Addictive Behaviors 156 (2024) 108049

Contents lists available at ScienceDirect

Addictive Behaviors

journal homepage: www.elsevier.com/locate/addictbeh

Big five personality traits, gaming motives, and regular and disordered gaming: A cross-national examination among college student gamers in seven countries

Francisco J. López-Fernández [a], Laura Mezquita [a,b,*], Verónica Vidal-Arenas [a], Yanina Michelini [d], Adrian J. Bravo [c], Angelina Pilatti [d], Generós Ortet [a,b], Manuel I. Ibáñez [a,b], Cross-Cultural Addictions Study Team (CAST)[1]

[a] Department of Basic and Clinical Psychology and Psychobiology, Universitat Jaume I, Castelló de la Plana, Spain
[b] Instituto de Salud Carlos III, Centro de Investigación Biomédica en Red de Salud Mental (CIBERSAM), Castelló de la Plana, Spain
[d] Facultad de Psicología, Universidad Nacional de Córdoba, Instituto de Investigaciones Psicológicas, IIPsi (CONICET-UNC), Córdoba, Argentina
[c] Department of Psychological Sciences, William & Mary, Williamsburg, VA, USA

ARTICLE INFO

Keywords:
Personality
Gaming motives
Disordered gaming
Video gaming
College students
Cross-national

ABSTRACT

Introduction: Previous research has shown that personality traits and gaming motives are important predictors for explaining regular and disordered gaming. However, the mediating role of gaming motives in the relation between personality traits and video game outcomes (e.g., time spent gaming or disordered gaming) has been scarcely studied and limited cross-national studies have addressed this issue. The present study aimed to examine the direct and indirect effects of the Big Five personality traits on weekly gaming and disordered gaming *via* gaming motives across seven countries.
Method: 3540 college student gamers (59.5% women) from the U.S., Canada, Spain, Argentina, Uruguay, South Africa and England completed the online survey. Structural equation modeling was conducted to test models. Multigroup models were employed to test model invariance across countries.
Results: Significant, albeit weak, relations were found between personality traits and gaming outcomes, and were mediated mostly by coping motives in predicting disordered gaming, and by social interaction and recreation (to a lesser extent) motives in predicting weekly gaming. Some minor, yet significant, differences across countries appeared and are discussed in detail.
Discussion: The present findings indicate that the differential interrelations between personality traits, gaming motives, and video gaming outcomes may be generalized in college students across countries.

1. Introduction

Video gaming is a popular worldwide activity of which the largest number of players are adolescents and young adults (Gilbert, 2023). Accordingly, video gaming represents a continuum of no problematic gaming to disordered gaming (i.e., meeting addiction criteria, Montag et al., 2021), which refers to a pattern of persistent and recurring gaming, characterized by impaired control, resulting in substantial life impairments (e.g., academic, professional, or social relationships) (American Psychiatric Association, 2013; World Health Organization, 2021). Recent *meta*-analyses have found disordered gaming prevalence rates for adolescents and young adults between 6.3 % (Kim et al., 2022)

* Corresponding author at: Department of Basic and Clinical Psychology and Psychobiology, Universitat Jaume I, Av. de Vicent Sos Baynat, s/n, 12071 Castellón de la Plana, Spain.
E-mail address: lmezquit@uji.es (L. Mezquita).

[1] This project was completed by the Cross-cultural Addictions Study Team (CAST), which includes the following investigators (in alphabetical order): Adrian J. Bravo, William & Mary (Coordinating PI); Christopher C. Conway, Fordham University; James M. Henson, Old Dominion University; Lee Hogarth, University of Exeter; Manuel I. Ibáñez, Universitat Jaume I de Castelló; Debra Kaminer, University of Cape Town; Matthew Keough, York University; Laura Mezquita, Universitat Jaume I de Castelló; Generós Ortet, Universitat Jaume I de Castello; Matthew R. Pearson, University of New Mexico; Angelina Pilatti, National University of Cordoba; Mark A. Prince, Colorado State University; Jennifer P. Read, University of Buffalo; Hendrik G. Roozen, University of New Mexico; Paul Ruiz, Universidad de la República; Verónica Vidal, Universitat Jaume I de Castelló.

https://doi.org/10.1016/j.addbeh.2024.108049
Received 12 January 2024; Received in revised form 22 April 2024; Accepted 30 April 2024
Available online 1 May 2024
0306-4603/© 2024 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC license (http://creativecommons.org/licenses/by-nc/4.0/).

and 9.9 % (Gao et al., 2022). Similar disordered gaming prevalence rates are reported for college student samples (Borges et al., 2019; Chiang et al., 2022; Ohayon & Roberts, 2021). Moreover, with college students, disordered gaming has been closely associated with internalizing symptomatology, such as anxiety, social anxiety, loneliness and depression (Ohayon & Roberts, 2021; Pontes et al., 2019), and future academic and social impairments (Benjet et al., 2023). Thus, research that examines the risk and protective factors that influence gaming is essential to prevent and treat disordered gaming, including the key role of personality and gaming motives (Ji et al., 2022).

In the personality traits field, the Big Five, rooted in language descriptors which describe human behavior, is the most accepted and employed typology (John, 2021). Specifically, when hierarchical structures of normal and abnormal personality from different theoretical frameworks are analyzed as a whole, the Big Five arises as crucial due to its comprehensive and integrative traits whereby other personality models can be derived (Markon et al., 2005). Consequently, a considerable number of studies has investigated the associations between these traits and disordered gaming. Accordingly, two recent *meta*-analyses have found significant correlations between disordered gaming and conscientiousness (−.28 and −.29), neuroticism (.20 and .21), agreeableness (−.17 and −.18), and extraversion (−.14 and −.15) (Akbari et al., 2021; Chew, 2022). The role of personality in the time spent gaming has shown weaker correlations compared to associations with disordered gaming (López-Fernández et al., 2021; Montag et al., 2021). For example, in young adults the strongest association appears for low conscientiousness (−.12), whereas the other relations present values of $\leq r = .10$ (Montag et al., 2021).

Focusing on a motivational framework for problematic technology use (Schimmenti, 2023), gaming motives are conceived as appetitive dimensions which satisfy psychological needs (Ryan et al., 2006; Sherry et al., 2006). Therefore, gaming allows players to actively manage and regulate their emotions (subjected in part to personality dispositions) through gaming motives (Schimmenti, 2023). Two *meta*-analyses converge in finding that the motivations of emotional escape or coping (e.g., "Gaming helps me improve my mood") show the strongest correlations with disordered gaming, from moderate to large effects (Bäcklund et al., 2022; Wang & Cheng, 2022). Social motives (e.g., "I make new friends") are important for predicting the time spent gaming (Greenberg et al., 2008; Hilgard et al., 2013; Király et al., 2017; López-Fernandez et al., 2020a; López-Fernández et al., 2021; Michelini et al., 2023; Sherry et al., 2012; Wu et al., 2017). In addition, some studies have found that social motives also have a substantial effect on disordered gaming (Hilgard et al., 2013; López-Fernandez et al., 2020a; López-Fernández et al., 2021; Männikkö et al., 2016).

Although the associations of personality traits and gaming motives on gaming outcomes have been thoroughly studied, only a few studies have explored the mediating role of gaming motives in the associations of personality traits and gaming outcomes. In one previous study, escape motives mediated the associations between the dark personality traits of psychopathy, narcissism and sadism and disordered gaming (Kircaburun et al., 2018; Tang et al., 2020). Furthermore, escape motives also mediated the associations between an emotional intelligence trait and disordered gaming (Kircaburun et al., 2019). Notwithstanding, very few studies have explored the mediating role of gaming motives in linking Big Five personality traits and regular and disordered gaming. A notable exception is the work of López-Fernández et al. (2021), which found neuroticism to be linked with disordered gaming *via* higher coping motives, whereas low agreeableness to be linked with disordered gaming *via* higher social interaction motives among adolescents. Along with replicating these findings in other age groups (i.e., young adults), the use of cross-national studies is also necessary to extend the universality of these results. Despite the existence of cross-national studies about gaming motives (Michelini et al., 2023; Montag et al., 2021), the impact of country/culture on the associations among personality traits, gaming motives, and gaming outcomes needs further examination.

1.1. The present study

The present study aimed to examine the mediating role of gaming motives between personality (i.e., Big Five personality traits) and regular (i.e., weekly gaming hours) and disordered gaming among college students from seven countries. Based on previous findings, we hypothesized that low conscientiousness and low emotional stability (high neuroticism) would show robust total effects on disordered gaming (Akbari et al., 2021; Chew, 2022), and the relation between low emotional stability and disordered gaming would be mediated by coping motives (López-Fernández et al., 2021). Concerning weekly gaming, personality traits would present smaller associations compared to disordered gaming (Montag et al., 2021), and social interaction motives would emerge as the most important mediator of time spent gaming (e.g., Király et al., 2017; López-Fernández et al., 2021; Michelini et al., 2023). Finally, we explored whether the findings from our path model were culturally universal or culturally specific by testing the equivalence of estimated paths (i.e., test of moderation) of the model among college students from seven countries.

2. Material and methods

2.1. Participants and procedures

College students were recruited from universities across the U.S. (five universities from four states: Colorado, New Mexico, New York, Virginia), Canada (two universities from the provinces Ontario and Manitoba), South Africa (one university from Cape Town city), Spain (one university from the Valencia Autonomous Community), Argentina (two universities from the Córdoba region), England (one university from Exeter city) and Uruguay (one university from Montevideo city). Participants completed an online survey about risk and protective factors for addictive behaviors (see Bravo et al., 2021 for more details).

Although 9171 students completed the larger study, only those who reported playing video games at least once in the last year ($n = 5248$) and completed measures (some were randomized) on the variables of interest herein were retained ($n = 3636$). The missing values from participants, which represented <5 % in a questionnaire were replaced with the mean score for the remaining items of that scale and the other cases were deleted. Given the few participants from Uruguay ($n = 49$), they were merged into a same cultural group together with Argentinians: *Southern Cone*. The final sample included 3,540 participants. The demographics of the whole sample and across countries are displayed in Table 1.

2.2. Measures

2.2.1. Weekly gaming

Based on a previous work (Pontes & Griffiths, 2015), participants were asked about their video game use in the last year: "Have you played a video game in the past year?" If participants responded "yes", they were branched to an additional question: "In a typical week, how often (from 1 = *<7 h per week* to 5 = *> 40 h per week*) do you spend playing on computers, consoles and/or other gaming platforms (e.g., handheld devices)?".

2.2.2. Disordered gaming

The 9-item Internet Gaming Disorder Scale–Short-Form (IGDS9-SF; Pontes & Griffiths, 2015) was employed to assess disordered gaming rooted in how often participants endorsed DSM-5 criteria for Internet Gaming Disorder (e.g., "Do you systematically fail when trying to control or cease your gaming activity?") on a 5-point scale (1 = *never;* 5 = *very often*). Total scores were obtained by summing item responses, with higher scores indicating greater disordered gaming. The IGDS9-SD showed configural, metric and partial scalar invariances across countries in a previous study performed with the same sample (Michelini et al., 2023).

Table 1
Demographic and descriptive statistics of the study variables for the total sample and across countries.

	Total sample (n = 3540)	U.S. (n = 1650)	CAN (n = 674)	SPA (n = 420)	SC (n = 378)	SAF (n = 252)	ENG (n = 166)	α (range between countries)	ω (range between countries)
Gender n (%)									
Women	2115 (59.7)	882 (53.5)	394 (58.5)	249 (59.3)	274 (72.5)	194 (77)	122 (73.5)	—	—
Men	1425 (40.3)	768 (46.5)	280 (41.5)	171 (40.7)	104 (27.5)	58 (23)	44 (26.5)	—	—
Age *M (SD)*	20.12 (3.54)	19.53 (2.81)	19.70 (3.39)	20.81 (2.55)	23.02 (5.92)	20.24 (2.04)	19.31 (3.82)	—	—
Weekly gaming n (%)								—	—
≤7 h	2475 (69.3)	1118 (67.3)	437 (63.8)	288 (68.4)	301 (79.2)	211 (83.1)	120 (71)	—	—
8–14 h	559 (15.7)	283 (17)	120 (17.5)	58 (13.8)	52 (13.7)	25 (9.8)	21 (12.4)	—	—
15–20 h	264 (7.4)	135 (8.1)	50 (7.3)	43 (10.2)	13 (3.4)	10 (3.9)	13 (7.7)	—	—
21–30 h	167 (4.7)	78 (4.7)	44 (6.4)	22 (5.2)	9 (2.4)	5 (2)	9 (5.3)	—	—
31–40 h	55 (1.5)	26 (1.6)	14 (2.0)	8 (1.9)	2 (0.5)	1 (0.4)	4 (2.4)	—	—
>40 h	50 (1.4)	21 (1.3)	20 (2.9)	2 (0.5)	3 (0.8)	2 (0.8)	2 (1.2)	—	—
IGDS9-SF *M* (*SD*)	13.19 (5.72)	12.93 (5.59)	14.16 (6.29)	12.86 (5.56)	13.14 (5.53)	13.05 (5.47)	13.03 (5.47)	.89 (.87,.90)	.90 (.88,.91)
VMQ *M (SD)*									
Recreation	4.10 (0.70)	4.08 (0.70)	4.10 (0.68)	4.20 (0.72)	4.26 (0.57)	3.99 (0.73)	3.89 (0.79)	.84 (.77,.86)	.84 (.77,.86)
Competition	3.42 (0.94)	3.55 (0.90)	3.56 (0.89)	3.28 (1.01)	3.11 (0.96)	3.16 (1)	3.06 (0.88)	.75 (.69,.79)	.76 (.70,.80)
Cognitive development	3.18 (0.84)	3.17 (0.83)	3.23 (0.75)	3.22 (0.90)	3.23 (0.87)	3.18 (0.93)	2.79 (0.87)	.70 (.67,.78)	.69 (.68,.79)
Coping	3.27 (0.99)	3.34 (0.89)	3.38 (0.95)	3.00 (1.02)	3.24 (0.94)	3.23 (1.04)	3.02 (1.01)	.85 (.81,.86)	.85 (.81,.86)
Social interaction	2.54 (1.08)	2.68 (1.08)	2.74 (1.09)	2.39 (1.05)	2.11 (0.90)	2.18 (0.98)	2.18 (1.06)	.83 (.71,.84)	.83 (.77,.85)
Violent reward	2.22 (1.06)	2.34 (1.06)	2.40 (1.06)	2.02 (1.05)	1.85 (0.98)	1.98 (1.06)	1.91 (0.98)	.88 (.80,.88)	.88 (.80,.89)
Customization	3.44 (1.08)	3.56 (1.03)	3.55 (0.57)	3.16 (1.12)	3.11 (1.22)	3.45 (1.12)	3.34 (1.03)	.86 (.83,.90)	.86 (.83,.91)
Fantasy	3.31 (1.11)	3.41 (1.07)	3.44 (1.04)	3.17 (1.15)	2.90 (1.22)	3.32 (1.16)	3.12 (1.11)	.86 (.85,.88)	.86 (.85,.88)
BFPTSQ *M (SD)*									
Openness	3.66 (0.63)	3.67 (0.63)	3.55 (0.57)	3.67 (0.69)	3.83 (0.62)	3.72 (0.58)	3.50 (0.61)	.80 (.76,.83)	.80 (.77,.82)
Extraversion	3.39 (0.77)	3.44 (0.77)	3.33 (0.77)	3.47 (0.75)	3.26 (0.78)	3.38 (0.75)	3.32 (0.78)	.86 (.85,.87)	.86 (.85,.88)
Agreeableness	3.61 (0.58)	3.60 (0.59)	3.57 (0.54)	3.80 (0.55)	3.58 (0.52)	3.54 (0.57)	3.61 (0.64)	.74 (.67,.81)	.71 (.67,.81)
Conscientiousness	3.38 (0.64)	3.44 (0.61)	3.32 (0.60)	3.32 (0.70)	3.31 (0.65)	3.37 (0.68)	3.19 (0.62)	.79 (.78,.81)	.76 (.73,.81)
Emotional stability	2.89 (0.78)	2.95 (0.77)	2.82 (0.77)	3.10 (0.78)	2.70 (0.77)	2.74 (0.77)	2.67 (0.78)	.85 (.84,.87)	.85 (.84,.87)

Note. IGDS = Internet Gaming Disorder Scale; VMQ = Video game Motives Questionnaire; BFPTSQ = Big Five Personality Trait Short Questionnaire; US = United States; CAN = Canada; SPA = Spain; SC = Southern Cone (Argentina and Uruguay); SAF = South Africa; ENG = England.

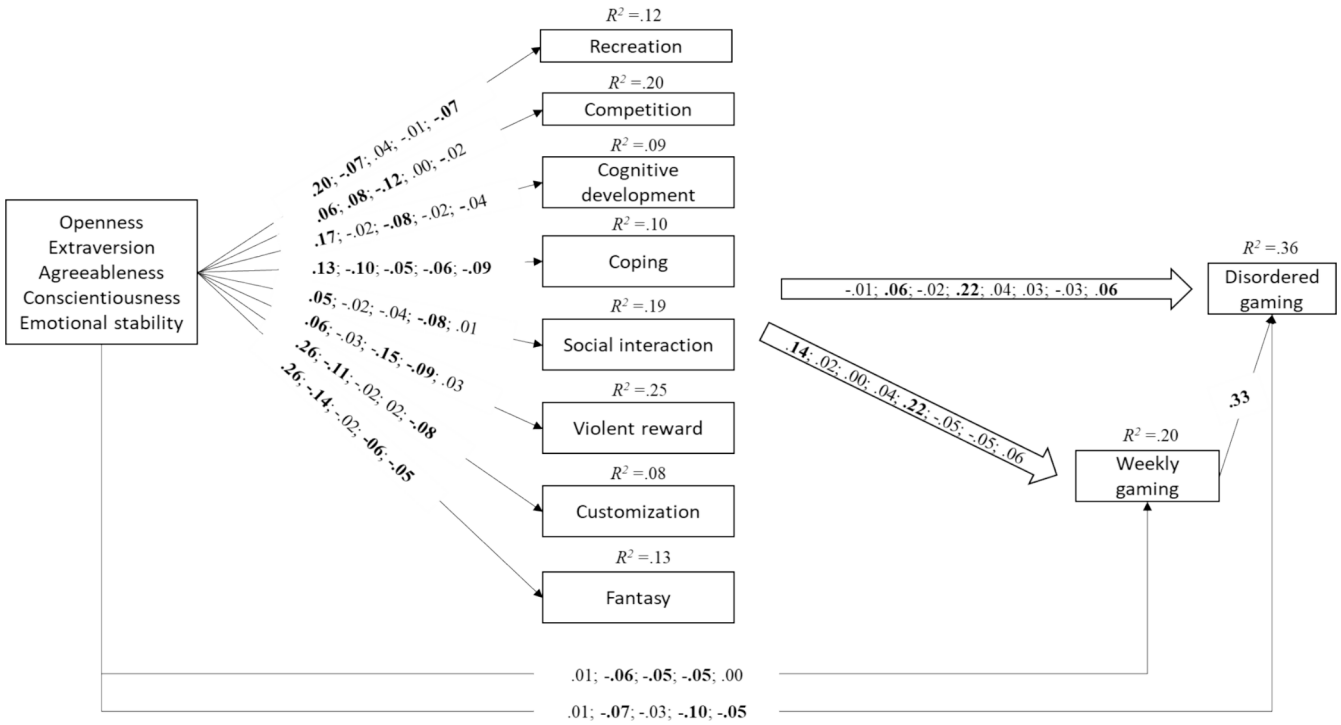

Fig. 1. The mediational model (M1) for each personality factor of the path coefficients between variables for disordered gaming and weekly gaming as dependent variables. Gender and age were included as the control variables. The first values (left) describe the model path coefficient in which openness is the independent variable, whereas the second, third, fourth and fifth values represent the path coefficients of models, in which extraversion, agreeableness, conscientiousness and emotional stability are the independent variables, respectively. The second values (inside thick arrows) describe the model path coefficients of the motives in which recreation is the mediating variable, whereas the second, third, fourth, fifth, sixth, seventh and eighth values represent the path coefficients of models, in which competition, cognitive development, coping, social interaction, violent reward, customization and fantasy are the mediating variables, respectively. For clarity, the covariances between personality traits to each other and video gaming motives to each other are not depicted in the figure. Significant associations are in **bold** typeface to emphasize and were determined by 99% bias-corrected standardized bootstrapped confidence intervals (based on 10,000 bootstrapped samples) that did not contain zero.

2.2.3. *Video gaming motives*

The 24-item Video gaming Motives Questionnaire (VMQ; López-Fernández et al., 2020a) was used to assess gaming motives (3 items per scale) on a 5-point scale (0 = *strongly disagree;* 4 = *strongly agree*). The following eight motives were assessed through the statement "I play video games because": social interaction (e.g., "I make new friends"), violent reward (e.g., "Shooting someone in the head in a game is deeply satisfying"), cognitive development (e.g., "Games make me think"), fantasy (e.g., "I like feeling that I'm part of a story"), coping (e.g., "It helps me get rid of stress"), competition (e.g., "I like to win"), customization (e.g., "I enjoy customizing things in games") and recreation (e.g., "I have fun"). The configural, metric and scalar invariance of the VMQ has been previously supported across countries in a previous study performed with the same sample (Michelini et al., 2023).

2.2.4. *Big five personality traits*

The 50-item Big Five Personality Trait Short Questionnaire (BFPTSQ; Morizot, 2014) was used to assess personality traits (openness, extraversion, agreeableness, conscientiousness, emotional stability) with 10 items per scale on a 5-point scale (0 = *totally disagree;* 4 = *totally agree*). The instrument has proven to be invariant in college students from U.S., Argentina and Spain (Mezquita et al., 2019a).

2.3. *Statistical analysis*

Descriptive statistics and internal consistencies (Cronbach's α and McDonald's ω, Hayes & Coutts, 2020) were performed through the SPSS statistical package, version 28. A fully saturated structural path model (see Fig. 1) was specified, in which personality traits were considered predictors of weekly gaming and disordered gaming to be dependent variables. Gaming motives were estimated as mediating variables. To test the model, structural equation modeling was conducted using Mplus, version 8 (Muthén & Muthén, 2018). The total, indirect and direct effects of personality and motives on weekly gaming and disordered gaming were examined using bias-corrected bootstrapped estimates (Efron & Tibshirani, 1993) based on 10,000 bootstrapped samples. This provides a powerful mediation test (Fritz & MacKinnon, 2007) that is robust to small deviations from normality (Erceg-Hurn & Mirosevich, 2008). To determine statistical significance, 99 % bias-corrected bootstrapped confidence intervals not containing zero were used.

Multigroup analyses were performed to test model invariance across countries. The chi-square difference test is widely used to examine model invariance, but is sensitive to sample size (Brown, 2015). Therefore, any decrements in CFI and RMSEA were also examined (ΔCFI should be $\leq$ 0.010 to consider a model invariant, Cheung & Rensvold, 2002; while ΔRMSEA ought to be $\leq$ 0.015, Chen, 2007) across more and less constrained models as a test of invariance.

3. Results

Table 1 shows the descriptive statistics of study variables for the total sample and across countries. The internal consistencies of each measure across countries and in the total sample appear in Supplemental Tables 1–7.

Table 2
Significant indirect effects of personality and motives on weekly gaming and disordered gaming (M1).

	β	99 %CI
Openness—Specific indirect effects		
→ Social interaction → Weekly gaming	.011	.001, .022
→ Recreation → Weekly gaming	.028	.017, .041
→ Competition → Disordered gaming	.003	.001, .009
→ Coping → Disordered gaming	.028	.017, .042
→ Fantasy → Disordered gaming	.016	.001, .033
→ Recreation → Weekly gaming → Disordered gaming	.009	.005, .014
Openness—Total indirect effects		
→ Weekly gaming	.045	.026, .065
→ Disordered gaming	.056	.031, .081
Extraversion—Specific indirect effects		
→ Recreation → Weekly gaming	−.010	−.019, −.004
→ Competition → Disordered gaming	.004	.001, .010
→ Coping → Disordered gaming	−.021	−.034, −.011
→ Fantasy → Disordered gaming	−.009	−.019, −.001
→ Weekly gaming → Disordered gaming	−.021	−.037, −.006
→ Recreation → Weekly gaming → Disordered gaming	−.003	−.006, −.001
Extraversion—Total indirect effects		
→ Weekly gaming	−.019	−.037, −.002
→ Disordered gaming	−.049	−.076, −.025
Agreeableness—Specific indirect effects		
→ Competition → Disordered gaming	−.007	−.014, −.002
→ Coping → Disordered gaming	−.011	−.023, −.001
→ Weekly gaming → Disordered gaming	−.018	−.034, −.003
Agreeableness—Total indirect effects		
→ Disordered gaming	−.041	−.067, −.015
Conscientiousness—Specific indirect effects		
→ Social interaction → Weekly gaming	−.016	−.029, −.006
→ Coping → Disordered gaming	−.013	−.025, −.002
→ Weekly gaming → Disordered gaming	−.016	−.031, −.002
→ Social interaction → Weekly gaming → Disordered gaming	−.005	−.010, −.002
Conscientiousness—Total indirect effects		
→ Weekly gaming	−.021	−.037, −.004
→ Disordered gaming	−.045	−.069, −.021
Emotional stability—Specific indirect effects		
→ Recreation → Weekly gaming	−.010	−.018, −.003
→ Coping → Disordered gaming	−.020	−.034, −.009
→ Recreation → Weekly gaming → Disordered gaming	−.003	−.006, −.001
Recreation—Specific indirect effects		
→ Weekly gaming → Disordered gaming	.046	.029, .065
Social interaction—Specific indirect effects		
→ Weekly gaming → Disordered gaming	.071	.048, .095

Note. The significant associations were determined by 99% bias-corrected standardized bootstrapped confidence intervals (based on 10,000 bootstrapped samples) that did not contain zero.

Table 3
Summary of total effects (direct + indirect effects) of personality and motives on weekly gaming and disordered gaming (M1).

	Weekly gaming		Disordered gaming	
	β	99 % CI	β	99 % CI
Openness	**.051**	**.005, .094**	**.068**	**.026, .112**
Extraversion	**−.081**	**−.129, −.034**	**−.122**	**−.167, −.079**
Agreeableness	**−.054**	**−.100, −.006**	**−.072**	**−.119, −.025**
Conscientiousness	**−.069**	**−.113, −.024**	**−.144**	**−.191, −.098**
Emotional stability	−.014	−.064, .037	**−.078**	**−.124, −.029**
Recreation	**.141**	**.089, .192**	.041	−.002, .084
Competition	.017	−.035, .068	**.064**	**.012, .113**
Cognitive development	.002	−.046, .048	−.017	−.071, .034
Coping	.044	−.011, .097	**.236**	**.182, .287**
Social interaction	**.216**	**.150, .281**	**.114**	**.054, .173**
Violent reward	−.051	−.107, .006	.009	−.051, .068
Customization	−.047	−.109, .012	−.049	−.107, .010
Fantasy	.058	−.008, .125	**.082**	**.017, .148**

Note. The significant associations are in **bold** typeface for emphasis and were determined by 99% bias-corrected standardized bootstrapped confidence intervals (based on 10,000 bootstrapped samples) that did not contain zero.

3.1. The mediational model

In the fully saturated structural model (M1), coping motives showed the strongest direct effect on disordered gaming, whereas social interaction and recreation motives had a direct effect on weekly gaming (see Fig. 1) and indirect effects on disordered gaming through weekly gaming (Table 2). Noteworthy, several direct relations between personality and motives were found (Fig. 1). Specifically, high openness was related to customization, fantasy, recreation, cognitive development and coping; low extraversion to fantasy, customization and coping; low agreeableness to violent reward and competition; and low emotional stability to coping. All the Big Five personality traits showed significant total effects on disordered gaming and weekly gaming, except emotional stability on weekly gaming (Table 3). The total effects of personality traits on disordered gaming were higher than those on weekly gaming. Additionally, coping mediated the relations between all the personality traits and disordered gaming (see Fig. 1 and Table 2). Concerning weekly gaming, social interaction mediated the associations between low conscientiousness and weekly gaming, and high openness and weekly gaming. Furthermore, recreation motives emerged as a mediator of the effects of high openness, lower extraversion and lower emotional stability on weekly gaming. All the indirect effects of personality and motives are found in Supplemental Tables 8–13.

Table 4
Invariance testing results of the structural equation model across countries.

	χ2	df	CFI	TLI	RMSEA	Model Comparison	ΔCFI	ΔRMSEA
MG1 Unconstrained Model	.000*	0	1	1	.000	—	—	—
MG2 Full Constrained Model +	1053.846*	675	.981	.978	.031	MG2 vs. MG1	−.019	−.031
MG3 Full Constrained Model less Constraints 105	1027.369*	670	.982	.979	.030	MG3 vs. MG1	−.018	−.030
MG4 Full Constrained Model less Constraints 105, 83	100.646*	665	.984	.980	.029	MG4 vs. MG1	−.016	−.029
MG5 Full Constrained Model less Constraints 105, 83, 6	983.029*	660	.984	.981	.029	MG5 vs. MG1	−.016	−.029
MG6 Full Constrained Model less Constraints 105, 83, 6, 14	963.014*	655	.985	.981	.028	MG6 vs. MG1	−.015	−.028
MG7 Full Constrained Model less Constraints 105, 83, 6, 14, 72	945.999*	650	.985	.982	.028	MG7 vs. MG1	−.015	−.028
MG8 Full Constrained Model less Constraints 105, 83, 6, 14, 72, 73	930.794*	645	.986	.982	.027	MG8 vs. MG1	−.014	−.027
MG9 Full Constrained Model less Constraints 105, 83, 6, 14, 72, 73, 121	909.432*	640	.987	.983	.027	MG9 vs. MG1	−.013	−.027
MG10 Full Constrained Model less Constraints 105, 83, 6, 14, 72, 73, 121, 128	889.658*	635	.987	.984	.026	MG10 vs. MG1	−.013	−.026
MG11 Full Constrained Model less Constraints 105, 83, 6, 14, 72, 73, 121, 128, 126	877.232*	630	.988	.984	.026	MG11 vs. MG1	−.012	−.026
MG12 Full Constrained Model less Constraints 105, 83, 6, 14, 72, 73, 121, 128, 126, 133	863.096*	625	.988	.985	.025	MG12 vs. MG1	−.012	−.025
MG13 Full Constrained Model less Constraints 105, 83, 6, 14, 72, 73, 121, 128, 126, 133, 111	845.410*	620	.989	.986	.025	MG13 vs. MG1	−.011	−.025
MG14 Full Constrained Model less Constraints 105, 83, 6, 14, 72, 73, 121, 128, 126, 133, 111, 82	829.522*	615	.989	.986	.024	MG14 vs. MG1	−.011	−.024
MG15 Full Constrained Model less Constraints 105, 83, 6, 14, 72, 73, 121, 128, 126, 133, 111, 82, 115	812.875*	610	.990	.987	.024	MG15 vs. MG1	−.010	−.024

Note. *$p < .001$. + Includes the constraints in the paths observed in Fig. 1, the correlations between variables and also the paths between age and gender with all the observable variables. Constraint 105 refers to openness with agreeableness, 83 denotes to weekly gaming on gender, 6 represents disordered gaming on recreation, 14 depicts weekly gaming on disordered gaming, 72 refers to agreeableness on gender, 73 indicates conscientiousness on gender, 121 represents cognitive development with coping, 128 refers to coping with customization, 126 denotes coping with social interaction, 133 depicts violent reward with customization, 111 refers to recreation with social interaction, 82 indicates fantasy on gender and 115 refers to competition with cognitive development.

3.2. *Model invariance across countries*

Our multigroup analyses results are found in Table 4. The fully constrained model (MG2) results suggested that this model was not invariant across countries (ΔCFI = .16 [i.e., exceeding the recommended cut-off of 0.01], ΔRMSEA = .029). To identify an invariant model, we identified the path that contributed the most to reduce model fit in the fully constrained model (MG2). Having identified this path and allowed it to be freely estimated (i.e., constraint number 105: correlation between openness and agreeableness), we identified the next path that contributed the most to reduce the model and repeated this procedure until we obtained a ΔCFI ≤ .010, compared to the baseline model (MG1; MG15).

In the final multigroup model (MG15), 13 associations were unconstrained: seven correlations between motives and personality traits, four paths for controlling age/gender effects, and only two paths that influence the targeted mediational model. Specifically, the paths that influenced our indirect effects were the path from recreation to disordered gaming and from weekly gaming to disordered gaming. Hence these pathways were examined across countries in model MG15. A significant association was observed between recreation motives and disordered gaming only in Canada (β = .094 [99 %CI: .005, .183]). Furthermore, weekly gaming was significantly associated with disordered gaming in all the countries, but the magnitude of effects varied from South Africa (β = .186 [99 %CI: .046, .327]) to U.S. (β = .387 [99 %CI: .338, .437]). Accordingly, the paths that included weekly gaming as an additional mediator (e.g., openness to experience → recreation motives → weekly gaming → disordered gaming) were only significant for some countries (see Table 5).

4. Discussion

The present research aimed to examine the mediational effects of gaming motives on the associations between personality and video gaming outcomes in a large sample of college students from U.S., Canada, Spain, the Southern Cone (Argentina and Uruguay), South Africa and England. The findings largely support the formulated hypotheses by finding differential patterns of associations between Big Five personality traits, gaming motives, weekly gaming, and disordered gaming.

All the Big Five personality traits presented significant, albeit, weak total effects on disordered gaming, with low conscientiousness showing the highest association in accordance with the literature (Akbari et al., 2021; Chew, 2022; Montag et al., 2021). However, compared to a prior cross-national conducted by Montag et al. (2021), the magnitude of the low emotional stability effect was much lower than expected, whereas the effects of the other traits were stronger. This discrepancy might be rooted in differences in the nature of samples. Our sample consisted of college students, but that of Montag et al. (2021) was collected from an online platform with a wider age range, which could moderate the associations between personality and disordered gaming (Hanel & Vione, 2016). The associations between personality and weekly gaming were even smaller compared to those found with disordered gaming. These findings, which agree with previous research, reinforce the conceptual distinction between gaming engagement and disordered gaming (Montag et al., 2021). Furthermore, illuminating how gaming motives are, partly, shaped by personality traits (Schimmenti, 2023); significant relations were observed between such variables and replicated the associations found among Spanish adolescents, albeit to a lesser extent (López-Fernández et al., 2021). That was the case of high openness with fantasy, customization and cognitive development motives, in line with adult samples (Graham & Gosling, 2013; Jeng & Teng, 2008), but not in others (de Hesselle et al., 2021; Park et al., 2011); low agreeableness with violent reward and competition, and also in line with adult findings (de Hesselle et al., 2021). The link between low emotional stability and coping was lower than expected compared to general adult (de Hesselle et al., 2021) and adolescent samples (López-Fernández et al., 2021).

Table 5
Summary of indirect effects of personality and motives on disordered gaming through weekly gaming across countries (MG15).

	U.S.	CAN	SPA	SC	SAF	ENG
	β (99 %CI)	*β (99 %CI)*	*β (99 %CI)*	*β (99 %CI)*	*β (99 %CI)*	*β (99 %CI)*
Openness—Specific indirect effects						
→ Recreation → Weekly gaming → Disordered gaming	**.013 (.004, .021)**	**.008 (.001, .016)**	.007 (−.001, .015)	.003 (−.006, .011)	.003 (−.004, .011)	.004 (−.008, .015)
Extraversion—Specific indirect effects						
→ Weekly gaming → Disordered gaming	**−.035 (−.063, −.007)**	−.016 (−.040, .008)	−.003 (−.035, .028)	−.002 (−.051, .048)	−.013 (−.045, .019)	−.005 (−.066, .057)
Agreeableness—Specific indirect effects						
→ Weekly gaming → Disordered gaming	**−.035 (−.062, −.008)**	−.002 (−.024, .020)	.009 (−.022, .039)	−.020 (−.064, .024)	−.028 (−.066, .010)	−.037 (−.104, .029)
Conscientiousness—Specific indirect effects						
→ Social interaction → Weekly gaming → Disordered gaming	−.006 (−.011,.000)	**−.011 (−.021, −.001)**	−.003 (−.008, .003)	−.001 (−.005, .003)	.000 (−.006, .006)	−.008 (−.042, .025)
Recreation—Specific indirect effects						
→ Weekly gaming → Disordered gaming	**.059 (.025, .093)**	**.042 (.009, .075)**	**.041 (.003, .078)**	.016 (−.033, .064)	.038 (−.012, .088)	.030 (−.050, .111)
Coping—Specific indirect effects						
→ Weekly gaming → Disordered gaming	**.037 (.001, .073)**	−.005 (−.035, .025)	−.003 (−.043, .037)	.011 (−.039, .060)	.012 (−.029, .052)	.039 (−.046, .125)
Social interaction—Specific indirect effects						
→ Weekly gaming → Disordered gaming	**.071 (.036, .106)**	**.076 (.035, .118)**	.032 (−.009, .072)	.016 (−.037, .069)	.043 (−.010, .096)	.053 (−.026, .133)
Fantasy—Specific indirect effects						
→ Weekly gaming → Disordered gaming	.002 (−.039, .044)	.008 (−.025, .041)	.022 (−.026, .071)	**.074 (.005, .143)**	.006 (−.041, .053)	.007 (−.083, .096)

Note. Significant associations are in **bold** typeface to emphasize and were determined by 99 % bias-corrected standardized confidence intervals (based on 10,000 bootstrapped samples) that did not contain zero. US = United States; CAN = Canada; SPA = Spain; SC = Southern Cone (Argentina and Uruguay); SAF = South Africa; ENG = England.

However, other studies conducted among college students, like the present one, show no such robust relation (Jeng & Teng, 2008; Park et al., 2011). This can represent another moderating effect due to the nature of samples in the association between emotional stability and coping (Hanel & Vione, 2016).

Coping motives widely mediated the associations of lower emotional stability, extraversion, conscientiousness and agreeableness and high openness with disordered gaming. According to the self-medication hypothesis, individuals use substances to regulate emotions as a consequence of insufficient coping skills (Khantzian, 1997). This is also reflected in the negative affect regulation pathway in alcohol consumption (Sher et al., 2005), in which coping motives arise as a relevant mediating variable in the association between low emotional stability and alcohol misuse (Mezquita et al., 2018). Research has demonstrated that self-medication hypothesis is also enabled by technological uses (Kuss et al., 2017; Schimmenti, 2023). In other words, pathological video game players may play more to relieve stress and to avoid daily hassles. In this manner, these gratifications would reinforce, in turn, coping motives, consolidating the addictive process in video gaming (Brand et al., 2016). This compensatory mechanism is endorsed across different studies, whereby disordered gaming *via* coping-escape motives is indirectly associated with psychopathological symptoms (e.g., Ballabio et al., 2017; Király et al., 2015). Accordingly, it is not surprising to find that coping motives partially mediated the association between high neuroticism (i.e., low emotional stability) and disordered gaming among adolescents (López-Fernández et al., 2021). In the present study, the other personality traits were also mediated by coping in their associations with disordered gaming. Therefore, the effects of personality → coping → disordered gaming associations could vary for age groups. Thus coping-escape motives mediated the relation between dark personality traits and disordered gaming in general gamer samples (Kircaburun et al., 2018; Tang et al., 2020). It has been suggested that low sensation seeking, a facet of extraversion, may be a main characteristic in the negative affect regulation pathway for pathological gambling (Milosevic & Ledgerwood, 2010). Along with low emotional stability, low extraversion could represent a crucial personality factor that influences the use of the dysfunctional coping mechanism in technological behaviors for adults.

Regarding the association between motives and regular gaming, our results replicated findings found in research in which social interaction motives arose as being most important for predicting video gaming (e.g., Király et al., 2017; López-Fernandez et al., 2020a; López-Fernández et al., 2021; Michelini et al., 2023; Wu et al., 2017). It has been also reported that social interaction presents relevant associations with disordered gaming (e.g., López-Fernandez et al., 2020a; López-Fernández et al., 2021; Männikkö et al., 2016). According to our data, this relation may be mediated by weekly gaming. In this way, significant associations were found *via* weekly gaming only in the U.S. and Canada. Additionally, recreation motives also showed a relevant link with weekly gaming. Some studies have demonstrated that recreation, together with social interaction, emerge as crucial motives in predicting hours played (Greenberg et al., 2008; Sherry et al., 2012). In this vein, the role of recreation (i.e., enhancement) motives in predicting higher use/frequencies is commonly found across different substance and technological addictive behaviors, including alcohol (Mezquita et al., 2010), cannabis (Mezquita et al., 2019b) and gambling (Stewart & Zack, 2008).

Some minor differences across countries emerged in the mediational model, mostly in the paths mediated by weekly gaming. North American countries (U.S. and Canada) generally presented stronger associations in such paths. Cultural environment might moderate associations between individual differences and addictive behaviors, such as alcohol use and misuse (Mezquita et al., 2018; Pilatti et al., 2022). Thus, individualistic countries that prioritize autonomy and individual goals (especially the U.S.), unlike collectivistic countries that prioritize interdependence and group interest (Singelis et al., 1995), might be more sensitive to video gaming experience (Michelini et al., 2023; Stavropoulos et al., 2017).

4.1. Limitations

The present study is not without its limitations. They include: the convenience sample of college students, which impedes the generalization of the results; its cross-sectional design, which prevents us from making causal inferences; and the use of self-reported instruments, which are subjected to well-known biases like recall bias. Moreover, further cross-national research to examine the interplay of individual differences in video gaming outcomes should include Asian countries because they show the highest worldwide disordered gaming prevalence (Kim et al., 2022). In the same vein, we used a measure of gaming disorder based on DSM-5 criteria (IGDS9-SF; Pontes & Griffiths, 2015) for the present study. Prevalence rates may differ if we used a measure of gaming disorder using the WHO framework, which may produce slightly more conservative and accurate prevalence rates (Billieux et al., 2019; Montag et al., 2019). Finally, game genres have been shown to have differing associations with personality (e.g., López-Fernández et al., 2020b), motives (e.g., López-Fernández et al., 2020a), and time spent and disordered gaming (Rehbein et al., 2021). Further research should check if our findings are consistent across game typology. Accordingly, the extension of our findings needs further testing among clinical samples.

4.2. Conclusions

Despite its limitations, this research extends previous work by cross-nationally examining the mediating role of gaming motives between personality and regular and disordered gaming, and by finding minor differences among countries. Coping motives mediated the associations between risky personality traits and disordered gaming, whereas social interaction and recreation motives were predictors of time spent gaming. Our findings allow the conception of personality-targeted interventions (Conrod, 2016) for disordered gaming. Identifying motives as more proximal variables that mediate personality and addictive behavior is also clinically important because motives can be used for making targeted replacement behaviors for disordered players (Steadman, 2019). Nonetheless, more research is necessary to examine relations among personality traits, gaming motives, and gaming outcomes across distinct populations.

Funding

Dr. Francisco Javier López-Fernández was supported by a Margarita Salas postdoctoral grant (MGS/2021/02, UP2021-021) funded by the European Union-NextGenerationEU. Dr. Bravo was supported by a training grant (T32-AA018108) from the National Institute on Alcohol Abuse and Alcoholism (NIAAA) in the United States. Data collection was supported, in part, by grant T32-AA018108. NIAAA had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication. Data collection in Spain was also supported by grants UJI-B2022-29 from the Universitat Jaume I and CIAICO/2021/052 from the Generalitat Valenciana. Data collection in Argentina was also supported by grants from the National Secretary of Science and Technology (FONCYT, Grant No PICT 2018–03170) and by grants from the Secretary of Science and Technology- National University of Córdoba (SECyT-UNC).

CRediT authorship contribution statement

Francisco J. López-Fernández: Writing – original draft, Methodology, Formal analysis, Conceptualization. **Laura Mezquita:** Writing – review & editing, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization. **Verónica Vidal-Arenas:** Writing – review & editing, Methodology, Investigation. **Yanina Michelini:** Writing – review & editing, Methodology, Investigation. **Adrian J. Bravo:** Writing – review & editing, Methodology, Investigation. **Angelina Pilatti:** Writing – review & editing, Methodology, Investigation. **Generós Ortet:** Writing – review & editing, Project administration, Funding acquisition, Conceptualization. **Manuel I. Ibáñez:** Writing – review & editing, Project administration, Funding acquisition, 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.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.addbeh.2024.108049.

References

Akbari, M., Seydavi, M., Spada, M. M., Mohammadkhani, S., Jamshidi, S., Jamaloo, A., & Ayatmehr, F. (2021). The Big Five personality traits and online gaming: A systematic review and meta-analysis. *Journal of Behavioral Addictions, 10*, 611–625. https://doi.org/10.1556/2006.2021.00050

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. American Psychiatric Pub.

Bäcklund, C., Elbe, P., Gavelin, H. M., Sörman, D. E., & Ljungberg, J. K. (2022). Gaming motivations and gaming disorder symptoms: A systematic review and meta-analysis. *Journal of Behavioral Addictions, 11*, 667–688. https://doi.org/10.1556/2006.2022.00053

Ballabio, M., Griffiths, M. D., Urbán, R., Quartiroli, A., Demetrovics, Z., & Király, O. (2017). Do gaming motives mediate between psychiatric symptoms and problematic gaming? An empirical survey study. *Addiction Research & Theory, 25*, 397–408. https://doi.org/10.1080/16066359.2017.1305360

Benjet, C., Orozco, R., Albor, Y. C., Contreras, E. V., Monroy-Velasco, I. R., Hernández Uribe, P. C., Báez Mansur, P. M., Covarrubias Díaz Couder, M. A., Quevedo Chávez, G. E., Gutierrez-García, R. A., Machado, N., Andersson, C., & Borges, G. (2023). A longitudinal study on the impact of Internet gaming disorder on self-perceived health, academic performance, and social life of first-year college students. *The American Journal on Addictions, 32*, 343–351. https://doi.org/10.1111/ajad.13386

Billieux, J., Flayelle, M., Rumpf, H.-J., & Stein, D. J. (2019). High Involvement Versus Pathological Involvement in Video Games: A Crucial Distinction for Ensuring the Validity and Utility of Gaming Disorder. *Current Addiction Reports, 6*, 323–330. https://doi.org/10.1007/s40429-019-00259-x

Borges, G., Orozco, R., Benjet, C., Martínez Martínez, K. I., Contreras, E. V., Jiménez Pérez, A. L., Peláez Cedrés, A. J., Hernández Uribe, P. C., Díaz Couder, M. A. C., Gutierrez-Garcia, R. A., Quevedo Chavez, G. E., Albor, Y., Mendez, E., Medina-Mora, M. E., Mortier, P., & Rumpf, H.-J. (2019). DSM-5 Internet gaming disorder among a sample of Mexican first-year college students. *Journal of Behavioral Addictions, 8*, 714–724. https://doi.org/10.1556/2006.8.2019.62

Brand, M., Young, K. S., Laier, C., Wölfling, K., & Potenza, M. N. (2016). Integrating psychological and neurobiological considerations regarding the development and maintenance of specific Internet-use disorders: An Interaction of Person-Affect-Cognition-Execution (I-PACE) model. *Neuroscience & Biobehavioral Reviews, 71*, 252–266. https://doi.org/10.1016/j.neubiorev.2016.08.033

Bravo, A., Prince, M. A., Pilatti, A., Mezquita, L., Keough, M., Hogarth, L., & the Cross-Cultural Addiction Study Team. (2021). Young Adult Concurrent Use and Simultaneous Use of Alcohol and Marijuana: A Cross-Cultural Examination among College Students in Seven Countries. *Addict. Behav. Rep., 14*, 100373. https://doi.org/10.1016/j.abrep.2021.100373

Brown, T. A. (2015). *Confirmatory factor analysis for applied research* (2nd ed.). Guilford Press.

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling, 14*, 464–504. https://doi.org/10.1080/10705510701301834

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*, 233–255. https://doi.org/10.1207/s15328007sem0902_5

Chew, P. K. H. (2022). A meta-analytic review of Internet gaming disorder and the Big Five personality factors. *Addictive Behaviors, 126*, Article 107193. https://doi.org/10.1016/j.addbeh.2021.107193

Chiang, C. L. L., Zhang, M. W. B., & Ho, R. C. M. (2022). Prevalence of Internet Gaming Disorder in medical students: A meta-Analysis. *Frontiers in Psychiatry, 12*. https://doi.org/10.3389/fpsyt.2021.760911

Conrod, P. J. (2016). Personality-targeted interventions for substance use and misuse. *Current Addiction Reports, 3*, 426–436. https://doi.org/10.1007/s40429-016-0127-6

de Hesselle, L. C., Rozgonjuk, D., Sindermann, C., Pontes, H. M., & Montag, C. (2021). The associations between Big Five personality traits, gaming motives, and self-reported time spent gaming. *Personality and Individual Differences, 171*, Article 110483. https://doi.org/10.1016/j.paid.2020.110483

Efron, B., & Tibshirani, R. J. (1993). *An Introduction to the Bootstrap*. Chapman and Hall/CRC.

Erceg-Hurn, D. M., & Mirosevich, V. M. (2008). Modern robust statistical methods: An easy way to maximize the accuracy and power of your research. *American Psychologist, 63*, 591–601. https://doi.org/10.1037/0003-066x.63.7.591

Fritz, M. S., & MacKinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological Science, 18*, 233–239. https://doi.org/10.1111/j.1467-9280.2007.01882.x

Gao, Y. X., Wang, J. Y., & Dong, G. H. (2022). The prevalence and possible risk factors of internet gaming disorder among adolescents and young adults: Systematic reviews and meta-analyses. *Journal of Psychiatric Research, 154*, 35–43. https://doi.org/10.1016/j.jpsychires.2022.06.049

Gilbert, N. (2023, November 18). *Number of Gamers Worldwide 2022/2023: Demographics, Statistics, and Predictions*. FinancesOnline. https://financesonline.com/number-of-gamers-worldwide/.

Graham, L. T., & Gosling, S. D. (2013). Personality profiles associated with different motivations for playing World of Warcraft. *Cyberpsychology, Behavior, and Social Networking, 16*, 189–193. https://doi.org/10.1089/cyber.2012.0090

Greenberg, B. S., Sherry, J., Lachlan, K., Lucas, K., & Holmstrom, A. (2008). Orientations to video games among gender and age groups. *Simulation & Gaming, 41*, 238–259. https://doi.org/10.1177/1046878108319930

Hanel, P. H. P., & Vione, K. C. (2016). Do student samples provide an accurate estimate of the general public? *PLOS ONE, 11*, e0168354.

Hayes, A. F., & Coutts, J. J. (2020). Use omega rather than Cronbach's alpha for estimating reliability. But…. *Communication Methods and Measures, 14*, 1–24. https://doi.org/10.1080/19312458.2020.1718629

Hilgard, J., Engelhardt, C. R., & Bartholow, B. D. (2013). Individual differences in motives, preferences, and pathology in video games: The gaming attitudes, motives, and experiences scales (GAMES). *Frontiers in Psychology, 4*. https://doi.org/10.3389/fpsyg.2013.00608

Jeng, S. P., & Teng, C. I. (2008). Personality and motivations for playing online games. *Social Behavior and Personality: An International Journal, 36*, 1053–1060. https://doi.org/10.2224/sbp.2008.36.8.1053

Ji, Y., Yin, M. X. C., Zhang, A. Y., & Wong, D. F. K. (2022). Risk and protective factors of Internet gaming disorder among Chinese people: A meta-analysis. *Australian & New Zealand Journal of Psychiatry, 56*, 332–346. https://doi.org/10.1177/00048674211025703

John, O. P. (2021). History, measurement, and conceptual elaboration of the Big-Five trait taxonomy: The paradigm matures. In O. P. John, & R. W. Robins (Eds.), *Handbook of personality: Theory and research* (pp. 35–82). Guilford Press.

Khantzian, E. J. (1997). The self-medication hypothesis of substance use disorders: A reconsideration and recent applications. *Harvard Review of Psychiatry, 4*, 231–244. https://doi.org/10.3109/10673229709030550

Kim, H. S., Son, G., Roh, E. B., Ahn, W.-Y., Kim, J., Shin, S.-H., Chey, J., & Choi, K.-H. (2022). Prevalence of gaming disorder: A meta-analysis. *Addictive Behaviors, 126*, Article 107183. https://doi.org/10.1016/j.addbeh.2021.107183

Király, O., Tóth, D., Urbán, R., Demetrovics, Z., & Maraz, A. (2017). Intense video gaming is not essentially problematic. *Psychology of Addictive Behaviors, 31*, 807–817. https://doi.org/10.1037/adb0000316

Király, O., Urbán, R., Griffiths, M. D., Ágoston, C., Nagygyörgy, K., Kökönyei, G., & Demetrovics, Z. (2015). The mediating effect of gaming motivation between psychiatric symptoms and problematic online gaming: An online survey. *Journal of Medical Internet Research, 17*, e88.

Kircaburun, K., Demetrovics, Z., Griffiths, M. D., Király, O., Kun, B., & Tosuntaş, Ş. B. (2019). Trait emotional intelligence and Internet Gaming Disorder among gamers: The mediating role of online gaming motives and moderating role of age groups. *International Journal of Mental Health and Addiction, 18*, 1446–1457. https://doi.org/10.1007/s11469-019-00179-x

Kircaburun, K., Jonason, P. K., & Griffiths, M. D. (2018). The Dark Tetrad traits and problematic online gaming: The mediating role of online gaming motives and moderating role of game types. *Personality and Individual Differences, 135*, 298–303. https://doi.org/10.1016/j.paid.2018.07.038

Kuss, D. J., Dunn, T. J., Wölfling, K., Müller, K. W., Hędzelek, M., & Marcinkowski, J. (2017). Excessive Internet use and psychopathology: The role of coping. *Clinical Neuropsychiatry: Journal of Treatment Evaluation, 14*, 73–81.

López-Fernández, F. J., Mezquita, L., Griffiths, M. D., Ortet, G., & Ibáñez, M. I. (2020). The development and validation of the Videogaming Motives Questionnaire (VMQ). *PLoS One, 15*, e0240726.

López-Fernández, F. J., Mezquita, L., Griffiths, M. D., Ortet, G., & Ibáñez, M. I. (2020). The role of personality on disordered gaming and game genre preferences in adolescence: Gender differences and person-environment transactions. *Adicciones, 33*, 263–272. https://doi.org/10.20882/adicciones.1370

López-Fernández, F. J., Mezquita, L., Ortet, G., & Ibáñez, M. I. (2021). Mediational role of gaming motives in the associations of the Five Factor Model of personality with weekly and disordered gaming in adolescents. *Personality and Individual Differences, 182*, Article 111063. https://doi.org/10.1016/j.paid.2021.111063

Männikkö, N., Billieux, J., Nordström, T., Koivisto, K., & Kääriäinen, M. (2016). Problematic gaming behaviour in Finnish adolescents and young adults: Relation to game genres, gaming motives and self-awareness of problematic use. *International Journal of Mental Health and Addiction, 15*, 324–338. https://doi.org/10.1007/s11469-016-9726-7

Markon, K. E., Krueger, R. F., & Watson, D. (2005). Delineating the Structure of Normal and Abnormal Personality: An Integrative Hierarchical Approach. *Journal of Personality and Social Psychology, 88*, 139–157. https://doi.org/10.1037/0022-3514.88.1.139

Mezquita, L., Bravo, A. J., Morizot, J., Pilatti, A., Pearson, M. R., Ibáñez, M. I., Ortet, G., & Cross-Cultural Addictions Study Team. (2019). Cross-cultural examination of the Big Five Personality Trait Short Questionnaire: Measurement invariance testing and associations with mental health. *PLOS ONE, 14*, e0226223.

Mezquita, L., Bravo, A. J., Ortet, G., Pilatti, A., Pearson, M. R., & Ibáñez, M. I. (2018). Cross-cultural examination of different personality pathways to alcohol use and misuse in emerging adulthood. *Drug and Alcohol Dependence, 192*, 193–200. https://doi.org/10.1016/j.drugalcdep.2018.08.004

Mezquita, L., Ruiz-Valero, L., Martínez-Gómez, N., Ibáñez, M. I., & Ortet, G. (2019). Marijuana motives measure short form. *Adicciones, 31*, 106–116. https://doi.org/10.1037/t77539-000

Mezquita, L., Stewart, S. H., Ruipérez, Ma., & Á.. (2010). Big-five personality domains predict internal drinking motives in young adults. *Personality and Individual Differences, 49*, 240–245. https://doi.org/10.1016/j.paid.2010.03.043

Michelini, Y., Ibáñez, M. I., Pilatti, A., Bravo, A. J., López-Fernández, F. J., Ortet, G., & Mezquita, L. (2023). Motives to play videogames across seven countries: Measurement invariance of the Videogaming Motives Questionnaire. *Addictive Behaviors, 140*, Article 107624. https://doi.org/10.1016/j.addbeh.2023.107624

Milosevic, A., & Ledgerwood, D. M. (2010). The subtyping of pathological gambling: A comprehensive review. *Clinical Psychology Review, 30*, 988–998. https://doi.org/10.1016/j.cpr.2010.06.013

Montag, C., Kannen, C., Schivinski, B., & Pontes, H. M. (2021). Empirical evidence for robust personality-gaming disorder associations from a large-scale international investigation applying the APA and WHO frameworks. *PLOS ONE, 16*, e0261380.

Montag, C., Schivinski, B., Sariyska, R., Kannen, C., Demetrovics, Z., & Pontes, H. M. (2019). Psychopathological Symptoms and Gaming Motives in Disordered Gaming—A Psychometric Comparison between the WHO and APA Diagnostic Frameworks. *Journal of Clinical Medicine, 8*, 1691. https://doi.org/10.3390/jcm8101691

Morizot, J. (2014). Construct validity of adolescents' self-reported Big Five personality traits. *Assessment, 21*, 580–606. https://doi.org/10.1177/1073191114524015

Muthén, L. K., & Muthén, B. O. (2018). *Mplus user's guide* (Eighth Edition). Los Angeles, CA: Muthen & Muthen.

Ohayon, M. M., & Roberts, L. (2021). Internet gaming disorder and comorbidities among campus-dwelling U.S. university students. *Psychiatry Research, 302*, Article 114043. https://doi.org/10.1016/j.psychres.2021.114043

Park, J., Song, Y., & Teng, C. I. (2011). Exploring the links between personality traits and motivations to play online games. *Cyberpsychology, Behavior, and Social Networking, 14*, 747–751. https://doi.org/10.1089/cyber.2010.0502

Pilatti, A., Klein, N. D., Mezquita, L., Bravo, A. J., Keough, M. T., & Pautassi, R. M. (2022). Drinking motives as mediators of the relationship of cultural orientation with alcohol use and alcohol-related negative consequences in college students from seven countries. *International Journal of Mental Health and Addiction*. https://doi.org/10.1007/s11469-022-00789-y

Pontes, H. M., & Griffiths, M. D. (2015). Measuring DSM-5 Internet gaming disorder: Development and validation of a short psychometric scale. *Computers in Human Behavior, 45*, 137–143. https://doi.org/10.1016/j.chb.2014.12.006

Pontes, H. M., Schivinski, B., Sindermann, C., Li, M., Becker, B., Zhou, M., & Montag, C. (2019). Measurement and conceptualization of Gaming Disorder according to the World Health Organization framework: The development of the Gaming Disorder Test. *International Journal of Mental Health and Addiction, 19*, 508–528. https://doi.org/10.1007/s11469-019-00088-z

Rehbein, F., King, D. L., Staudt, A., Hayer, T., & Rumpf, H.-J. (2021). Contribution of Game Genre and Structural Game Characteristics to the Risk of Problem Gaming and Gaming Disorder: A Systematic Review. *Current Addiction Reports, 8*, 263–281. https://doi.org/10.1007/s40429-021-00367-7

Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The Motivational Pull of Video Games: A Self-Determination Theory Approach. *Motivation and Emotion, 30*, 344–360. https://doi.org/10.1007/s11031-006-9051-8

Schimmenti, A. (2023). Beyond Addiction: Rethinking Problematic Internet use from a Motivational Framework. *Clinical neuropsychiatry, 20*, 471–478. https://doi.org/10.36131/cnfioritieditore20230601

Sher, K. J., Grekin, E. R., & Williams, N. A. (2005). The development of Alcohol Use Disorders. *Annual Review of Clinical Psychology, 1*, 493–523. https://doi.org/10.1146/annurev.clinpsy.1.102803.144107

Sherry, J. L., Greenberg, B. S., Lucas, K., & Lachlan, K. (2012). *Video game uses and gratifications as predictors of use and game preference. In Playing video games* (pp. 248–262). Routledge.

Sherry, J. L., Lucas, K., Greenberg, B. S., & Lachlan, K. (2006). Video game uses and gratifications as predictors of use and game preference. In P. Vorderer, & J. Bryant (Eds.), *Playing computer games: Motives, responses, and consequences* (pp. 213–224). Lawrence Erlbaum.

Singelis, T. M., Triandis, H. C., Bhawuk, D. P. S., & Gelfand, M. J. (1995). Horizontal and vertical dimensions of individualism and collectivism: A theoretical and measurement refinement. *Cross-Cultural Research, 29*, 240–275. https://doi.org/10.1177/106939719502900302

Stavropoulos, V., Beard, C., Griffiths, M. D., Buleigh, T., Gomez, R., & Pontes, H. M. (2017). Measurement invariance of the Internet Gaming Disorder Scale–Short-Form (IGDS9-SF) between Australia, the USA, and the UK. *International Journal of Mental Health and Addiction, 16*, 377–392. https://doi.org/10.1007/s11469-017-9786-3

Steadman, J. L. (2019). Gaming motivations as a guide to treating problematic gaming behaviors. *Journal of Technology in Behavioral Science, 4*, 332–339. https://doi.org/10.1007/s41347-019-00103-z

Stewart, S. H., & Zack, M. (2008). Development and psychometric evaluation of a three-dimensional Gambling Motives Questionnaire. *Addiction, 103*, 1110–1117. https://doi.org/10.1111/j.1360-0443.2008.02235.x

Tang, W. Y., Reer, F., & Quandt, T. (2020). The interplay of gaming disorder, gaming motivations, and the dark triad. *Journal of Behavioral Addictions, 9*, 491–496. https://doi.org/10.1556/2006.2020.00013

Wang, H. Y., & Cheng, C. (2022). The associations between gaming motivation and Internet Gaming Disorder: Systematic review and meta-analysis. *JMIR Mental Health, 9*, e23700.

World Health Organization (2021). *International statistical classification of diseases and related health problems (ICD-11, 11th ed.)*. https://icd.who.int/.

Wu, A. M. S., Lai, M. H. C., Yu, S., Lau, J. T. F., & Lei, M. (2017). Motives for online gaming questionnaire: Its psychometric properties and correlation with Internet gaming disorder symptoms among Chinese people. *Journal of Behavioral Addictions, 6*, 11–20. https://doi.org/10.1556/2006.6.2017.007