Features related to the presence of internet gaming disorder and their impact on the treatment outcomes

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FULL-LENGTH REPORT

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ABSTRACT

Background and aims: Internet gaming disorder (IGD) is a highly engrossing activity with the individual spending up to 10 h per day gaming, this causes issues in accomplishing their tasks and personal goals. Also, to generate in them increased anxiety, impulsivity and lack of social skills, this impacts the good personal development and individual's quality of life. Therefore, it is **vital** to better understand, in terms of treatment, which factors are associated with therapeutic outcomes (largely to achieve control over the use of video games and the lack of relapses) following a standardized Cognitive Behavioral Therapy (CBT) protocol. This study aimed to explore sociodemographic and personality variables and their relation to treatment outcome in patients with IGD. *Method:* The sample included $n = 105$ patients with IGD, considered between January 2005 and December 2022 and recruited from the Behavioral Addictions Unit at the University Hospital of Bellvitge. Data at baseline was registered (sociodemographic and clinical measures), as well as the therapy outcomes (compliance with the guidelines, presence of relapses and dropouts). *Results:* Patients were mainly males ($n = 95$) with a mean age of 24.97 (SD = 12.03). All patients included in this sample had individual CBT treatment in relation to their problematic gaming behavior. In terms of patients who relapsed, they had higher interpersonal sensitivity, hostility and persistence with lower self-directedness. Patients who dropped out were males with an older age of IGD onset. When looking at treatment noncompliance, it was related to higher psychoticism and reward dependence, and lower cooperation. Patients with IGD show higher levels of treatment noncompliance. *Conclusion:* These findings evidence a positive and promising effect of CBT on IGT. The factors identified as predictors of good and poor treatment outcomes should be considered for developing new evidence-based interventions focused on learning healthier key coping strategies to manage both cravings and triggers.

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INTRODUCTION

Easy availability and access to online video games have enabled internet gaming to become a common leisure activity. But the increasing prevalences of problems arising from excessive use of these systems has captured the interests of both researchers and clinicians, particularly among adolescents and young adults due to their great risk to initiate an internet gaming disorder (IGD) (King, 2018; Sugaya, Shirasaka, Takahashi, & Kanda, 2019).

The definition of the clinical criteria and the classification of IGD in current taxonomies have been largely debated. The International Classification of Diseases (ICD - 11th Revision, 2020) describes IGD as a pattern of problematic, persistent, uncontrolled, and recurrent gaming behavior, both online and offline that generates negative consequences for individuals. This manual categorized IGD with disorders related to addictive behaviors. The Diagnostic and Statistical Manual of Mental Disorder states that patients with IGD show clinical profiles comparable to individuals with substance use disorder, and it places IGD as a mental disorder in section III: "Conditions for Further Study" (DSM-5-TR, American Psychiatric Association, 2022).

Epidemiological studies have published cross-sectional point prevalence estimations in a large range, from 0.7% to 27.5% (Fam, 2018; Stevens, Dorstyn, Delfabbro, & King, 2021; Zajac, Ginley, & Chang, 2020), with greater rates in Western industrialized countries (Brand, Young, Laier, Wölfling, & Potenza, 2016). The findings on the natural course of IGD are inconsistent and showed high variability across studies (Mihara & Higuchi, 2017), but it is noticeable a tendency to stability or aggravation (Krossbakken et al., 2018).

Regarding etiological research, it has been observed that male sex constitutes a highly vulnerable population (Durkee et al., 2012; Rehbein & Baier, 2013; Van Deursen, Bolle, Hegner, & Kommers, 2015), as well as young age (Andreassen, 2015; Kuss, Griffiths, Karila, & Billieux, 2014), and a psychological profile characterized by lack of social skills, low conscientiousness, high level of neuroticism, and high impulsivity levels (Currie et al., 2020; Şalvarlı & Griffiths, 2021).

Substantial harm from untreated IGD has been described (Zajac, Ginley, Kelly, Flori, & Pfund, 2014), including high rates of unemployment (or academic difficulty), comorbid mental health problems (such as depression and anxiety), physical health issues (including overweight and obesity, sleep disorders, weakness or numbness in the hands, and even blood clots), family conflicts, and social isolation. These negative consequences related to the problematic excessive gambling highlight the need to identify challenges related to treatment and the pathways for addressing these challenges.

Treatment efforts for IGD have developed and tested behavioral, pharmacological and neuromodulatory approaches (Dong, Dai, & Potenza, 2024). Systematic reviews have concluded that cognitive behavioral therapy (CBT) is the most widely employed intervention (King et al., 2017; Sharma & Weinstein, 2024; Winkler, Dörsing, Rief, Shen, & Glombiewski, 2013; Zajac et al., 2020), as well as the treatment with the most promising results addressing excessive gaming, dysfunctional cognitions, social and behavioral deficits, motivation for change, negative mood states, and reinstatement of alternative behaviors (King, Delfabbro, Griffiths, & Gradisar, 2012; Stevens, King, Dorstyn, & Delfabbro, 2019; Winkler et al., 2013). In addition, Young and Brand (2017) have argued that CBT techniques may be particularly useful in targeting the maladaptive processes that contribute to IGD as described in the Interaction of Person-Affect-Cognition-Execution (I-PACE) model. This model postulates that IGD is maintained in the patient by decreased cognitive control, which inhibits decision-making processes that result in the decision to play videogames (Brand et al., 2016).

But the results obtained for CBT among IGD patients must be interpreted with caution (Wang, Liu, & Nogueira, 2023). Firstly, because of the variability in the type of CBT analyzed (some using standard CBT, others using gaming-specific interventions, others incorporating parent psychological components, and still others focused on craving). Secondly, because most of the studies have been critized for poor design and methodological flows, such as relatively small sample sizes and lack of control groups (Gentile et al., 2017; Zajac, Ginley, Chang, & Petry, 2017). And thirdly, due to the differences in the diagnostic criteria to recruit participants (for example, self-report screening scales or diagnostic tools based on the criteria of DSM-5 or ICD-11 criteria) and the differences to evaluate the effectiveness of the treatment.

Related with the definition of the treatment outcomes, CBT studies have assessed cognitive and behavioral measures of recovery (King & Delfabbro, 2014). The most common included the change in the number (and/or severity) of the specific symptoms/criteria for IGD, the frequency of the gaming activity, the improvement in the global mental state, and the absence of relapses (defined as the recurrence of previously absent symptoms state, deterioration of the symptoms to a former worse state or the existence of uncontrolled gaming episodes). It is important to note that many intervention plans for IGD may not intend to completely abstain from gaming during the therapy, since total cessation of use may be counterproductive. That means that treatment goal for these programs is reduce gaming, controlled games use, and direct attention toward other healthy leisure activities.

Finally, knowledge of the predictors of treatment retention and outcomes in patients seeking treatment for IGD is very limited (King, Adair, Saunders, & Delfabbro, 2018). It has been observed that the severity of the disorder may negatively impact on treatment compliance and adherence (Kaptis et al., 2016). The presence of comorbidities (such as depression, anxiety, substances related disorders, attention deficit and hyperactivity) are likely to negatively affect the ability of individuals to abstain from or reduce gaming (Han, Yoo, Renshaw, & Petry, 2018; Ho et al., 2014; Lee, Lee, & Choo, 2017). Playing certain types of games (such as popular

competitive action shooting games) and the modality of gaming (such as massively multiplayer online games) have been associated to increased difficulty to reduce use and maintain at secure levels (James & Tunney, 2017).

In short, during the last decades IGD has become a significant concern in mental healthcare, particularly since the publication of the ICD-11 and the DSM-5. The increasing number of individuals engaging in unhealthy gaming has involved the development of several psychological interventions, with preliminarily support for CBT approaches over their counterparts. However, the study of empirically validated treatments for IGT and the identification of multiple factors contributing to the ability to abstain from gaming are still at early stages. Therefore, the aim of this study is to explore the response to CBT treatment of patients diagnosed with IGD, looking at sociodemographic variables, personality traits and therapy outcomes (e.g., risk of dropout and relapse). Since this is an exploratory study, and due the lack of available empirical evidence regarding the potential role of the variables analyzed on the therapy results, no empirical hypotheses are formulated.

METHODS

Participants

In this study, participants were recruited from the Behavioral Addictions Unit at the University Hospital of Bellvitge. A consecutive sampling was considered between January 2005 and December 2022, due to the low number of IGD patients which attend the unit compared to other behavioral addictions (e.g., gambling disorder). All patients included in this sample had individual outpatient CBT treatment in relation to their problematic gaming behavior and all of them met criteria for IGD according to the DSM. For patients who were assessed between 2005 and 2013 (i.e., prior to the DSM-5), IGD was identified through a semi-structured interview adapted from DSM-III-R pathological gambling criteria (Griffiths & Hunt, 1998). The sample included $n = 105$ patients ($n = 95$ men, 90.5%), most of them with primary ($n = 45$, 42.9%) or secondary ($n = 53$, 50.5%) education levels, single ($n = 92$, 87.6%), unemployed ($n = 78$, 74.3%) and in mean-low to low socioeconomic groups ($n = 91$, 86.6%). The mean duration of gaming-related problems was 4.1 years (SD = 3.3).

Measures

Clinical criteria for Internet Gaming Disorder. A semi-structured face-to-face clinical interview assessed the criteria included in section 3 of the DSM-5 ("Conditions for Further Study") for the presence of gaming (American Psychiatric Association, 2022; Petry et al., 2014) preoccupation or obsession, withdrawal, tolerance, loss of control, loss of interest, continued overuse, deception, release of negative feelings and functional impairment. In addition to the cut-off proposed in the DSM-5 (5 out of 9 criteria are required to confirm the condition), the presence of IGD in this study

required that the symptoms had to be endorsed within a 12-month period to establish the diagnosis (this method is aligned with recent research showing that more lenient criteria are susceptible to pathologization of non-pathological gaming patterns (Billieux, Flayelle, Rumpf, & Stein, 2019; Deleuze et al., 2017). As mentioned previously, for patients assessed between 2005 and 2013 (before the release of the DSM-5), gaming disorder was identified through a semi-structured face-to-face interview adapted from DSM–III–R pathological gambling criteria (Griffiths & Hunt, 1998).

Symptom Checklist-Revised (SCL-90-R) (Derogatis, 2002). This is a self-report questionnaire developed to assess the psychological state using 90 items factorized into nine primary (first order) dimensions (somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism), and three global indices [global severity index (GSI), total positive symptoms (PST), and positive symptom distress index (PSDI)]. The psychometrical Spanish adaptation of this tool obtained adequate internal consistency (Cronbach's alpha $\alpha = 0.75$) (Gonzalez De Rivera et al., 1989). The internal consistency in our sample was also in the adequate to good range ($\alpha = 0.79$, for the paranoid ideation scale, to $\alpha = 0.98$ for the global indices).

Temperament and Character Inventory-Revised (TCI-R). (Cloninger, Przybeck Thomas, Svrakic Dragan, & Wetzel, 1994). This is a self-report questionnaire developed to assess personality traits using 240 items based on Cloninger's multidimensional model and structured into seven factors [four for temperament (novelty seeking, harm avoidance, reward dependence, and persistence), and three for character (self-directedness, cooperation, and self-transcendence)]. The psychometrical Spanish adaptation of the tool obtained adequate internal consistency (Cronbach's alpha $\alpha = 0.87$) (Gutiérrez-Zotes et al., 2004). The internal consistency in this study was in the adequate to good range ($\alpha = 0.70$, for novelty seeking and $\alpha = 0.87$ for persistence).

Other variables. This study also analyzed additional data via a semi-structured interview. This tool covered sociodemographic characteristics (sex, marital status, education level, employment status), as well as the socio-economic position index, according to Hollingshead's scale (based on the participants' level of education and their profession) (Hollingshead, 2011). This interview also registered the presence of other comorbid diagnoses with the question "*Are your diagnosed of any mental disorder, or are you receiving treatment for any mental disorder?*"

Procedure

Therapeutic Program: The program consists of various sessions, the first one being focused on assessing the presence of IGD and the concrete profile of the gaming. This initial session also included the semi-structured clinical interview. The second session consisted of completing the psychometric tools, to measure personality traits, psychopathology, and other psychological constructs. Subsequently, there is a

third session with the patient and a concerned significant other, in which the results of the questionnaires and treatment plan are discussed. The CBT program protocol for IGD has a 12 week treatment plan, with 30-minute weekly sessions. The treatment is distributed into 6 phases: a) psychoeducation; b) cognitive restructuring; c) stimulus control and overcoming the desire; d) training in control techniques and appropriate use of video games; e) promotion of alternative tasks to the use of video games and f) training in relapse prevention. During the therapy, patients are instructed that the main goal of the treatment is not achieving complete abstinence from video games use, but to regain lost self-control and learn to use video games in a healthy way. Patients are also encouraged to change the problematic video game activity by others leisure healthy activities. After the treatment sessions, a final assessment is carried out, and the patient and the clinicians value the achievements.

Figure 1 displays the scheme with the study procedure.

Participation in this study was completely voluntary and explanation of the guidelines was provided prior to participation. Once the participants signed the consent form, the questionnaires were administered to them. Patients receive only psychotherapy CBT.

Statistical analysis

Statistical analysis was carried out with Stata18 for Windows (StataCorp, 2023). Logistic regression generated predictive models for the treatment outcomes of risk of relapse (no/yes), risk of dropout (no/yes) and risk of poor compliance (no/yes). In this study, relapse was defined as the presence of uncontrolled gaming episodes during treatment. Dropouts were considered for patients who completed less than 50% of the therapy sessions and they did not attend the final therapy session. And poor compliance was defined as patients who did not comply with the therapeutic guidelines (the assessment of the compliance level was made by the clinicians). The set of predictors included the sociodemographic and clinical profiles at baseline: sex, age, marital status, social position index), age of onset and duration of the gaming related problems, psychological state (SCL-90R scales) and personality profile (TCI-R scales). The selection of the best predictors (with significant contribution of the therapeutic criteria) was based on the back-stepwise procedure, the goodness-of-fit was measured with the Hosmer-Lemeshow test (H-L), and the global predictive capacity with the Nagelkerke's pseudo-R^2 coefficient (N-R^2).

Poisson regression, used to analyze count data, was employed to obtain the variables with the most predictive capacity (between the list of variables measured at baseline) about the number of relapses during the treatment and the number of sessions attended.

Survival analysis was used to analyze the rate (expected duration of time) until the presence of the treatment outcomes, relapses and dropouts. The Kaplan-Meier function was used to estimate the probability that a patient survives longer than a concrete time.

Ethics

The latest version of the Declaration of Helsinki was used to conduct the present study. The Clinical Research Ethics Committee of Bellvitge University Hospital approved this study (ref. PR393/17). Signed informed consent was obtained from all participants.

RESULTS

Descriptive variables of the sample

Most participants were men (90.5%), single (87.6%), with a secondary education level (50.5%), unemployed (74.3%), and pertaining to a low social position index (57.1%). Mean age was 25.0 years (SD = 12.0), mean onset of the addictive behavior 19.9 years (SD = 10.4) and mean duration of the problematic gaming was 4.1 years (SD = 3.3).

The frequency of patients who replied in the affirmative for the item included in the diagnostic interview measuring the presence of any mental disorder different to IGD was $n = 30$ (28.6%). And the percentage of patients within the clinical range in the screening measure of psychopathology (SCL-90R) was in the range between 25.7% for the PSDI global index to 52.4% for the interpersonal sensitivity factor.
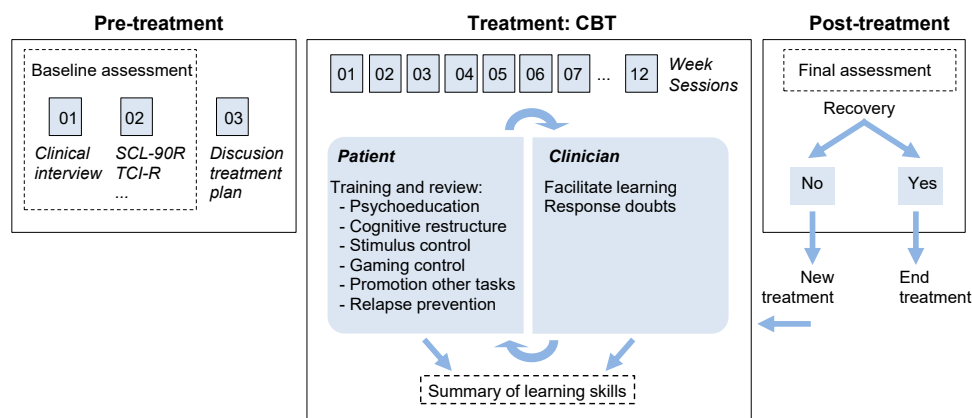

Fig. 1. Scheme with the study procedure

Table 1 displays the complete descriptive variables for the sample, with the frequency distribution of all the variables measured at baseline.

Predictive models of therapy outcomes

Figure 2 displays the 100% stacked bar chart with the distribution for the outcomes analyzed in the study (compliance with the therapy guidelines, dropout and relapses), stratified by sex and age groups. This figure shows that men tend to attain a poor treatment outcome, and that the likelihood of relapse tends to increase among patients within the middle age group (between 18 and 30 years-old). Table S1 (supplementary material), contains the comparison between patients with and without dropout and relapses, for all the variables registered at baseline.

Table 2 contains the results for the final models obtained in the logistic regression analyses. Adequate goodness-of-fit was achieved for the three models ($p > 0.05$ in the H-L tests). The risk of relapse was increased for patients with higher scores in the SCL-90R scales of interpersonal sensitivity and hostility, as well as with higher scores in the TCI-R scale of persistence. Being male and older age increased the likelihood of dropout. And poor compliance was associated with higher scores in SCL-90R psychotic ideation, higher level in the TCI-R reward dependence, and lower level in the TCI-R cooperativeness. The global predictive of the models was in the range N-R^2 = 0.085 (8.5%, for the regression on the criterion risk of dropout) to

N-R^2 = 0.245 (25.5%, for the regression on the criterion risk of poor compliance).

The results of the Poisson regression are displayed in Table 3. The first model of this table showed that the number of relapses increased for patients with higher levels of interpersonal sensitivity, hostility and persistence, and lower level in the self-directedness personality trait. Regarding the second model, the number of sessions attended during the treatment was higher in women, patients who reported higher education levels, higher scores in interpersonal sensitivity, hostility, paranoid ideation and cooperativeness, and lower scores in self-transcendence.

Survival analysis

Figure 3 shows the survival curves for the rate of relapses and dropout during treatment. The presence of uncontrolled gaming episodes was uniformly registered during the first 6 sessions, and only a few patients reported relapses between session 6 and the end of treatment. Regarding dropouts, all abandonments were registered during the first 5 sessions of treatment, with the risk of discontinuation being highest in the first week of treatment.

DISCUSSION

This study explored the profile of patients with IGD (sociodemographic variables, psychopathology distress and

Table 1. Descriptive variables for the sample at baseline

Sociodemographic profile	n	%	Psychopathology (SCL-90R)	Mean	SD	[1]n	[1]%
Sex			Somatization	0.84	0.81	37	35.24%
Female	10	9.5%	Obsessive-compulsive	1.23	0.84	48	45.71%
Male	95	90.5%	Interpersonal sensitivity	1.18	0.95	55	52.38%
Marital status			Depression	1.26	1.01	47	44.76%
Single	92	87.6%	Anxiety	0.80	0.77	29	27.62%
Married – couple	11	10.5%	Hostility	1.04	0.91	37	35.24%
Divorced – separated	2	1.9%	Phobic anxiety	0.52	0.77	30	28.57%
Education			Paranoid ideation	1.10	0.93	42	40.00%
Primary	45	42.9%	Psychotic ideation	0.77	0.80	39	37.14%
Secondary	53	50.5%	GSI	1.00	0.76	48	45.71%
University	7	6.7%	PST	41.08	21.30	43	40.95%
Employment			PSDI	1.93	0.64	27	25.71%
Unemployed	78	74.3%	*Personality (TCI-R)*	*Mean*	*SD*		
Employed	27	25.7%	Novelty seeking	104.00	13.20		
Social			Harm avoidance	104.02	17.26		
High	2	1.9%	Reward dependence	94.85	17.37		
Mean-high to high	3	2.9%	Persistence	92.62	19.20		
Mean	9	8.6%	Self-directedness	124.43	23.67		
Mean-low	31	29.5%	Cooperativeness	129.65	19.27		
Low	60	57.1%	Self-transcendence	60.09	14.61		
Age, onset and duration	*Mean*	*SD*					
Age (years-old)	24.97	12.03					
Onset of addiction (yrs-old)	19.92	10.36					
Duration of the addiction (yrs)	4.05	3.27					
Prevalence of mental disorders	*n*	*%*					
Any mental disorder	30	28.57					

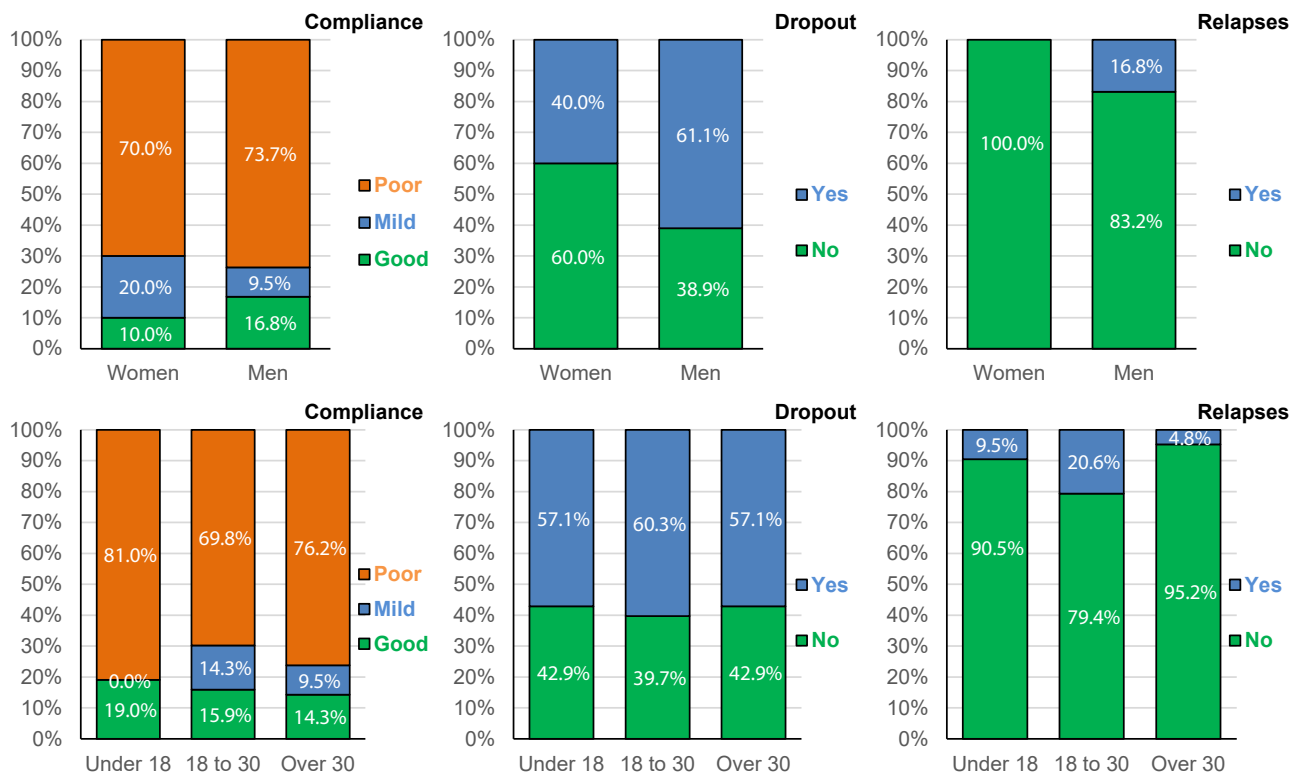*Note.* SD: standard deviation. [1]Prevalence of patients within the clinical range.

Fig. 2. Treatment outcomes: risk of dropout and relapses during therapy

Table 2. Logistic regression with the final discriminative models

Criterion: risk of relapse	B	SE	p	OR	95%CI (OR)		H-L	N-R^2
SCL-90R interpersonal sensitivity	2.268	0.868	0.009	9.658	1.762	52.925	0.118	0.210
SCL-90R hostility	1.267	0.600	0.035	3.550	1.096	11.499		
TCI-R persistence	0.032	0.017	0.049	1.033	0.999	1.000		
Criterion: risk of dropout	B	SE	p	OR	95%CI (OR)		H-L	N-R^2
Sex (0:female; 1:male)	1.771	0.886	0.046	5.875	1.034	33.370	0.188	0.085
Age of onset (years-old)	0.066	0.032	0.040	1.068	1.003	1.137		
Criterion: risk of poor compliance	B	SE	p	OR	95%CI (OR)		H-L	N-R^2
SCL-90R psychotic ideation	1.629	0.600	0.007	5.101	1.572	16.546	0.947	0.245
TCI-R reward dependence	0.070	0.023	0.003	1.072	1.024	1.122		
TCI-R cooperativeness	−0.051	0.022	0.020	0.951	0.911	0.992		

Note. SE: standard error. OR: odds ratio. 95%CI: 95% confidence interval.
Fit statistics: H-L: Hosmer-Lemeshow (*p*-value). N-R2: Nagelkerke pseudo R-squared.
List of predictors: sociodemographic profile (sex, age, marital status, social position index), age of onset and duration of the gaming related problems, psychological state (SCL-90R scales), and personality profile (TCI-R scales).

personality traits), as well as treatment outcomes (relapse, compliance, dropout). The IGD profile was characterized by a high proportion of men who are single, have a higher level of education, are unemployed, have a low social status, have a young average age and a young age of onset of addiction problems, and have a high probability of having several psychiatric symptoms at the same time. Poor treatment outcomes were associated to male gender, older age, worse psychopathology state, higher levels in persistence and reward dependence, and lower levels in cooperativeness and self-directedness.

Profile of patients with IGD

The sample included a higher percentage of males with IGD compared to females. These results are in line with previous studies where they indicate that IGD is more prevalent in males (Stevens et al., 2021). This could be due to the nature of internet games, which were oriented for many years to males, designed for men by men. In addition, and compared with other behavioral addictions, patients with IGD are mostly younger and single, and report an earlier age of onset. This is explained by the fact that video games are

Table 3. Poisson regression with the final discriminative models

Criterion: number of relapses	B	SE	p	95%CI (B)	
SCL-90R interpersonal sensitivity	1.708	0.581	0.003	0.570	2.846
SCL-90R hostility	0.953	0.422	0.024	0.125	1.781
TCI-R persistence	0.038	0.012	0.001	0.015	0.060
TCI-R self-directedness	−0.048	0.014	<0.001	−0.075	−0.021
Criterion: number of sessions	B	SE	p	95%CI (B)	
Sex (0:female; 1:male)	−0.309	0.176	0.078	−0.653	0.035
Education level (higher)	0.249	0.080	0.002	0.092	0.407
SCL-90R interpersonal sensitivity	0.255	0.128	0.047	0.004	0.506
SCL-90R hostility	0.158	0.081	0.050	0.000	0.317
SCL-90R paranoid ideation	0.444	0.109	0.000	0.231	0.657
TCI-R cooperativeness	0.008	0.003	0.019	0.001	0.015
TCI-R self-transcendence	−0.007	0.003	0.050	−0.014	0.000

Note. SE: standard error. 95%CI: 95% confidence interval.

List of predictors: sociodemographic profile (sex, age, marital status, social position index), age of onset and duration of the gaming related problems, psychological state (SCL-90R scales), and personality profile (TCI-R scales).
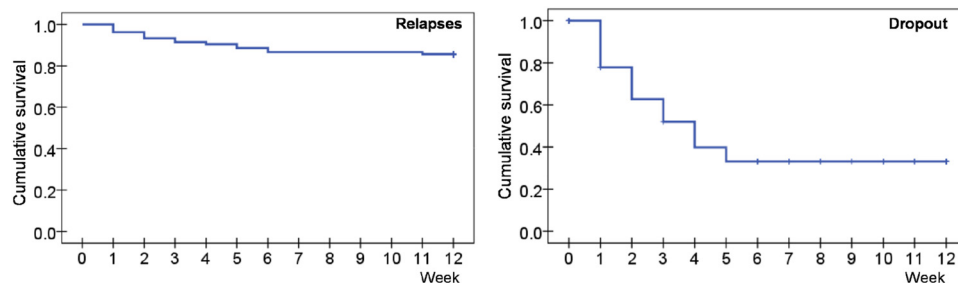
Fig. 3. Cumulative survival functions for the rate of relapses and dropout

more attractive to adolescents and young adults and this group tends to have a higher rate of unemployment (Mallorquí-Bagué, et al., 2017). Regarding other sociodemographic features, the young age of the individuals with IGD could also explain the higher proportion of unemployed patients and secondary education levels. In addition, and given the cross-sectional nature of the data analyzed for the baseline, we can only describe the associations between the variables, without attempting to establish causality. The high unemployment level and low socioeconomic status could be associated with IGD or with other variables such as education level and age of onset of the disorder. Researchers have found that the most problematic internet use tends to be in the younger population (Buil, Solé, & García, 2015; Carbonell, 2014; Ferguson, Coulson, & Barnett, 2011; Kuss, Van Rooij, Shorter, Griffiths, & Van de Mheen, 2013). Moreover, studies have emphasized that IGD has comorbidity with other psychiatric disorders and is also related to introversion and deficits in social skills (Şalvarlı & Griffiths, 2021), which could explain potential difficulties in obtaining a job. Be that as it may, since IGD typically develops among male gender in adolescence and in early adulthood, as other behavioral addictions (Macur & Pontes, 2021), secondary and university students should be considered a highly vulnerable group for preventing the onset and progression of video games use.

Related to the psychopathology levels, this study observed that IGD was associated to high scores in most psychiatric symptom dimensions, i.e., somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. This concurrence of IGD with other mental diseases has also been reported in previous studies (Han et al., 2018; Kim et al., 2016; Wang, Liu, & Nogueira, 2023). But our data does not allow a causal link between excessive gaming as predictor of worse psychopathology levels. On the contrary, reciprocal bidirectional relationships between IGD with other comorbid conditions (such as anxiety, depression or hyperactivity/inattention) have been observed, evidencing that people with IGD had a high risk of developing concurrent diseases and symptoms, and these disorders and symptoms could also increase the likelihood of onset (and even deteriorate) IGD (Meng et al., 2024; Shi et al., 2020).

Treatment outcome: relapse

The findings obtained showed that the subjects who relapse have higher interpersonal sensitivity, hostility, persistence, and lower self-directedness. These results are consistent with previous research, which has also found individuals who suffer from IGD to have difficulties with interpersonal

relationships (De Pasquale et al., 2020). In this vein, a higher risk of relapse is related to interpersonal sensitivity (i.e., feelings of inadequacy and inferiority when compared to others and discomfort in social interactions) (Granero, Fernández-Aranda, Castro-Calvo, et al., 2021). Previous research described that hostility present in IGD could be a means to handle emotional distress (Stavropoulos, Kuss, Griffiths, Wilson, & Motti-Stefanidi, 2017) which would be consistent with the present study. Therefore, hostility becomes an escape mechanism from distress in order to feel satisfied and emotionally regulated. Indeed, Kuss (2013) describes that the preference for online social relationships, escapism, and use of maladaptive coping strategies could be maintaining variables and useful in coping with everyday stressors.

Additionally, another factor related to risk of relapse was persistence, associated with more rigidity, which causes the patient to have difficulty in changing their habits, not allowing them to move their focus from gaming to another behavior and even though the individual may be tired, they continue gaming, and they may not be able to stop themselves from engaging in this behavior (Ayala-Rojas et al., 2022; Jiménez-Murcia et al., 2019).

And finally, lower self-directedness is related to low self-esteem and lower self-regulatory capacity (Cloninger, Svrakic, & Przybeck, 1993; Hahn, Reuter, Spinath, & Montag, 2017). Some studies have found that low self-direction is a predictor of IGD, reflected in low regulation and adaptation of behavior to the fulfillment of personal goals and projects (Montag et al., 2012). Due to low self-esteem and self-acceptance, the subjects have less self-control and difficulties in planning their life according to meaningful personal and social goals. In line with this, research has found a positive association between IGD, low self-esteem and lack of social and interpersonal skills (González-Bueso, et al., 2020; Jiménez-Murcia, et al., 2014).

Treatment outcome: noncompliance

The results show patients have high levels of psychoticism, reward dependence and low cooperation, in relation to poor treatment compliance. Some studies have found a high association between low cooperation, paranoid traits and low conscientiousness (Li, Zou, Wang, & Yang, 2016; Schimmenti, Infanti, Badoud, Laloyaux, & Billieux, 2017).

Recently authors refer to a positive association between introverted people and addictive behaviors in general. Meaning that being immersed in an online environment allows one to hide their identity, where the probability of being embarrassed, ridiculed or rejected is decreased, and the ease of establishing new interpersonal relationships is increased, through a new lifestyle (Şalvarlı & Griffiths, 2021). IGD patients present with difficulties in social interactions, rejection sensitivity and empathy, these are deficient when trying to establish connections with their peer group and to trust others. In line with our findings, some authors mention that patients with IGD have low sociability (Festl, Scharkow, & Quandt, 2013), low openness to experiences (Wang, Ho,

Chan, & Tse, 2015) and a combination of low self-directedness and cooperation (Montag et al., 2012), which greatly impacts the lack of social relationships and in consequence a difficulty to adhere to treatment. A study conducted by Cook and collaborators (2017) has found that the formation of a positive therapeutic alliance is fundamental for effective psychotherapy. This could possibly explain that if there is low cooperation and a lack of trust towards the therapist, it may hinder treatment bonding (Cook, Schwartz, & Kaslow, 2017). Low cooperation, from the TCI-R scale, has been linked with low extroversion, unfriendliness and low perceived social support, whereas high cooperativeness has been seen to be associated with empathy, social acceptance and agreeableness (Bojanowska & Urbańska, 2021).

Additionally, it is observed that studies relating personality traits and internet addiction found high scores for conscientiousness and low scores for openness to novel experiences. Internet addiction was negatively related with conscientiousness, extraversion, openness to new experiences and agreeableness, and positively related with neuroticism (Kayiş et al., 2016).

Treatment outcome: dropout

When looking at the risk of dropout, only two factors were relevant in this study, sex and age of onset. Males presented higher risk of dropout, which is in line with epidemiological and clinical data that demonstrate that gaming disorder is overall more prevalent in males, due to several factors (e.g., psychological, social, cultural) (Granero, Fernández-Aranda, Castro-Calvo, et al., 2021; Kuss & Griffiths, 2012; Lopez-Fernandez, Williams, & Kuss, 2019). Also, an older age of IGD onset implied a higher risk of dropout. In this vein, previous studies have shown the significance of variables such as age of onset and chronological age, which have been associated with distinct patient profiles. For instance, one study identified two profiles in a sample of gaming disorder patients. The first group presented a lower psychological impact which was characterized by younger age, earlier age of onset of gaming, better psychopathological status and a more functional profile. On the other hand, the second group presented a higher psychological impact and was represented by older patients, with later age of onset of gaming and more marked psychopathological symptoms and dysfunctional personality profiles. Also, they were correlated with higher risk of alcohol consumption, and other behavioral addictions (Granero, Fernández-Aranda, Castro-Calvo, et al., 2021; Granero, Fernández-Aranda, Demetrovics, et al., 2021). Therefore, older age and later age of onset in gaming disorder are associated with greater severity of the disorder and with other concurrent disorders, and thus, with a higher risk of treatment dropout (Han et al., 2018).

Strengths and limitations

This study had several limitations, such as the cross-sectional design (concretely for data analyzed at baseline),

which does not allow us to determine the causality of the variables evaluated. The size of the clinical sample was unequal, since there were more men than women, and since it is a clinical sample, it is not possible to apply it to the general population. Future studies could include a more heterogeneous and diverse sample size in order to better understand the similarities and differences in the personality and psychopathological traits of patients with IGD and be able to replicate it in other social environments. Finally, the long recruitment period was also a limitation: since IGD evolves rapidly, it is quite possible that the patients' profiles and some treatment features might differ comparing the first and last participants, and these inconstancies could have influenced the results.

On the other hand, there were many strengths in this study, the first one being that it was a clinical sample of individuals with IGD, made up of women and men. The second is the set of variables evaluated at the sociodemographic, psychopathological and clinical levels, based on the response to treatment (risk of dropout and relapse), and noncompliance, according to the number of sessions attended by the patients.

CONCLUSION

As this study has shown, compliance with IGD treatment is very poor, it is imperative to have treatments, which are more specifically tailored to IGD. Especially in terms of the traits which are most prevalent in this group, such as, interpersonal sensitivity, hostility and persistence (in terms of rigidity and difficulty in changing from one activity to another). Future studies may focus on the identification of possible components (personal, familial and social) that hinder the successful development of treatment in order to prevent the risk of relapse and/or dropout. Special attention should be paid to risk and protective factors that empirical research has related to the progression of IGD (Ropovik et al., 2023), such as coping strategies, self-esteem, emotion regulation capacities, presence of other physical and/or psychological problems, social support, family functioning, and motives for gaming. It is also essential to attend impairing parenting styles and school-related stress among young age individuals. In the same vein, precise treatment plans should be developed for patients with concrete characteristics that might hinder treatment success, valuing the benefits of alternative or complementary treatment approaches (such as family-based plans, or augmented psychotherapy with additional cognitive/emotional bias modification sessions, motivation and relapse prevention sessions) (Sharma & Weinstein, 2024). Interestingly, studies have observed a strong link between the inclusion of the family members in the treatment plans with the patients' responses to treatment, particularly for improve affectation and gaming cues among adolescents with (Pallesen, Lorvik, Bu, & Molde, 2015) and decreasing dropout rates (González-Bueso et al., 2018). Finally, continued research in IGD is encouraged in order to increase clinical knowledge and to help assess IGD as a disorder that impedes the favorable development of individuals.

SUPPLEMENTARY MATERIAL

Supplementary data to this article can be found online at https://doi.org/10.1556/2006.2024.00070.

REFERENCES

American Psychiatric Association (2022). *Diagnostic and statistical manual of mental disorders* (5th ed.). Text Revision: American Psychiatric Association Publishing.

Andreassen, C. S. (2015). Online social network site addiction: A comprehensive review. *Current Addiction Reports*, *2*(2), 175–184. https://doi.org/10.1007/s40429-015-0056-9.

Ayala-Rojas, R. E., Granero, R., Mora-Maltas, B., Rivas, S., Fernández-Aranda, F., Gómez-Peña, M., … Jiménez-Murcia, S. (2022). Factors related to the dual condition of gambling and gaming disorders: A path analysis model. *Journal of Psychiatric Research*, *145*, 148–158. https://doi.org/10.1016/j.jpsychires.2021.12.005.

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*(3), 323–330. https://doi.org/10.1007/s40429-019-00259-x.

Bojanowska, A., & Urbańska, B. (2021). Individual values and well-being: The moderating role of personality traits. *International Journal of Psychology: Journal International de Psychologie*. https://doi.org/10.1002/ijop.12751.

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 and Biobehavioral Reviews*, *71*, 252–266. https://doi.org/10.1016/j.neubiorev.2016.08.033.

Buil, P., Solé, M. J., & García, P. (2015). La regulación publicitaria de los juegos de azar online en España. Una reflexión sobre la protección del menor. *Adicciones*, *27*, 198–204. https://doi.org/10.20882/adicciones.706.

Carbonell, X. (2014). La adicción a los videojuegos en el DSM-5. *Adicciones*, *26*, 91–95. Disponible en. https://www.redalyc.org/articulo.oa?id=289131590001.

Cloninger, C. R., Przybeck Thomas, R., Svrakic Dragan, M., & Wetzel, R. D. (1994). *The Temperament and Character Inventory (TCI). A guide to its development and use*. St. Louis, MO: Washington University. Center for Psychobiology of Personality.

Cloninger, C. R., Svrakic, D. M., & Przybeck, T. R. (1993). A psychobiological model of temperament and character. *Archives of General Psychiatry*, *50*(12), 975–990.

Cook, S. C., Schwartz, A. C., & Kaslow, N. J. (2017). Evidence-based psychotherapy: Advantages and challenges. *Neurotherapeutics: The Journal of the American Society for Experimental Neuro-Therapeutics*, *14*(3), 537–545. https://doi.org/10.1007/s13311-017-0549-4.

Currie, S. R., Brunelle, N., Dufour, M., Flores-Pajot, M.-C., Hodgins, D., Nadeau, L., & Young, M. (2020). Use of self-control strategies for managing gambling habits leads to less harm in regular gamblers. *Journal of Gambling Studies*, *36*(2), 685–698. https://doi.org/10.1007/s10899-019-09918-0.

De Pasquale, C., Sciacca, F., Martinelli, V., Chiappedi, M., Dinaro, C., & Hichy, Z. (2020). Relationship of internet gaming disorder with psychopathology and social adaptation in Italian young adults. *International Journal of Environmental Research and Public Health*, *17*(21), 8201. https://doi.org/10.3390/ijerph17218201.

Deleuze, J., Nuyens, F., Rochat, L., Rothen, S., Maurage, P., & Billieux, J. (2017). Established risk factors for addiction fail to discriminate between healthy gamers and gamers endorsing DSM-5 Internet gaming disorder. *Journal of Behavioral Addictions*, *6*(4), 516–524. https://doi.org/10.1556/2006.6.2017.074.

Derogatis, L. R. (2002). *SCL-90-R. Cuestionario de 90 Síntomas-Manual. Madrid: TEA Ediciones*.

Dong, G. H., Dai, J., & Potenza, M. N. (2024). Ten years of research on the treatments of internet gaming disorder: A scoping review and directions for future research. *Journal of Behavioral Addictions*, *13*(1), 51–65. https://doi.org/10.1556/2006.2023.00071.

Durkee, T., Kaess, M., Carli, V., Parzer, P., Wasserman, C., Floderus, B., … Wasserman, D. (2012). Prevalence of pathological internet use among adolescents in Europe: Demographic and social factors. *Addiction*, *107*(12), 2210–2222. https://doi.org/10.1111/j.1360-0443.2012.03946.x.

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

Ferguson, C. J., Coulson, M., & Barnett, J. (2011). A meta-analysis of pathological gaming prevalence and comorbidity with mental health, academic and social problems. *Journal of Psychiatric Research*, *45*, 1573–1578. https://doi:10.1016/j.jpsychires.2011.09.005.

Festl, R., Scharkow, M., & Quandt, T. (2013). Problematic computer game use among adolescents, younger and older adults. *Addiction (Abingdon, England)*, *108*(3), 592–599. https://doi.org/10.1111/add.12016.

Gentile, D. A., Bailey, K., Bavelier, D., Brockmyer, J. F., Cash, H., Coyne, S. M., & Young, K. (2017). Internet gaming disorder in children and adolescents. *Pediatrics*, *140*, S81–S85. https://doi.org/10.1542/peds.2016-1758H.

Gonzalez De Rivera, J. L., Derogatis, L. R., De las Cuevas, C., Gracia Marco, R., Rodríguez-Pulido, F., Henry-Benitez, M., & Monterrey, A. (1989). The Spanish version of the SCL-90-R. Normative data in the general population. Towson. *Clinical Psychometric Research*.

González-Bueso, V., Santamaría, J. J., Fernández, D., Merino, L., Montero, E., Jiménez-Murcia, S., … Ribas, J. (2018). Internet gaming disorder in adolescents: Personality, psychopathology and evaluation of a psychological intervention combined with parent psychoeducation. *Frontiers in Psychology*, *9*, 787. https://doi.org/10.3389/fpsyg.2018.00787.

González-Bueso, V., Santamaría, J. J., Oliveras, I., Fernández, D., Montero, E., Baño, M, … Ribas, J. (2020). Agrupación de trastornos de los juegos de Internet basada en rasgos de personalidad en adolescentes y su relación con las comorbilidades Síntomas psicológicos. *Revista Internacional de Investigación Ambiental y Salud Pública*, *17*(5), 1516. https://doi.org/10.3390/ijerph17051516.

Granero, R., Fernández-Aranda, F., Castro-Calvo, J., Billieux, J., Valero-Solís, S., Mora-Maltas, B., … Jiménez-Murcia, S. (2021). Subtyping treatment-seeking gaming disorder patients. *Addictive Behaviors*, *123*, 107086. https://doi.org/10.1016/j.addbeh.2021.107086.

Granero, R., Fernández-Aranda, F., Demetrovics, Z., Ayala-Rojas, R. E., Gómez-Peña, M., Moragas, L., & Jiménez-Murcia, S. (2021). Profile of treatment-seeking gaming disorder patients: A network perspective. *Journal of Gambling Studies*, *38*(3), 941–965. https://doi.org/10.1007/s10899-021-10079-2.

Griffiths, M. D., & Hunt, N. (1998). Dependence on computer games by adolescents. *Psychological Reports*, 82(2), 475–480. https://doi.org/10.2466/pr0.1998.82.2.475.

Gutiérrez-Zotes, J. A., Bayón, C., Montserrat, C., Valero, J., Labad, A., Cloninger, C. R., & Fernández-Aranda, F. (2004). Temperament and character inventory revised (TCI-R): Standardization and normative data in a general population sample. *Actas Españolas de Psiquiatria*, 32(1), 8–15.

Hahn, E., Reuter, M., Spinath, F. M., & Montag, C. (2017). Internet addiction and its facets: The role of genetics and the relation to self-directedness. *Addictive Behaviors*, 65, 137–146. https://doi.org/10.1016/j.addbeh.2016.10.018.

Han, D. H., Yoo, M., Renshaw, P. F., & Petry, N. M. (2018). A cohort study of patients seeking Internet gaming disorder treatment. *Journal of Behavioral Addictions*, 7(4), 930–938. https://doi.org/10.1556/2006.7.2018.102.

Ho, R. C., Zhang, M. W., Tsang, T. Y., Toh, A. H., Pan, F., Lu, Y., … Mak, K. K. (2014). The association between internet addiction and psychiatric co-morbidity: A meta-analysis. *BMC Psychiatry*, 14, 183. https://doi.org/10.1186/1471-244X-14-183.

Hollingshead, A. B. (2011). Four factor index of social status. *Yale Journal of Sociology*, 8, 21–51.

ICD - 11th Revision (2020). *International statistical classification of diseases and related health problems*.

James, R. J. E., & Tunney, R. J. (2017). The need for a behavioural analysis of behavioural addictions. *Clinical Psychology Review*, 52, 69–76. https://doi.org/10.1016/j.cpr.2016.11.010.

Jiménez-Murcia, S., Fernández-Aranda, F., Granero, R., Chóliz, M., La Verde, M., Aguglia, E., & Menchón, J. M. (2014). Video game addiction in gambling disorder: Clinical, psychopathological, and personality correlates. *BioMed Research International*, 2014. https://doi.org/10.1155/2014/315062.

Jiménez-Murcia, S., Granero, R., Fernández-Aranda, F., Stinchfield, R., Tremblay, J., Steward, T., … Menchón, J. M. (2019). Phenotypes in gambling disorder using sociodemographic and clinical clustering analysis: An unidentified new subtype? *Frontiers in Psychiatry*, 10. https://doi.org/10.3389/fpsyt.2019.00173.

Kaptsis, D., King, D. L., Delfabbro, P. H., & Gradisar, M. (2016). Withdrawal symptoms in internet gaming disorder: A systematic review. *Clinical Psychology Review*, 43, 58–66. https://doi.org/10.1016/j.cpr.2015.11.006.

Kim, N. R., Hwang, S. S., Choi, J. S., Kim, D. J., Demetrovics, Z., Király, O., … Choi, S. W. (2016). Characteristics and psychiatric symptoms of internet gaming disorder among adults using self-reported DSM-5 criteria. *Psychiatry investigation*, 13, 58–66. https://doi.org/10.4306/pi.2016.13.1.58.

Kayiş, A. R., Satici, S. A., Yilmaz, M. F., Şimşek, D., Ceyhan, E., & Bakioğlu, F. (2016). Big five-personality trait and internet addiction: A meta-analytic review. *Computers in Human Behavior*, 63, 35–40. https://doi.org/10.1016/j.chb.2016.05.012.

King, D. L. (2018). Comment on the global gaming industry's statement on ICD-11 gaming disorder: A corporate strategy to disregard harm and deflect social responsibility? *Addiction*, 113(11), 2145–2146. https://doi.org/10.1111/add.14388.

King, D. L., Adair, C., Saunders, J. B., & Delfabbro, P. H. (2018). Clinical predictors of gaming abstinence in help-seeking adult problematic gamers. *Psychiatry Research*, 261, 581–588. https://doi.org/10.1016/j.psychres.2018.01.008.

King, D. L., & Delfabbro, P. H. (2014). Internet gaming disorder treatment: A review of definitions of diagnosis and treatment outcome. *Journal of Clinical Psychology*, 70(10), 942–955. https://doi.org/10.1002/jclp.22097.

King, D. L., Delfabbro, P. H., Griffiths, M. D., & Gradisar, M. (2012). Cognitive-behavioral approaches to outpatient treatment of internet addiction in children and adolescents. *Journal of Clinical Psychology*, 68(11), 1185–1195. https://doi.org/10.1002/jclp.21918.

King, D. L., Delfabbro, P. H., Wu, A. M. S., Doh, Y. Y., Kuss, D. J., Pallesen, S., … Sakuma, H. (2017). Treatment of Internet gaming disorder: An international systematic review and CONSORT evaluation. *Clinical Psychology Review*, 54, 123–133. https://doi.org/10.1016/j.cpr.2017.04.002.

Krossbakken, E., Pallesen, S., Mentzoni, R. A., King, D. L., Molde, H., Finserås, T. R., & Torsheim, T. (2018). A cross-lagged study of developmental trajectories of video game engagement, addiction, and mental health. *Frontiers in Psychology*, 9, 2239. https://doi.org/10.3389/fpsyg.2018.02239.

Kuss, D. J. (2013). Internet gaming addiction: Current perspectives. *Psychology Research and Behavior Management*, 6, 125–137. https://doi.org/10.2147/PRBM.S39476.

Kuss, D. J., & Griffiths, M. D. (2012). Internet gaming addiction: A systematic review of empirical research. *International Journal of Mental Health and Addiction*, 10(2), 278–296. https://doi.org/10.1007/s11469-011-9318-5.

Kuss, D., Griffiths, M., Karila, L., & Billieux, J. (2014). Internet addiction: A systematic review of epidemiological research for the last decade. *Current Pharmaceutical Design*, 20(25), 4026–4052. https://doi.org/10.2174/13816128113199990617.

Kuss, D. J., Van Rooij, A. J., Shorter, G. W., Griffiths, M. D., & Van de Mheen, D. (2013). Internet addiction in adolescents: Prevalence and risk factors. *Computers in Human Behavior*, 29, 1987–1996. https://doi:10.1016/j.chb.2013.04.002.

Lee, S., Lee, H. K., & Choo, H. (2017). Typology of Internet gaming disorder and its clinical implications. *Psychiatry and Clinical Neurosciences*, 71, 479–491. https://doi.org/10.1111/pcn.12457.

Li, H., Zou, Y., Wang, J., & Yang, X. (2016). Role of stressful life events, avoidant coping styles, and neuroticism in online game addiction among college students: A moderated mediation model. *Frontiers in Psychology*, 7, 1794. https://doi.org/10.3389/fpsyg.2016.01794.

Lopez-Fernandez, O., Williams, A. J., & Kuss, D. J. (2019). Measuring Female gaming: Gamer profile, predictors, prevalence, and characteristics from psychological and gender perspectives. *Frontiers in Psychology*, 10. https://doi.org/10.3389/fpsyg.2019.00898.

Macur, M., & Pontes, H. M. (2021). Internet gaming disorder in adolescence: Investigating profiles and associated risk factors. *BMC Public Health*, 21, 1547. https://doi.org/10.1186/s12889-021-11394-4.

Mallorquí-Bagué, N., Fernández-Aranda, F., Lozano-Madrid, M., Granero, R., Mestre-Bach, G., Baño, M., … Jiménez-Murcia, S. (2017). Internet gaming disorder and online gambling disorder: Clinical and personality correlates. *Journal of Behavioral Addictions*, 6(4), 669–677. https://doi.org/10.1556/2006.6.2017.078.

Meng, Y., Shi, X., Cai, D., Ran, M., Ye, A., & Qiu, C. (2024). Prevalence, predictive factors, and impacts of internet gaming disorder among adolescents: A population-based longitudinal

study. *Journal of Affective Disorders*, *362*, 356–362. https://doi.org/10.1016/j.jad.2024.06.020.

Mihara, S., & Higuchi, S. (2017). Cross-sectional and longitudinal epidemiological studies of internet gaming disorder: A systematic review of the literature. *Psychiatry and Clinical Neurosciences*, *71*(7), 425–444. https://doi.org/10.1111/pcn.12532.

Montag, C., Flierl, M., Markett, S., Walter, N., Jurkiewicz, M., & Reuter, M. (2012). Internet addiction and personality in first-person-shooter video gamers. *Journal of Media Psychology*. https://doi.org/10.1027/1864-1105/a000049.

Pallesen, S., Lorvik, I. M., Bu, E. H., & Molde, H. (2015). An exploratory study investigating the effects of a treatment manual for video game addiction. *Psychological Reports*, *117*, 490–495. https://doi.org/10.2466/02.PR0.117c14z9.

Petry, N. M., Rehbein, F., Gentile, D. A., Lemmens, J. S., Rumpf, H.-J., Mößle, T., … O'Brien, C. P. (2014). An international consensus for assessing internet gaming disorder using the new DSM-5 approach. *Addiction*, *109*(9), 1399–1406. https://doi.org/10.1111/add.12457.

Rehbein, F., & Baier, D. (2013). Family-, media-, and school-related risk factors of video game addiction. *Journal of Media Psychology*, *25*(3), 118–128. https://doi.org/10.1027/1864-1105/a000093.

Ropovik, I., Martončik, M., Babinčák, P., Baník, G., Vargová, L., & Adamkovič, M. (2023). Risk and protective factors for (internet) gaming disorder: A meta-analysis of pre-COVID studies. *Addictive Behaviors*, *139*, e-107590. https://doi.org/10.1016/j.addbeh.2022.107590.

Şalvarlı, Ş. İ., & Griffiths, M. D. (2021). Internet gaming disorder and its associated personality traits: A systematic review using PRISMA guidelines. *International Journal of Mental Health and Addiction*, *19*(5), 1420–1442. https://doi.org/10.1007/s11469-019-00081-6.

Schimmenti, A., Infanti, A., Badoud, D., Laloyaux, J., & Billieux, J. (2017). Schizotypal personality traits and problematic use of massively-multiplayer online role-playing games (MMORPGs). *Computers in Human Behavior*, *74*, 286–293. https://doi.org/10.1016/j.chb.2017.04.048.

Sharma, R., & Weinstein, A. M. (2024). Recent treatment and novel imaging studies evaluating treatment of internet gaming disorder: A narrative review. *Frontiers in Psychiatry*, *15*, 1408560. https://doi.org/10.3389/fpsyt.2024.1408560.

Shi, L., Wang, Y., Yu, H., Wilson, A., Cook, S., Duan, Z., … Chen, R. (2020). The relationship between childhood trauma and internet gaming disorder among college students: A structural equation model. *Journal of Behavioral Addictions*, *9*(1), 175–180. https://doi.org/10.1556/2006.2020.00002.

StataCorp. (2023). *Stata statistical software: Release 18*. Stata Press Publication. (StataCorp LLC.

Stavropoulos, V., Kuss, D. J., Griffiths, M. D., Wilson, P., & Motti-Stefanidi, F. (2017). MMORPG gaming and hostility

predict Internet Addiction symptoms in adolescents: An empirical multilevel longitudinal study. *Addictive Behaviors*, *64*, 294–300. https://doi.org/10.1016/j.addbeh.2015.09.001.

Stevens, M., Dorstyn, D., Delfabbro, P. H., & King, D. L. (2021). Global prevalence of gaming disorder: A systematic review and meta-analysis. *Australian & New Zealand Journal of Psychiatry*, *55*(6), 553–568. https://doi.org/10.1177/0004867420962851.

Stevens, M., King, D. L., Dorstyn, D., & Delfabbro, P. H. (2019). Cognitive–behavioral therapy for internet gaming disorder: A systematic review and meta-analysis. *Clinical Psychology & Psychotherapy*, *26*(2), 191–203. https://doi.org/10.1002/cpp.2341.

Sugaya, N., Shirasaka, T., Takahashi, K., & Kanda, H. (2019). Bio-psychosocial factors of children and adolescents with internet gaming disorder: A systematic review. *BioPsychoSocial Medicine*, *13*(1), 3. https://doi.org/10.1186/s13030-019-0144-5.

Van Deursen, A. J. A. M., Bolle, C. L., Hegner, S. M., & Kommers, P. A. M. (2015). Modeling habitual and addictive smartphone behavior. *Computers in Human Behavior*, *45*, 411–420. https://doi.org/10.1016/j.chb.2014.12.039.

Wang, C. W., Ho, R. T., Chan, C. L., & Tse, S. (2015). Exploring personality characteristics of Chinese adolescents with internet-related addictive behaviors: Trait differences for gaming addiction and social networking addiction. *Addictive Behaviors*, *42*, 32–35. https://doi.org/10.1016/j.addbeh.2014.10.039.

Wang, Y., Liu, M., & Nogueira, O. C. B. L. (2023). Prevalence and risk factors of internet gaming disorder under the COVID-19 pandemic among university students in Macao. *SAGE Open Nursing*, *9*. https://doi.org/10.1177/23779608231158158.

Winkler, A., Dörsing, B., Rief, W., Shen, Y., & Glombiewski, J. A. (2013). Treatment of internet addiction: A meta-analysis. *Clinical Psychology Review*, *33*(2), 317–329. https://doi.org/10.1016/j.cpr.2012.12.005.

Young, K. S., & Brand, M. (2017). Merging theoretical models and therapy approaches in the context of internet gaming disorder: A personal perspective. *Frontiers in Psychology*, *8*. https://doi.org/10.3389/fpsyg.2017.01853.

Zajac, K., Ginley, M. K., & Chang, R. (2020). Treatments of internet gaming disorder: A systematic review of the evidence. *Expert Review of Neurotherapeutics*, *20*(1), 85–93. https://doi.org/10.1080/14737175.2020.1671824.

Zajac, K., Ginley, M. K., Chang, R., & Petry, N. M. (2017). Treatments for internet gaming disorder and internet addiction: A systematic review. *Psychology of Addictive Behaviors*, *31*, 979–994. https://doi.org/10.1037/adb0000315.

Zajac, K., Ginley, M. K., Kelly, L. M., Flori, J. N., & Pfund, R. A. (2024). Tackling internet gaming disorder: What are the challenges in its treatment? *Expert Review of Neurotherapeutics*, *24*(6), 545–547. https://doi.org/10.1080/14737175.2024.2349819.