gaming habits rather than true cultural contrasts. It is possible that sample composition, genre preferences, or contextual factors influenced the strength of these associations. Overall, the results highlight that IGD predictors may differ across countries due to contextual rather than strictly cultural factors, underscoring the importance of examining risk profiles within specific national settings.

Limitations of the study

This study has several limitations. First, the sample consisted exclusively of university students obtained through convenience sampling, which may affect representativeness and introduce selection bias, limiting the generalisability of the findings. In addition, specific sample characteristics—such as the gender imbalance in the Spanish sample and the different proportions of active gamers in each country—may have influenced the observed IGD prevalence estimates. Given that IGD is more common among men and more likely to occur among regular gamers, these distributions should be considered when interpreting prevalence rates and extrapolating the findings to broader populations. Second, the cross-sectional design prevents establishing causal relationships between variables. Third, self-reported data may be influenced by biases like social desirability, impacting the accuracy of responses. In the context of IGD, a sensitive topic, respondents may feel inclined to provide socially acceptable answers or underestimate the presence of symptoms they find stigmatising. This may result in a tendency to underreport the severity or frequency of problematic gaming behaviours. Additionally, cultural nuances in self-reporting (e.g. variations in response styles and comfort levels when discussing problematic behaviours) can differ across countries and should thus be considered when interpreting cross-national comparisons. In this study, participants were informed that anonymous questionnaires would be used and that their data would be treated confidentially, which may have mitigated some reporting concerns but does not eliminate potential bias.

Future research directions

Future research should aim to recruit gender-balanced samples to minimise sampling biases and enhance the external validity of prevalence estimates. Longitudinal and mixed-methods designs would help clarify temporal dynamics and mechanisms involved in IGD development (e.g. whether emotional dysregulation and social support deficits precede, result from, or mutually reinforce

problematic gaming). Additionally, studies should incorporate techniques to detect or reduce self-report bias, ensuring more accurate self-reporting. Beyond gaming-related IGD, future work should examine other Internet or social network-related behavioural phenomena to obtain a more comprehensive picture of digital addictions. Finally, while translation of instruments was performed by native Italian and Spanish speakers, repeating the study with validated questionnaires for these populations could help determine a specific cut-off value.

Practical implications of the study

Several practical implications arise for educational and psychological contexts regarding IGD in the university context. First, student health and counselling services could incorporate brief screening components into mental health assessments that include psychosocial variables associated with IGD (e.g. emotional regulation abilities), together with gaming-related risk indicators (e.g. gaming intensity). Enhancing students' emotion regulation skills and strengthening their offline social support networks may reduce the possible cyclical dynamic of escapist gaming and social withdrawal, thereby reducing vulnerability to IGD. Students identified at higher risk could then be offered targeted counselling modules focused on emotion regulation and stress management, together with impulse-control strategies for those with urgency-driven gaming patterns. Second, universities could implement workshops to promote healthy gaming habits. These workshops would include weekly time-tracking logs, gaming-study balance plans, and prioritising supportive gaming social circles instead of anonymous or toxic environments. Third, strengthening social support through peer mentoring programmes or gaming clubs that emphasise cooperative play may also reduce reliance on solitary or anonymous online gaming. Universities can collaborate with student unions or gaming societies to organise gaming events that promote gaming as a socially shared activity. These targeted and context-specific strategies may support prevention and early intervention in university settings.

Conclusion

Differences in prevalence and predictors of IGD highlight the need for context-specific approaches to its prevention and treatment. Understanding these variations is crucial for accurately interpreting research findings and addressing IGD effectively. These insights also suggest that universities and campus mental health services could play a key role in implementing early screening, psychoeducation, and support initiatives targeting students at risk.

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Author contributions

JG-P, MM-V, CL, MAF and LB-R contributed to the conception and design of the manuscript. JG-P and LB-R performed data analysis. JG-P, CL, MM-V, MAF and LB-R helped in the acquisition of data. JG-P, CL and LB-R contributed to the interpretation of data. JG-P, CL, MM-V, MAF and LB-R prepared the manuscript. All authors provided final approval of the manuscript for publication.

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Data availability statement

The data supporting this study's findings are available on request from the corresponding author.

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Appendix

Table A1. Cronbach's alpha and McDonald's omega of study scales.

		e-MUV										UPPS-P					MSPSS					WLEIS-S				
		IMM	CUS	VIO	COP	FUN	CHAL	COMP	SOC	IGDS	NU	LPM	LPS	SS	PU	T	FA	PE	OS	T	SEA	OEA	EA	ER	T	
Spanish sample	α	.85	.86	.88	.84	.89	.85	.83	.83	.86	.76	.87	.85	.79	.55	.81	.92	.92	.97	.88	.82	.81	.79	.83	.89	
	ω	.86	.88	.88	.83	.89	.85	.84	.83	.86	.76	.87	.85	.80	.59	.81	.92	.92	.97	.88	.83	.82	.80	.83	.89	
Italian sample	α	.87	.83	.89	.89	.93	.89	.81	.85	.85	.83	.73	.88	.75	.71	.80	.77	.71	.70	.89	.70	.71	.65	.74	.92	
	ω	.87	.85	.89	.89	.93	.90	.83	.85	.85	.84	.75	.88	.76	.73	.81	.78	.75	.74	.89	.70	.72	.67	.74	.92	

Note: e-MUV = Motives in Video Game Use scale; IMM = Immersion; CUST = Customisation; VIO = Violent Gratification; COP = Coping; FUN = Fun; CHAL = Cognitive Challenge; COMP = Competition; SOC = Social Interaction; IGDS = Internet Gaming Disorder Scale; UPPS-P = UPPS-P impulsive behaviour scale; NU = Negative urgency; LPM = Lack of premeditation; LPS = Lack of perseverance; SS = Sensation seeking; PU = Positive urgency; T = Total score scale; MSPSS = Multidimensional scale of perceived social support; PE = Perceived family support; OS = Perceived peer support; FA = Perceived support of significant others; WLEIS-S = Wong and Law Emotional Intelligence Scale; SEA = appraisal of one's own emotions; OEA = appraisal of others' emotions; EA = emotion awareness; ER = Emotion regulation.



Factor structure of the Internet Gaming Disorder Scale: an Exploratory Graph Analysis approach in Spanish university gamers

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ABSTRACT

Importance: Internet gaming disorder (IGD) has emerged as a growing concern, particularly among adolescents and young adults. This concern has prompted the development of standardized tools for IGD assessment, such as the Internet Gaming Disorder Scale (IGDS). IGDS is based on the DSM-V diagnostic criteria, and has been mainly used as a unidimensional measure of IGD.

Objective: This study aimed to translate and validate the Spanish version of the IGDS in a sample of university students ($N = 274$, $M_{age} = 21.64$ years, $SD_{age} = 2.93$, % male = 59.7%).

Methods: Exploratory Graph Analysis (EGA) followed by Confirmatory Factor Analysis (CFA) were conducted, and internal consistency and convergent validity were assessed.

Results: EGA identified a bidimensional structure comprising (1) cognitive-emotional symptoms and (2) relational-problem outcomes, which was confirmed through CFA. Both dimensions demonstrated excellent reliability and adequate convergent validity.

Conclusion: The Spanish IGDS is a psychometrically valid instrument for assessing IGD, allowing for an accurate distinction between gaming intensity and functional impairment. These findings challenge the traditional unidimensional perspective and support a biaxial conceptualization of IGD.

1. Introduction

Internet gaming disorder (IGD) is a growing health concern. While gaming is often associated with cognitive, psychological, and social benefits, such as recreation and building social connections (Halbrook et al., 2019; von der Heiden et al., 2019), excessive gaming can lead to negative symptoms that impact both physical and mental health (Király et al., 2023). Excessive gaming can result in a gaming disorder, which shares characteristics with other addictions, such as gambling disorder (Saunders et al., 2017). The World Health Organization (2022; section 6C51, p.1) formally recognized gaming disorder in ICD-11 as “a pattern of gaming behavior characterized by impaired control over gaming, increasing priority given to gaming over other activities to the extent that gaming takes precedence over other interests and daily activities, and continuation or escalation of gaming despite the occurrence of negative consequences”.

The Diagnostic and Statistical Manual of Mental Disorders (5th ed., text rev.; DSM-V-TR, American Psychiatric Association [APA], 2022)

includes IGD as a condition for further research. IGD is characterized by significant impairment or distress in several aspects of a person's life due to gaming behaviors. DSM-V-TR includes nine IGD symptoms, such as (1) preoccupation with gaming, (2) withdrawal symptoms when gaming is not possible (sadness, anxiety, irritability), (3) tolerance, (4) inability to reduce or quit gaming, (5) giving up other activities due to gaming, (6) continuing gaming despite problems, (7) deceiving family members or others about gaming time, (8) the use of gaming to relieve negative moods, and (9) risk, having jeopardized or lost a job or relationship due to gaming (APA, 2022). To be diagnosed with IGD, an individual must experience five or more of these symptoms related to gaming within one year.

Two meta-analyses of IGD prevalence estimated an overall prevalence of between 1.96–3.05 % (95 % CI: [2.38, 3.91]; Stevens et al., 2021) and 3.3 % (95 % CI: [2.6–4.0]; Kim et al., 2022), with lower estimates with adjusted prevalence estimations (1.96 %, 95 % CI: [0.19, 17.12], Stevens et al., 2021; 1.4 %, 95 % CI: [0.9–1.9], King et al., 2022). Both studies identified countries of study, age group, and gender as

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sources of prevalence variability. IGD seems to be a more severe concern in early stages, with an estimated prevalence of 4.6 % in adolescence and young adults (Fam, 2018) and 6.1 % in young adults (Gisbert-Pérez et al., 2025). Moreover, males have a higher prevalence of IGD than females (6.8 % and 1.3 %, respectively; Wang and Cheng, 2021). As a result, mental health professionals face several controversies and opportunities when assessing and treating IGD (Carbonell et al., 2020).

The inclusion of IGD in the DSM-V (APA, 2013) and the increasing prevalence fostered the development of instruments to assess and diagnose IGD. Such instruments include the 10-item Internet Gaming Disorder Test (IGDT-10; Király et al., 2017), the 9-item short form of the Internet Gaming Disorder Scale (IGDS9-SF; Pontes and Griffiths, 2015), the Video Game Scale for Children (VGS-C; Donati et al., 2019), and the 27-item and 9-item Internet Gaming Disorder Scale (IGDS; Lemmens et al., 2015), among others. The systematic review of IGD instruments by King et al. (2020) highlighted five IGD instruments with better psychometric properties. One of these is the IGDS by Lemmens et al. (2015), which covers all nine DSM-5 IGD criteria (preoccupation, tolerance, withdrawal, persistence, escape, problems, deception, displacement, and conflict). IGDS has been validated in population between 13 and 40 years (Lemmens et al., 2015) and in children and adolescents (12–17 years; Paschke et al., 2021).

The IGDS scale has been translated and validated in several languages, including Arabic (Baiumy et al., 2018), Turkish (Evren et al., 2017), and Chinese (Lei et al., 2020). While there is a preliminary Spanish translation of the 27-item dichotomous IGDS scale (Hidalgo, 2022), there has not yet been a study that translates and validates the 9-item IGDS scale into Spanish. This highlights a gap in the literature and emphasizes the need for a psychometrically validated Spanish version of the 9-item IGDS scale.

For this study, the 9-item IGDS with polytomous response (Likert 0–5) version was selected. Higher scores indicate more problematic gaming behavior. For the diagnosis of gaming disorder, the recommended cut-off point established by the researchers is the presentation of five or more criteria over 12 months, based on the DSM-5 recommendation (APA, 2013; Lemmens et al., 2015). This criterion, assumed from the DSM-5 (>5), showed high specificity and adequate sensitivity (Bernaldo-de-Quirós et al., 2020). Assuming this cut-off point, Lemmens et al. (2015) identified three types of players: normal, at-risk, and disordered. Regarding its structure, Lemmens et al. (2015) reported unidimensionality according to the fit indices of a Confirmatory Factor Analysis (CFA) and excellent consistency with a Cronbach's alpha of 0.93. IGDS has also been adequate in several reliability generalization meta-analyses (Gisbert-Pérez et al., 2022; Yoon et al., 2021). In the case of the shortened 9-item versions of the IGDS, the polytomous response option showed higher mean reliability scores. Convergent validity is supported by small to medium correlations of IGDS scores with psychological constructs such as impulsivity, antisocial behavior, anger control, hyperactivity, loneliness, emotional distress, low self-esteem, life satisfaction, and prosocial behavior (Lemmens et al., 2015; Schivinski et al., 2018; Wartberg et al., 2019).

Previous research has studied the psychometric properties of different IGDS versions, generally supporting the unidimensionality of the scale. Coşa et al. (2024) analyzed the measurement invariance of the one factor model proposed by the author of the IGDS in a sample of Romanian adolescents and their parents. Their results showed that the one-factor IGDS model fit well in both the self-reported and parent-reported versions. Lei et al. (2020) compared the performance of the IGDS Mandarin Chinese version using binary and polytomous items, the one-factor structure was retained in both versions through EFA and CFA in a sample of adolescents and adults. It should be noted that most studies assumed the unidimensionality of the scale established by the authors, such as the measurement invariance carried out by Ali et al. (2022) which demonstrated an equal functioning of the scale across different countries. However, the unidimensionality reported in the original IGDS study has not always been consistently replicated across

studies. Paschke et al. (2021) explored the psychometric properties of the IGDS in three samples of children and adolescents, where the results did not support unidimensionality using CFA. Ono et al. (2025) conducted a validation of the IGDS for the Chinese population. Although the overall sample showed adequate CFA fit indices, they were not acceptable in its clinical and healthy subsamples.

Given the inconsistent results found in the previous literature, further investigation of the IGDS factor structure is needed. The lack of consensus may be due to differences in the methodologies used to examine dimensionality, including both EFA and CFA. Simulation studies have shown that these techniques do not estimate well underlying dimensions (Garrido et al., 2013; Lubbe, 2019; Montoya and Edwards, 2020). For this reason, it is worth exploring alternative approaches to analyze the dimensionality of the IGDS.

A robust alternative for scale validation is Exploratory Graph Analysis (EGA). EGA is a technique derived from network psychometrics (Golino and Epskamp, 2017). Network psychometrics utilizes network modeling techniques to analyze scale dimensionality through the Gaussian graphical model (GGM; Lauritzen, 1996) and clustering techniques (Pons and Latapy, 2006). GGM estimates the joint distribution of random variables (Lauritzen, 1996; Epskamp et al., 2017). Based on partial correlation coefficients, EGA produces a network plot that depicts item clusters and their strength of association (Golino et al., 2020). Simulation studies have shown that EGA is more accurate in dimensionality analysis compared to traditional methods used in (exploratory) factor and principal component analysis (Golino and Epskamp, 2017; Golino et al., 2020).

The main objective of this study is to translate and validate the 9-item IGDS in a Spanish young adult sample. To the best of our knowledge, this represents the first adaptation and validation of the 9-item IGDS into Spanish. Given the inconsistencies in the factorial study of the IGDS, and the evidence obtained from the use of EGA versus the usual methods of studying dimensionality, this study aims to explore the dimensionality of the IGDS with EGA and confirm this dimensionality using CFA. Additionally, internal consistency and convergent validity evidence is provided.

2. Method

2.1. Procedure

Study data were collected through a cross-sectional survey using LimeSurvey. Before the survey, all participants gave informed consent, and they were free to withdraw from the study at any time without giving any reason. The study adhered to the ethical standards of both the institutional and national research committee, the 1964 Declaration of Helsinki, and its subsequent amendments, or comparable ethical standards. The study was reviewed and approved by the Ethics Committee of the University of Valencia (code 2023-MAG- 2988759).

2.2. Participants

Data for this study was gathered by convenience sampling. The sample consisted of a total of 274 university students in Spain during the 2022–2024 academic years. Inclusion criteria were (1) current video game players, and (2) being 18 or older. Their mean age was 21.64 years ($SD = 2.93$). Regarding gender, 38.1 % were female, 59.7 % were male and 2.2 % were non-binary. The sample was randomly split in two subsamples. Following the recommendations of Del Rey et al. (2021), we ensured that both subsamples were balanced based on sociodemographic characteristics through *t*-test for age and Pearson's Chi-squared test for gender and occupation. Sociodemographic data from both subsamples are displayed in Table 1.

Table 1

Means, percentages and standard deviations of the sociodemographic data for both subsamples.

	Mean ($\pm$ SD) or %		Statistic test	p
	Subsample 1	Subsample 2		
Age	21.46 ($\pm$ 2.81)	21.82 ($\pm$ 3.05)	$t(272) = -1.03$	.303
Gender			$\chi^2(3) = 2.12$	.548
Female	39.7 %	36.5 %		
Male	57.4 %	62.0 %		
Non-Binary	2.9 %	1.5 %		
Occupation			$\chi^2(3) = 0.975$	.807
Only study	63.5 %	65.7 %		
Only work	12.4 %	8.8 %		
Study and work	22.6 %	24.1 %		
None of the above	1.5 %	1.5 %		

Note. SD = Standard deviation. Missing data from sociodemographic were excluded for this analysis.

2.3. Instruments

The Internet Gaming Disorder Scale (IGDS; Lemmens et al., 2015) is a nine-item self-reported scale developed to assess IGD based on DSM-V criteria (APA, 2013). IGDS was translated to Spanish and evaluated in eight steps (Wild et al., 2005): 1) Forward translation: two translators unfamiliar with the IGDS but knowledgeable about gaming disorder and fluent in English independently translated the English version into Spanish; 2) Reconciliation of items: a third native Spanish translator fluent in English reviewed the two translations to generate an optimal translation from them. He evaluated the quality and clarity of the translation for the general public, selecting the best translation and suggesting alternatives when necessary to make it linguistically and culturally appropriate; 3) Backward translation: a fourth translator back-translated the reconciled version into English; 4) Back translation review: the original version was compared with the backward translated version; 5) Cognitive debriefing: a pilot test was conducted with 10 university students to evaluate intelligibility, interpretation, relevance and cognitive equivalence of the translation, as well as subsequent debriefing. During the debriefing, the interviewing researcher went through each item of the questionnaire asking the students if the translation was difficult to answer, confusing, difficult to understand, or offensive; 6) Finalization and proofreading: grammatical and spelling checking; 7) Validation of the final translated questionnaire and reliability assessment; 8) Inclusion of the final report (e.g., item 1 “¿Ha habido ocasiones en las que solo pensabas en el momento de jugar a videojuegos?”, item 2 “¿Te has sentido insatisfecho porque querías jugar más?”). The nine items are scored on a six-point Likert scale ranging from 0 (never) to 5 (every day or almost every day). In this study, higher scores indicate a greater presence of symptoms indicative of disordered gaming. In addition to the IGDS Spanish version, sociodemographic variables related to age, gender and educational level were collected.

Internet Gaming Disorder Scale-Short Form (IGDS9-SF; Pontes and Griffiths, 2015; Spanish version of Maldonado-Murciano et al., 2020). IGDS9-SF assesses IGD based on DSM-V criteria (APA, 2013). It consists of nine items scored on a five-point Likert scale ranging from 1 (never) to 5 (very often). In this study, higher scores indicate higher levels of disordered gaming symptoms.

2.4. Data analysis

We assessed structural validity, internal consistency and convergent validity of the Spanish version of the IGDS. Studying the structure of scales to determine the number of dimensions has typically been problematic, as it requires subjective decision-making on the part of the researcher (Sass and Schmitt, 2010). As noted by Haslbeck and Van Bork (2024), two classical and predominant strategies had been used for the selection of the number of dimensions when estimating (exploratory)

factor and/or component analysis. The first one is based on the study of the pattern of eigenvalues of the covariance matrix. The second approach considers it a model selection problem, so several fit indexes are observed to select the number of dimensions. To overcome the subjectivity issues in this selection, we split the sample in two subsamples for cross-validation. Firstly, an Exploratory Graph Analysis (EGA) was performed in the first subsample ($n = 137$) to explore the number of clusters of items and their distribution. Secondly, two Confirmatory Factor Analysis (CFA) was performed in the second subsample ($n = 137$): a one-factor model reflecting the original theoretical structure and a second model to validate the structure found by EGA in the previous analysis.

The Exploratory Graph Analysis (EGA) model was estimated using a polychoric correlation matrix to account for the ordinal nature of the items. The estimation method was a variant of Least Absolute Shrinkage and Selection Operator (LASSO; Tibshirani, 1996), the Graphical LASSO (GLASSO; Friedman et al., 2007) which is one of the most commonly employed in networks psychometrics. The Walktrap algorithm was used for community detection, as it demonstrated to be the most accurate algorithm for small sample sizes and low number of nodes (Christensen et al., 2023). Consistency of structure was assessed through the bootstrapped version of EGA and it is operationalized as the proportion of occasions that each dimension is estimated equally across a set of replicate samples (Christensen et al., 2020). Additionally, we employed variable redundancy analysis (UVA; Christensen et al., 2023) to address items' redundancy.

The estimation method employed for the two CFA models was DWLS (Diagonally Weighted Least Squares), due to is largely known to perform better than ML (Maximum Likelihood) when using categorical non-normal data (Li, 2016; Mîndrîlă, 2010). We employed the chi-square statistic (χ^2), the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), the Standardized Root Mean Square Residual (SRMR), and the Root Mean Squared Error of Approximation (RMSEA) as measures of fit. Acceptable model fit is considered with values of CFI and TLI being equal or greater than 0.90, and RMSEA and SRMR values equal or lower than 0.08 (Hu and Bentler, 1999).

Analyses were carried out using the R packages *EGAnet* (Golino and Christensen, 2019) and *lavaan* (Rosseel, 2012), while descriptive statistics were calculated in SPSS 29. Regarding internal consistency, it was estimated using the Composite Reliability Index (CRI) in order to overcome some limitations of Cronbach's alpha (Hancock and An, 2018). Convergent validity was assessed by estimating the correlation coefficients among the dimensions extracted in our study and the scores calculated from the translation carried out by Maldonado-Murciano et al. (2020) from the scale developed by Pontes and Griffiths (2015). In addition, the Average Variance Extracted (AVE) was calculated as a measure of convergent validity. Average Variance Extracted (AVE) represents, for each latent factor j , the proportion of variance in its indicators that is captured by the factor relative to the variance attributable to measurement error. Following Fornell and Larcker (1981), AVE values ≥ 0.50 are typically taken as evidence of adequate convergent validity.

3. Results

3.1. Exploratory graph analysis

In this section, we explored the dimensionality of IGDS employing EGA. Unlike the theoretical structure of IGDS, the resulting network consisted in two moderate correlated clusters of items as can be observed in Fig. 1. Cluster 1 was composed of items 1, 2, 3 and 5, while the remaining items were classified on cluster 2. A qualitative evaluation of the items reveals that cluster 1 includes items related to cognitive and emotional symptoms. Conversely, the items in cluster 2 refer to relational aspects, such as family, friends and partners.

Then, we studied replicability within this sample of this structure

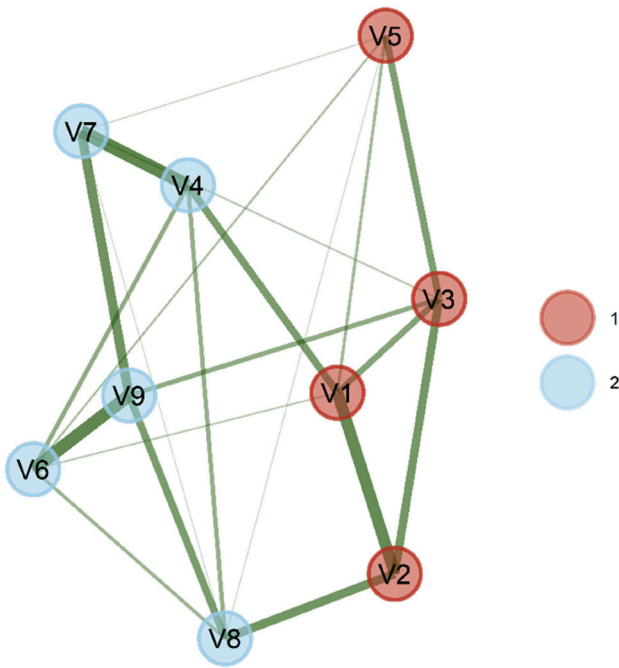


Fig. 1. EGA estimated network for the data on subsample 1.

using bootstrapped EGA. Over the 500 iterations, the two-dimensional solution was identified as the most likely model 41.8 % of the time. This was followed by one-dimensional solutions, which appeared 34 % of the time, and three-dimensional solutions, which appeared 23 % of the time. As shown in the specific results for each item, while the items in cluster 2 (except for item 8, which had a replicability percentage of 42 %) had a replicability frequency close to 50 %, the items in cluster 1 had replicability frequencies of 82 % or higher. The network loadings and the replicability ratio of each item in its dimension are shown in Table 2.

Lastly, we employed variable redundancy analysis (UVA; Christensen et al., 2023) to study the items redundancy based on weighted topological overlap (wTO, Zhang and Horvath, 2005). The results showed that items 6 and 9 present a high degree of redundancy ($wTO = 0.306$), this implies that both items reported very similar information. Additionally, two other pairs of items had wTO values greater than 0.25: items 4 and 7 ($wTO = 0.291$), as well as items 1 and 2 ($wTO = 0.272$). However, it was decided to maintain the number of items of the original scale, and none of the items were removed.

3.2. Confirmatory factor analysis

In order to verify whether the structure identified by the EGA was consistent with the data, two CFAs were conducted on the second subsample: a one-factor model reflecting the original theoretical structure,

Table 2

Network loadings and percentage of replicability per item in dimensions on subsample 1.

Items	Network loadings		Percentage of Replicability
	Cluster 1	Cluster 2	
Preoccupation	.513		98 %
Tolerance	.495		97 %
Withdrawal	.530		96.6 %
Persistence		.453	49.4 %
Escape	.247		81.8 %
Problems		.430	54.2 %
Deception		.487	54 %
Displacement		.332	42 %
Conflict		.613	55.4 %

and a two-factor model based on the EGA clustering methodology. As shown in Table 3, the two-factor model exhibited a superior fit in comparison to the one-factor model. In this two-factor solution, correlation between factors was 0.794 ($p < .001$).

3.3. Reliability and convergent validity

Internal consistency and convergent validity for the two-factor structure were assessed through different indices. To test reliability, Composite Reliability Index (CRI) was calculated for each latent factor. Both factors showed good reliability with CRI values near to 0.90. Regarding convergent validity, all standardized factor loadings were statistically significant and above 0.70. In addition, the Average Variance Extracted (AVE) for both factors were above 0.50, indicating adequate convergence among items. Also, correlation coefficients among dimensions from our scale and the translation by Maldonado-Murciano et al. (2020) were high and statistically significant. The coefficient between the scores for the cognitive and emotional symptoms dimension was $r = 0.65$ ($p < .001$) and between the scores for social related issues was $r = 0.74$ ($p < .001$). Standardized factor loadings, CRI and AVE are displayed on Table 4.

4. Discussion

This study aimed to examine the psychometric properties of the Spanish version of the Internet Gaming Disorder Scale (IGDS). To our knowledge, this study is the first to validate the Spanish version of this scale, and also the first to employ network psychometrics to explore its structure, given that most studies assume unidimensionality of the IGDS as established by Lemmens et al. (2015). This is relevant, as the IGDS is one of the few screening measures for IGD based on DSM-V criteria and one of the most widely employed.

As aforementioned, we explored the structure employing Exploratory Graph Analysis technique in subsample 1, which suggested a bidimensional structure consisting of two moderately correlated clusters: one reflecting cognitive–emotional symptoms (including items 1, 2, 3 and 5) and the second one representing relational difficulties (including items 4, 6, 7, 8 and 9). This structure was subsequently confirmed through Confirmatory Factor Analysis (CFA), where the two-factor model shown superior fit compared to the original one-factor solution in subsample 2.

The internal consistency of both dimensions was high, with composite reliability values approaching 0.90, indicating excellent reliability. Furthermore, the strong standardized factor loadings (all above 0.70) and average variance extracted (AVE) values exceeding 0.50 support adequate convergent validity. In addition, correlation coefficient with IGDS dimensions were high and statistically significant for both dimensions: cognitive and emotional symptoms ($r = 0.65$, $p < .001$) and social related issues ($r = 0.74$, $p < .001$). Taken together, these results suggest that the IGDS demonstrates robust psychometric properties, with a stable and interpretable two-factor structure in this Spanish sample.

Our results challenge the traditional assumption of unidimensionality, aligning with the results of Paschke et al. (2021). As established in

Table 3

Scaled fit indexes for the one-factor and two-factor models tested on subsample 2.

Model	χ^2 (df)	p	CFI	TLI	RMSEA	90 % CI	SRMR
One-factor	91.231 (27)	<0.001	.964	.952	.132	.103–.163	.084
Two-factors	43.401 (26)	<0.05	.990	.986	.070	.030–.106	.058

Note. Robust fit indices (scaled χ^2 , CFI, TLI, and RMSEA) are reported using the DWLS estimator.

Table 4
Factor loadings, composite reliability index and average variance extracted (AVE) on subsample 2.

	Items	Factor 1	Factor 2
Standardized Factor Loadings	<i>Preoccupation</i>	.830	
	<i>Tolerance</i>	.904	
	<i>Withdrawal</i>	.893	
	<i>Persistence</i>		.890
	<i>Escape</i>	.708	
	<i>Problems</i>		.723
	<i>Deception</i>		.862
	<i>Displacement</i>		.806
	<i>Conflict</i>		.700
CRI		.903	.897
AVE		.701	.639
Correlation Between Factors		.794	

Note. All factor loadings and the correlation coefficient were statistically significant ($p < .001$). Composite Reliability Index (CRI). Average Variance Extracted (AVE).

the biaxial model of addictive behaviors (Kelly and Hoeppner, 2014; Wakefield, 2015), the combination of endogenous factors and contextual characteristics can lead to the onset and maintenance of addictive behavior disorders. This phenomenon is evidenced by the results obtained from the factor analysis of the IGDS, which reveals the presence of one factor associated with cognitive and emotional symptoms, and a second factor that consolidates items pertaining to relational issues derived by the gaming addictive patterns.

According to the biaxial model, our findings suggest that the presence of gaming-related symptoms alone does not necessarily indicate disordered gaming behavior in this sample. Instead, it is the combination of symptom-based indicators (such as preoccupation, tolerance, and withdrawal) alongside problem-related outcomes (like conflict, deception, and social impairment) that may differentiate between high engagement and pathological gaming. This pattern aligns with the findings of the latent class analysis by Colder Carras and Kardefelt-Winther (2018), who showed that symptoms and life consequences vary among different groups of adolescent gamers. They suggested that individuals experiencing both dimensions should be classified as having IGD.

This bidimensional configuration is further supported by the network analysis conducted by Liu et al. (2022), who identified two distinct clusters of IGD symptoms: one comprising internalizing symptoms (withdrawal, tolerance, preoccupation, and escape), and another comprising externalizing behaviors (conflict, problems, deception, persistence, and displacement) that are directed toward the social environment. Taken together, the biaxial configuration supports the idea that internalized symptoms may precede externalized consequences, indicating a progression from intensive but non-pathological gaming to clinically significant impairment. Overall, this study contributes to a more nuanced understanding of IGD in Spanish university students, supporting the conceptualization of IGD as a multidimensional construct rather than a single continuum of severity.

4.1. Limitations and future directions

This study has several limitations. Firstly, the replicability of the findings appears to be limited, probably due to the relatively small sample size. Secondly, responses to the self-reported IGDS may be subject to a bias towards providing socially desirable answers, particularly among individuals with more severe symptoms, as has been observed in the case of gambling problems (Schell et al., 2021). People tend to minimize their symptoms, leading to less variability in the variables and potentially affecting the factor structure. Thirdly, items 6 and 9 demonstrate a high degree of redundancy ($wTO = 0.306$) and are qualitatively similar, as they both address social conflicts arising from gaming behavior. Therefore, these items should be combined, or the

better-performing item should be retained. In the present study, however, both items were retained in the subsequent analysis because the scale has a small number of items used for diagnosing IGD. Future studies could replicate the current analyses using a larger, more representative sample and include a measure of socially desirable responses to control for bias (Schell et al., 2021).

4.2. Practical implications

The multidimensional approach to the concept of IGD presented in this study has multiple practical implications. This study provides a psychometrically valid tool in Spanish to assess IGD, differentiating between gaming intensity and functional impact, which improves diagnosis, prevention, and the design of specific interventions.

At a clinical level, for example, it suggests that IGD may be more accurately understood as a bidimensional construct comprising internalized (cognitive-emotional) and externalized (problem-related) symptoms. In clinical practice, this suggests that professionals should assess both dimensions separately, rather than relying solely on the presence of five or more symptoms to make a diagnosis. Following the biaxial model of addiction, distinguishing between engaged/intensive and pathological gamers reduces the risk of misdiagnosing functional but engaged gamers.

In terms of preventive measures, early detection strategies and prevention programs can be improved by distinguishing between intensive gaming and problematic gaming. This differentiation allows for the identification of individuals who engage in intensive gaming, enabling the development of strategies to prevent these individuals from developing problematic gaming habits. This approach also may benefit guidelines for clinical intervention by focusing on internalized symptoms, which can be addressed through cognitive-behavioral therapy, including emotional regulation, coping strategies, and psychoeducation (Stevens et al., 2019). On the other hand, social repercussions can be targeted by implementing psychosocial strategies that involve the individual's social environment in the program, such as family (Bonnaire et al., 2019).

CRediT authorship contribution statement

Júlia Gisbert-Pérez: Conceptualization, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Adrián García-Mollá:** Conceptualization, Formal analysis, Methodology, Writing – review & editing. **José M. Tomás:** Formal analysis, Methodology, Writing – review & editing. **Manuel Martí-Vilar:** Investigation, Writing – review & editing. **Laura Badenes-Ribera:** Investigation, Supervision, Writing – review & editing.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

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