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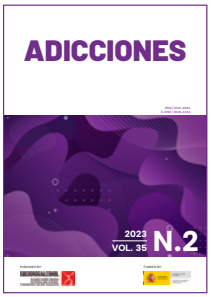

ORIGINAL

Personality traits and psychopathology in adolescents with videogame addiction

Rasgos de personalidad y psicopatología en adolescentes con adicción a videojuegos

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Abstract

Gaming disorder (GD) was recently included in the 11th edition of the International Classification of Diseases. A cross-sectional study was conducted in five secondary schools, with a final sample of 119 students. A diagnosis of GD was made in 6.4% (n = 23) of this sample. Compared with healthy subjects, adolescents with GD showed low levels of conscientiousness (F = 7.82; p = .001) and agreeableness (F = 3.31; p = .041) and scored higher in school maladjustment (SMC; F = 9.23; p < .001). Two discriminating functions were obtained that allowed us to predict patient group allocation with a success rate of 60.5% (Z_1 = 0.406 × Sex + 0.560 × Conscientiousness − 0.677 × SMC; Z_2 = 0.915 × Sex + 0.191 × Conscientiousness + 0.326 × SMC). Subjects with addiction differed from healthy subjects in presenting school maladjustment and low consciousness, while both groups of subjects with addiction differed in that video game addiction was proportionally higher in boys. The probability of GD was higher if subjects were male (OR [95% CI]) = 4.82 [1.17-19.81]; p = .029) and had school maladjustment (OR [95% CI] = 1.08 [1-1.17]; p = .047); while that of substance use disorder was higher if the subjects had neuroticism (OR [95% CI] = 1.07 [1-1.14]; p < .040), clinical maladjustment (OR [95% CI] = 1.10 [1.01-1.20]; p = .020), school maladjustment (OR [95% CI] = 1.06 [1-1.13]; p = .048), low personal adjustment (OR [95% CI] = 0.94 [0.88-0.99]; p = .047) and emotional symptoms (OR [95% CI] = 0.86 [0.78-0.96]; p = .006).

Key words: Internet gaming disorder (IGD), gaming disorder (GD), substance use disorder, personality, conscientiousness

Resumen

El trastorno por uso de videojuegos se incluyó recientemente en la 11ª edición de la Clasificación Internacional de Enfermedades. Se realizó un estudio transversal en cinco institutos, con una muestra final de 119 alumnos. El 6,4% (n = 23) de los sujetos tenía trastorno por uso de videojuegos. Los adolescentes con trastorno por uso de videojuegos mostraron bajos niveles de consciencia (F = 7,82; p = ,001) y amabilidad (F = 3,31; p = ,041); y puntuaron más alto en inadaptación escolar (SMC; F = 9,230; p < ,001) que los sanos. Obtuvimos dos funciones discriminantes que clasificaban correctamente al 60,5% (Z1 = 0,406 × Sexo + 0,560 × Conciencia - 0,677 × SMC; Z2 = 0,915 × Sexo + 0,191 × Conciencia + 0,326 × SMC). Los sujetos con adicción se diferenciaban de los sanos en presentar inadaptación escolar y baja conciencia, mientras que ambos grupos con adicción se diferenciaban en que los alumnos con adicción a videojuegos eran en mayor proporción varones. La probabilidad de trastorno por uso de videojuegos aumentaba si el sujeto era varón (OR [CI 95%] = 4,82 (1,17-19,81); p = ,029) con inadaptación escolar (OR [IC 95%] = 1,08 (1-1,17); p = ,047); mientras que el trastorno por uso de sustancias aumentaba si el sujeto presentaba neuroticismo (OR [IC 95%] =1,07 [1-1,14]; p < ,040), desajuste clínico (OR [IC 95%] = 1,10 [1,01-1,20]; p = ,020), inadaptación escolar (OR [IC 95%] = 1,06 [1-1,13]; p = ,048), bajo ajuste personal (OR [IC 95%] = 0,94 [0,88-0,99]; p = ,047) y síntomas emocionales (OR [IC 95%] = 0,86 [0,78-0,96]; p = ,006).

Palabras clave: trastorno por uso de videojuegos predominantemente en línea, trastorno por uso de videojuegos, trastorno por uso de sustancias, personalidad, consciencia

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Video games use is an increasingly present behaviour in our society; it is the primary audiovisual leisure option in Spain both in domestic settings through consoles (26%) or PCs (21%) and via mobile phones or devices (21%). Indeed, playing videogames has become one of the most valued entertainment options for approximately 2.34 billion people (*Asociación Española de Videojuegos* –AEVI–, 2017; Statista, 2020). In 2018, there was a 6.2% increase in videogame players, with 59% being male and 41% female. Regarding the frequency of play, 77.4% played every week, and Spanish youth spend an average of 6.2 hours/week playing videogames, with the majority being adolescents or pre-adolescents (AEVI, 2017).

This increase has meant that criteria for detecting video game addiction have also been established. Following the inclusion of Internet Gaming Disorder (IGD) as a condition for further study in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association –APA–, 2013), Gaming Disorder (GD) was recently included as a formal diagnosis in the 11th edition of the International Classification of Diseases (ICD-11) (World Health Organization –WHO–, 2018). The ICD refers to both offline and online games and draws a distinction between GD and hazardous gaming (Throuvala, Janikian, Griffiths, Rennoldson & Kuss, 2019). The ICD-11 criteria include (1) impaired control over gaming (e.g., onset, frequency, intensity, duration, termination, and context); (2) increasing priority given to gaming to the extent that gaming takes precedence over other life interests and daily activities; and (3) continuation or escalation of gaming despite the occurrence of negative consequences. The behaviour pattern required for a GD diagnosis must be sufficiently severe to result in significant impairment to personal, family, social, educational, occupational, or other important areas of function (WHO, 2018). Since IGD is not a formal diagnosis, here we will refer indistinctly to IGD and GD in reference to gaming addiction.

The aetiology of IGD is not well understood, perhaps because it is currently impossible to clearly demarcate pathological from non-pathological behaviours (Costa & Kuss, 2019). The development of problematic gaming behaviour is complex because, unlike substance addictions, gaming has some benefits, including spatial skill improvements, and enhanced creativity and problem-solving skills (Chung, Sum & Chan, 2018; Granic, Lobel & Engels, 2014). Although the risk factors for problematic videogaming have been difficult to establish, male sex, psychopathological conditions, impulsivity, gaming time and certain online gaming subtypes are deemed possible candidates (Buiza-Aguado, Alonso-Canovas, Conde-Mateos, Buiza-Navarrete & Gentile, 2018; Gentile et al., 2017). Several studies indicate that sex seems to be a robust predictor of IGD because males are more likely to engage in video game use and to be categorised as problematic gamers than females (Bouna-Pyrrou et al., 2018; Dong et al., 2018; Krossbakken et al., 2018). In fact, gendered motivations for higher levels of game play have been identified, suggesting different interventions for boys and girls may be required to create a balanced approach to video gaming (Brooks, Chester, Smeeton & Spencer, 2016).

The influence of age on IGD is also unclear, but the prevalence is highest among adolescents (Paulus, Ohmann, Von Gontard & Popow, 2018). Even though adolescents seem to be more vulnerable to IGD (Fam, 2018), the prevalence estimates reported for this population widely varies from 0.7% to 15.6%, depending on the measurement method, age, and geographical area considered. One recent study estimated the prevalence of IGD at 1%–10% in western countries (Chung et al., 2018; Saunders et al., 2017) and the prevalence of IGD in a sample of 708 Spanish adolescents was reported as 8.3% (Buiza-Aguado et al., 2018), with others finding similar rates at around 6.1% (Chamarro et al., 2014) and 8.2% (Porter, Starcevic, Berle & Fenech, 2010).

The Interaction of Person-Affect-Cognition-Execution (I-PACE) and Compensatory Internet Use (CIU) are two of the most influential models in gaming studies. The I-PACE (Brand, Young, Laier, Wölfling & Potenza, 2016) provides an integrative theoretical framework concerning internet-related disorders and posits that the core characteristics of individuals, including personality, biopsychological constitution, social cognitions, and psychopathology, constitute the aetiological factors involved in the development, maintenance, and relapse of IGD (Kircaburun, Griffiths & Billieux, 2019). Similarly, Paulus et al. (2018) suggested that developing IGD requires several interacting internal factors such as deficient self, mood, and reward regulation, decision-making problems, and external factors including deficient family background and social skills. The CIU model proposes that addictive internet use can compensate unmet needs (e.g., achievement, social affiliation, etc.) or help cope with psychological suffering in, for example, depressive, anxious, and traumatised individuals (Kircaburun et al., 2019). Both models also hypothesise personality characteristics are predisposing factors, with the I-PACE suggesting that interactions between potentially predisposing personality factors, use expectancies, and dysfunctional coping styles could be one of several important processes that facilitate the development of GD (Laier, Wegmann & Brand, 2018).

Concerning the Big Five model of personality traits, authors agree that neuroticism is positively associated with IGD and there is a negative association between GD and extraversion and conscientiousness (Borzikowsky & Bernhardt, 2018; Bouna-Pyrrou et al., 2018; Laier et al., 2018). The few studies that have explored the association

of the Big Five traits and GD in adolescents, consistently associate low conscientiousness with IGD. However, and with regard to other dimensions (extraversion, neuroticism, agreeableness, openness), the results are less conclusive (López-Fernández, Mezquita, Griffiths, Ortet & Ibáñez, 2020). Other personality traits have been related with IGD, especially impulsivity (Bouna-Pyrrou et al., 2018), lower self-control/self-regulation, sensation seeking, lower social competence and empathy (Estévez, Jauregui & López-González, 2019), lower responsibility (González-Bueso et al., 2018a), inclination towards boredom, risky behaviour (Paulus et al., 2018), and hostility and enhanced levels of aggression (Estévez et al., 2019; Kuss, 2013; Paulus et al., 2018). IGD has also been related with low self-esteem, alexithymia, emotional regulation dysfunctions (Bonnaire & Baptista, 2019), and psychoticism (González-Bueso et al., 2018a). In contrast, perseverance/grit (Borzikowsky et al., 2018), psychological resilience (Canale et al., 2019), positive reappraisal (Kökönyei et al., 2019), responsibility, reward dependence, complacency, and self-directedness (Brand et al., 2016; González-Bueso et al., 2018a), may also be protective factors according to different studies.

GD is thought to be a progressive behaviour with a chronic course that may lead to significant social, physical, and mental health problems. Although some studies have shown the positive impact of moderate videogames use, some individuals use gaming in a dysfunctional way and this behaviour becomes disruptive, thus potentially meeting the criteria for addiction (Throuvala et al., 2019). Decades of research have shown that some adolescents who engage in persistent gaming can experience mild to serious negative effects on their psychological wellbeing (King & Potenza, 2019) at the cognitive, psychological, and emotional levels (Throuvala et al., 2019). Lehenbauer-Baum et al. (2015) reported higher levels of psychopathology in addictive gamers than in healthy controls. In addition, people diagnosed with GD tend to experience depression, anxiety, social anxiety, and hostility (Király et al., 2015), with depression being the most common symptom. Indeed, addicts scored higher on the Beck Depression Inventory and Social Phobia Inventory and were less agreeable, thorough, or emotionally stable, with the intensity of anger, guilt, anxiety, and envy felt by addicted players being more severe than controls (Naskar, Victor, Nath & Sengupta, 2016).

While GD is common in attention-deficit hyperactive disorder (ADHD) (Bhat, Prakash & Srivastava, 2019), the connection between ADHD and videogames is inconclusive, with some authors finding no association between gaming and ADHD (Lobel, Engels, Stone, Burk & Granic, 2017). Regarding its social impact, some reported side effects are social isolation, cessation of hobbies or external activities, family conflicts, and difficulties in interpersonal relationships (Chung et al., 2018). There is increased public awareness that GD is a severe disorder with negative consequences such as failing school and family and relationship problems (Borzikowsky et al., 2018), and many authors agree that there is a strong association between problematic gaming and poor academic performance (Chung et al., 2018; Lobel et al., 2017; Naskar et al., 2016). Only a study showed an indirect association between strategic video game play and higher academic grades, opening to the possibility that certain subtypes of videogames could have a positive impact on academic performance (Adachi & Willoughby, 2013).

Compared to other addictions, GD shows identical neural mechanisms to substance use disorders (SUDs) and many other behavioural addictions such as pathological gambling (Bhat et al., 2019). Although these are two different types of addictions, they frequently coexist because they both involve the same or similar biological mechanisms (Kuss, Pontes & Griffiths, 2018). In addition, problematic videogaming shares a common psychopathological basis with other addictions, including attention bias, low inhibitory control, and impulsivity, and psychopathological features such as depression, low self-esteem, and isolation (Buiza-Aguado et al., 2018). Symptoms in patients with GD resemble addiction-specific phenomena comparable with those seen in SUDs, including cravings and withdrawal symptoms such as unpleasant feeling and tolerance states (Kim et al., 2017). Moreover, like other addictive behaviours, GD has been associated with many dysfunctional personality traits. In fact, neuroticism might represent a general health risk factor which predisposes individuals to addiction; higher neuroticism scores are connected with GD and with the tendency to feel anxious, depressed, and guilty (Bouna-Pyrrou et al., 2018).

Although there is no consensus regarding all the personality traits involved in GD, several studies have analysed the weight of personality in the development of GD, as well as its relationship with SUDs or other factors such as interpersonal relationships, family dynamics, or emotional regulation strategies. However, very few empirical studies have examined the relationship between personality and psychopathology in GD and the involvement of these variables in GD and SUDs has never been clearly established. In this study we aimed to (1) identify the personality traits involved in the development of GD in an adolescent population; (2) understand the difference between the personality traits of adolescents with SUD and GD; (3) clarify the relationship between GD, psychopathology, and academic performance; and (4) establish the scientific basis for developing addiction prevention programs for certain personality types in the adolescent population.

We suggest the following empirical hypotheses: (1) Certain personality traits predispose to addictive behaviours in general, being low conscientiousness a risk

factor for developing GD; (2) Psychopathology such as anxiety, depression and social anxiety is found in subjects with GD; (3) GD is related to school maladjustment and poor academic performance.

Method

Design

This was an observational, cross-sectional study with descriptive and analytical components.

Participants

The initial sample comprised 397 students in the third or fourth year of compulsory secondary education, from four private or concerted schools, or one public secondary school in the province of Castellón. These educational centres were selected by intentional sampling, according to availability and geographical location. We used G*Power software (version 3.1) to calculate that a minimum sample size of N = 111 would be required to perform an ANOVA with three groups, a 95% confidence level at a power of 80% and with a 0.30 effect size.

We selected the participants with a video game addiction (score exceeding the CERV and GASA cutoff; n = 23) or with a substance addiction (above the threshold in at least two of the CRAFFT, POSIT, and AUDIT questionnaires; n = 37). Any participants who scored above the cut-off in only one of the substance or video games questionnaires were excluded because, although they could not be considered healthy, a single questionnaire is insufficient for an adequate diagnosis. We also excluded those with addictions to both substances and video games. Of the remaining healthy participants (who scored below the cut-off on all the questionnaires), 59 were randomly selected in order to obtain a final sample of 119 students. A flowchart of sampling can be seen in figure 1.

Measurement instruments

The Questionnaire of Experiences Associated with Video games (CERV) scale assesses the problematic use of non-massive video games. It comprises 17 items on concern, denial, increased tolerance, negative effects, reduced activities, loss of control, evasion, and desire to play. The cut-off was ≥ 26, considering scores between 26 and 38 a potential problem and scores between 39 and 68 a severe problem. The Cronbach's alpha coefficients for the subscales are: 0.869 for negative consequences and 0.861 for dependence and evasion, with the total Cronbach's alpha of 0.912 (Chamarro et al., 2014). Cronbach's alpha in the sample was 0.95.

The Game Addiction Scale for Adolescents (GASA), assesses video game addiction and consists of 7 items corresponding to 7 dimensions (salience, tolerance, emotion, relapse, abstinence, conflict, and problems), which are grouped into a higher order factor: addiction. The items are scored dichotomously and the positive items are then summed; the cut-off was ≥ 4. The reliability of the Spanish adaptation is Cronbach's alpha of 0.81 (Lloret, Morell, Marzo & Tirado, 2018), a value that exceeds the criterion of 0.70 and is consistent with those published by the original authors (Lemmens, Valkenburg & Peter, 2009), who obtain high reliability, both on the 21-item scale (first sample, a Cronbach's alpha of 0.94 and, second sample, a Cronbach's alpha of 0.92), and on the 7-item scale (first sample, a Cronbach's alpha of 0.86 and, second sample, a Cronbach's alpha of 0.81) (Lloret et al., 2018). Cronbach's alpha in the sample was 0.92.

Abuse Screening Test (CRAFFT), is a tool designed for use with adolescents to screen the risky consumption of alcohol and other substances; it comprises 6 dichotomous items (yes/no) and the cut-off was ≥ 2 positive items. The level of internal consistency obtained in the Spanish psychometric validation was 0.74, a level similar to that obtained in the original validation study by Knight, Sherritt, Shrier, Harris & Chang (2002), where an internal consistency of 0.72 was obtained. In the mentioned study, the sensitivity was 92% and the specificity was 82%, having obtained in the Spanish version a sensitivity of 74.4% and a specificity of 96.4% (Rial et al., 2019). Cronbach's alpha in the sample was 0.91.

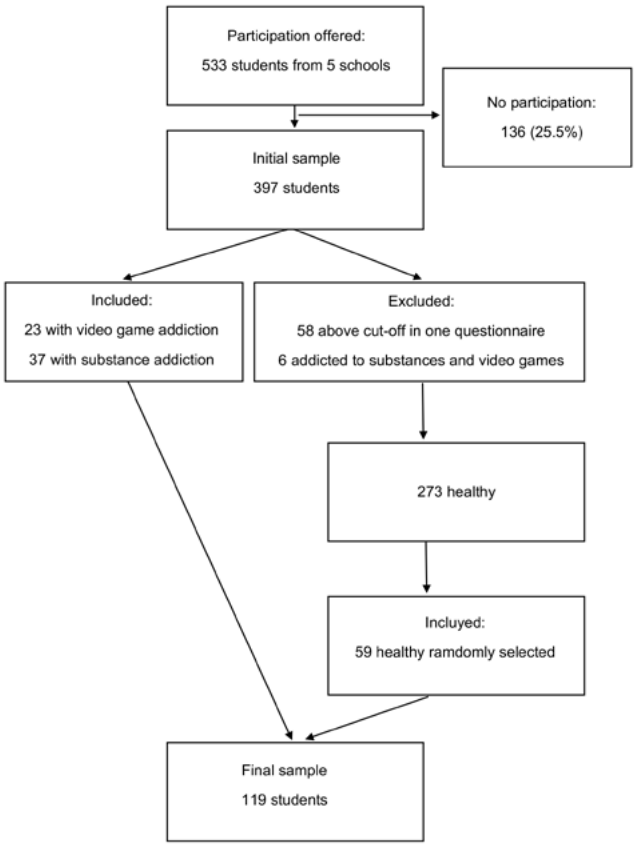

Figure 1. **Flowchart of the sampling.**

The Problem Oriented Screening Instrument for Teenagers (POSIT), is a common, internationally used instrument for screening for the risky consumption of alcohol and other drugs in adolescents and also consists of 17 dichotomous items (yes/no) and has a cut-off of ≥ 2 positive items. This instrument shows good psychometric behaviour in the Spanish version, showing high internal consistency (Cronbach's alpha 0.82) and high sensitivity (94.3%) and specificity (83.9%) values (Araujo, Golpe, Braña, Varela & Rial, 2018). In relation to the data found in other studies, the internal consistency of the scales measured by Cronbach's alpha varied in the test tests from 0.40 to 0.79 and in the retest from 0.45 to 0.87 (Knight, Goodman, Pulerwitz & Durant, 2001). Regarding the sensitivity and specificity indices, the data provided indicate values of 95% and 79%, respectively (Latimer, Winters & Stinchfield, 1997). Cronbach's alpha in the sample was 0.84.

Finally, the Alcohol Use Disorders Identification Test (AUDIT), is a screening test developed in collaboration with the World Health Organization that is used to determine excessive alcohol consumption; it comprises 10 questions and is scored out of a total of 40 points; total scores ≥ 8 in men and ≥ 6 in women indicate risky and harmful consumption as well as possible alcohol dependence (Babor, Higgings-Biddle, Saunders & Monteiro, 2000). The internal consistency would be between 0.75 and 0.94. The internal consistency indices are generally at 0.80 (Allen, Litten, Fertig & Babor, 1997). It has a sensitivity of 57-59% and a specificity of 91-96% (Álvarez, Gallego, Latorre & Bermejo, 2001). Cronbach's alpha in the sample was 0.84.

The "Big Five" personality questionnaire for children and adolescents (BFQ-NA), is an adaptation of the Big Five personality model (Barbaranelli et al., 2013); it consists of 65 items and the five dimensions evaluated are (a) Conscientiousness: autonomy, order, precision, perseverance, and compliance with regulations and commitments; (b) Openness: including elements of some intellectual factors, creativity, and cultural interests; (c) Extraversion: sociability, activity, enthusiasm, assertiveness, and self-confidence; (d) Agreeableness: the tendency to provide support and to be pro-social, as well as the degree of cooperation and sensitivity towards others and their needs; and (e) Neuroticism: the tendency towards being neurotic and ill at ease, manifested as mood swings, anxiety, depression, discontent, and irritability. Cronbach's alpha in its original version varies between 0.74 and 0.90 for each of the factors (Caprara & Zimbardo, 1996). Del Barrio, Carrasco & Holgado-Tello (2006), obtained adequate reliability (Cronbach's alpha between 0.78 and 0.88; test-retest between 0.62 and 0.84). The consistency by subscales was: alpha consciousness of 0.87, agreeableness 0.82, emotional instability 0.83, extraversion 0.76, openness 0.75 and, finally, internal consistency for the total of the scale 0.86 (Soto et al., 2011). Cronbach's alpha in the sample was 0.60.

The Behaviour Assessment System for Children (BASC), questionnaire is another system for assessing behaviour in children and adolescents (Reynolds & Kamphaus, 2004) which contains five components that can be used together or individually: here we used the self-report (S3) and a questionnaire for parents (P3). The internal consistency of the global dimensions varies from 0.76 to 0.96, with an average value of 0.91 (Reynolds & Kamphaus, 2004). Cronbach's alpha in the sample for S3 was 0.69 and for P3 0.84. The BASC is multidimensional because it measures numerous aspects of behaviour and personality, including both adaptive and maladaptive (pathological) dimensions. The S3 provides data from clinical scales and four global dimensions: School Maladjustment (SMC), Clinical Maladjustment (CMC), Personal Adjustment (PAC), and the Emotional Symptoms Index (ESI). SMC measures the attitude towards school and teachers as well as sensation seeking; high scores are related to psychopathology, risk of truancy, and tendency to engage in new or risky behaviours. CMC measures atypicality, locus of control, anxiety, and somatisation; high scores are associated with emotional distress, feelings of helplessness or a lack of motivation, anxiety, and even psychotic symptoms. PAC measures the Relations with Parents, Interpersonal Relations, Self-Esteem, and Self-Reliance scales. The ESI is a self-reported global indicator of serious emotional disturbance, particularly internalised disorders; it composes four scales from the Internalising Problems composite (Social Stress, Anxiety, Depression, and Sense of Inadequacy) and two scales from the PAC (Self-Esteem and Self-Reliance). The P3 assessment questionnaires measure maladaptive behaviours. Finally, as a global dimension, the BASC allowed us to calculate four values: Externalising problems, Internalising problems, Adaptive skills, and an Index of behavioural symptoms.

Procedure

In order to access the sample of interest, we contacted the management teams at the five educational centres and explained with a personal appointment the purpose of the study to them. A letter was then sent to all the parents of the students in third or fourth year of compulsory secondary education at these centres requesting their authorisation for the participation of their children in this study. The tests were administered to the students by two independent psychologists from our educational team from October to December 2018 over two consecutive days for one and a half hours during class sessions specifically planned for this purpose. The participants' parents received their questionnaires by postal mail and returned the completed surveys back to us via their respective schools. Neither the families nor the adolescents received any kind of retribution for their collaboration.

Statistical analysis

We used SPSS software (v21, IBM Corp., Armonk, NY) to analyse the relationships between the variables studied. We compared sociodemographic characteristics between included and not included subjects using t test for quantitative variables and chi squared for categorical variables. Results were considered significant when $p < .05$. We compared the studied groups using chi squared tests for categorical variables. We calculated the correlations between the personality and psychopathological variables and the addiction screening scales. Because some quantitative variables were correlated, we performed multivariate analysis of variance (MANOVA) using as independent variable the diagnostic group (substance addiction, video game addiction or healthy) and as dependent variables age, repeated courses, BFQ's Conscientiousness, Openness, Extraversion, Agreeableness, and Neuroticism; and BASC's Clinical Maladjustment, School Maladjustment, Personal Adjustment, Total Emotional Symptoms Index, Exteriorising Problems, Interiorising Problems, Adaptative Skills, and Total Behavioural Symptoms Index. We used the Bonferroni correction. We specified these differences using one-way ANOVA and as post-hoc tests Tukey when the variances were homogeneous and Games-Howell when they were not. The effect size (ES) as the partial eta squared and the observed power (1-β) were calculated. Using the variables in which significant differences were found in ANOVA and chi squared, by discriminant analysis, we obtained two equations that allowed us to predict the participant categorisations. Finally, using the variables in which significant differences were found in the ANOVA and chi squared, we employed logistic multinomial regression to obtain variables that would allow us to predict group categorisation. Each variable was controlled by all the others included in the analysis.

Ethical aspects

The principles of the Declaration of Helsinki and the Convention of the Council of Europe (World Medical Association, 2013) were always met. The confidentiality of the participants and their data was guaranteed according to the General Data Protection Regulation (GDPR) law of May 2016 (European Parliament and Council, 2016). The students and guardians included in this study signed their informed consent prior to participation. The overall study protocol was authorised by the Ministry of Education, Research, Culture, and Sport (CN00A/2018/25/S), the ethics committee at the Cardenal Herrera-CEU University (CEI18/112), and by the Research commission of the Castellón Provincial Hospital (3-16/12/19).

Results

In the initial sample (N = 397), 46.9% (n = 168) were healthy, 9.3% (n = 37) had a substance addiction, 6.4% (n = 23) had a video game addiction, 34.6% (n = 124) scored above the cut off for at least one addiction questionnaire, and 1.6% (n = 6) had an addiction both to substances and video games. In the final sample (n = 119), 49.6% (n = 59) were healthy, 31.1% (n = 37) had a substance addiction, and 19.3% (n = 23) had a video game addiction. Table 1 shows the comparison between the subjects included and not in the final sample. There are not differences in age, sex, and repeated courses, but the subjects included lived in greater proportion only with father or mother and less with both.

Table 1. ***Sociodemographic characteristics and comparisons between subjects included (n = 119) and not included (n = 278) in the study.***

VARIABLE		INCLUDED (N = 119) $\bar{X}$/N SE/%	NOT INCLUDED (N = 278) $\bar{X}$/N SE/%	t/χ^2 p
AGE		14.85 0.79	14.80 0.71	.624 .533
SEX	Men	48 40.3	122 44	.467 .494
	Women	71 59.7	155 56	
COEXISTENCE**	Both Parents	68 65.4	202 82.4	12.167 .002
	Only father or mother	33 31.7	39 15.9	
	Other relatives	3 2.9	4 1.6	
REPEATED COURSES		0.33 0.62	0.22 0.53	1.485 .139

Note. $^{**}p < .001$.

Table 2 shows the correlations between the personality and psychopathological variables and the addiction screening scales in the final sample. MANOVA reported that there were differences between the groups in the variables studied (F = 1.907; p = .007; ES: 0.287; $(1-\beta)$ = 0.995). Table 3 shows the mean scores of the final sample as well as the scores separated by groups and the comparations between groups by ANOVA. With respect to substance abuse group, healthy subjects scored higher in Conscientiousness (p = .005), and Openness (p = .015); and scored less in Neuroticism (p = .006), Clinical Maladjustment (p = .008), and School Maladjustment (p < .001). With respect to video game addiction group, healthy subjects scored higher in Conscientiousness (p = .005), and Agreeableness (p = .045); and scored less in School Maladjustment (p = .027). Post-hoc tests did not reach significance in Personal Adjustment and Total Emotional Symptoms Index. No significant differences were identified between the video game and substance addiction groups. By chi squared, there were more boys than girls in the

Table 2. *Correlations between the personality and psychopathological variables and the addiction screening scales.*

	CRAFFT r *p*	POSIT r *p*	AUDIT r *p*	CERV r *p*	GASA r *p*
CONSCIENTIOUSNESS	-0.211 0.022*	-0.263 0.004**	-0.158 0.187	-0.165 0.073	-0.154 0.098
OPENNESS	-0.084 0.366	-0.174 0.059	-0.129 0.285	-0.046 0.616	-0.072 0.441
EXTRAVERSION	0.001 0.990	-0.050 0.592	0.065 0.591	-0.059 0.526	-0.049 0.598
AGREEABLENESS	-0.107 0.247	-0.146 0.112	-0.061 0.612	-0.224 0.014*	-0.222 0.017*
NEUROTICISM	0.125 0.176	0.407 <0.001**	0.349 0.003**	0.083 0.367	0.076 0.420
CLINICAL MALADJUSTMENT	0.209 0.023*	0.471 <0.001**	0.446 <0.001**	0.099 0.287	0.098 0.299
SCHOOL MALADJUSTMENT	0.172 0.063	0.344 <0.001**	0.317 0.007**	0.159 0.086	0.173 0.065
PERSONAL ADJUSTMENT	-0.123 0.185	-0.169 0.068	-0.238 0.047*	-0.183 0.048*	-0.127 0.175
TOTAL EMOTIONAL SYMPTOMS INDEX	0.068 0.462	0.177 0.055	0.206 0.088	0.320 <0.001**	0.300 0.001**
EXTERIORISING PROBLEMS	0.163 0.103	0.156 0.120	0.309 0.018*	0.067 0.508	0.067 0.509
INTERIORISING PROBLEMS	0.068 0.498	0.185 0.063	0.154 0.243	-0.095 0.345	-0.061 0.546
ADAPTIVE SKILLS	-0.100 0.321	-0.146 0.144	-0.142 0.287	-0.057 0.574	-0.020 0.844
TOTAL BEHAVIOURAL SYMPTOMS INDEX	0.046 0.647	0.178 0.074	0.149 0.265	0.030 0.768	0.031 0.765

Note. *p < .01 *p < .05.

Table 3. *Average scores (n = 119) and comparisons between the groups.*

VARIABLE	OS	H	SA	VGA	F *p*	ES 1-β
AGE	14.85 0.79	14.88 0.87	15 0.66	14.56 0.72	0.830 0.440	0.019 0.188
REPEATED COURSES	0.33 0.62	0.42 0.10	0.31 0.09	0.13 0.09	1.438 0.243	0.033 0.300
CONSCIENTIOUSNESS**	52.07 1.69	56.23 1.51	48 8.90	47.95 1.01	7.826 0.001	0.157 0.945
OPENNESS*	53.90 1.31	56.67 1.76	5.32 8.19	52.56 1.55	4.283 0.017	0.093 0.732
EXTRAVERSiON	48.74 11.22	5.16 1.86	48 11.17	46.30 12.16	0.787 0.459	0.018 0.180
AGREEABLENESS*	5.29 9.96	52.91 1.51	49.05 8.83	45.56 8.31	3.316 0.041	0.073 0.614
NEUROTICISM**	53.72 11.98	49.15 1.70	6.32 1.79	54.82 12.09	5.049 0.008	0.107 0.805
CLINICAL MALADJUSTMENT**	52.14 11.41	47.72 9.23	58.10 12.01	53.69 11.01	4.989 0.009	0.106 0.800
SCHOOL MALADJUSTMENT**	51.47 11.29	46.55 9.76	57.21 1.80	54.65 1.49	9.230 <0.001	0.180 0.973
PERSONAL ADJUSTMENT*	45.20 12.75	49.01 11.63	41.40 12.32	41.69 13.77	3.340 0.040	0.074 0.617
TOTAL EMOTIONAL SYMPTOMS INDEX*	53.93 12.45	49.84 9.63	56.35 11.79	6.34 16.12	4.087 0.020	0.089 0.711
EXTERIORISING PROBLEMS	47.51 1.63	45.29 8.25	51 13.03	48.55 11.64	2.017 0.139	0.046 0.406
INTERIORISING PROBLEMS	48.59 12.03	47.42 8.41	52.27 14.13	46.31 16.17	1.259 0.289	0.029 0.267
ADAPTIVE SKILLS	52.20 1.84	53.74 9.74	5.03 12.61	51.11 1.81	1.023 0.364	0.024 0.223
TOTAL BEHAVIOURAL SYMPTOMS INDEX	47.56 11.82	45.61 1.77	5.48 13.18	48.72 12.09	1.078 0.345	0.025 0.233

Note. OS: Overall sample (*N*=119), H: Healthy, SA: Substance addiction, VGA: Video game addiction, ES: Effect size by partial Eta Squared, *p < .005, **p < .001.

group with an addiction to video games (χ^2= 7.87; p = .020). There were no differences in coexistence (χ^2= 5.816; p = .213).

We created two functions that could predict the group assignment of these students with an overall 60.5% success rate (healthy 81.4%, substance addiction 40.5%, and video game addiction 39.1%). These equations are:

Z1 = 0.406 x Sex + 0.560 x Conscientiousness - 0.677 x SMC

Z2 =0.915 x Sex + 0.191 x Conscientiousness + 0.326 x SMC

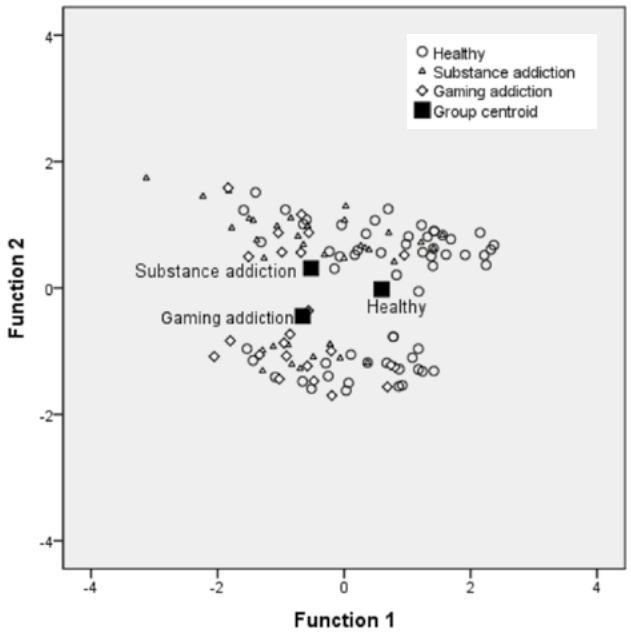

Figure 2. **Scatter diagram for the prediction of patient inclusion in the gaming addiction, substance addiction, or healthy groups by two discriminant functions including sex, conscientiousness, and school maladjustment.**

Figure 2 shows the scatter diagram for these discriminant functions. The first had an eigenvalue of 0.352 and explained 83.2%% of the variance and the second had an eigenvalue of 0.071 and explained 16.8% of the variance.

Finally, table 4 shows the result of multinomial logistic regression including the variables that were significative in the ANOVA. This model explains 47.4% (*pseudo R2* = 0.474) of the variance and correctly classifies 72% of the participants (healthy = 77.6%, substance addiction = 73%, and gaming addiction = 56.5%). The variables that predicted substance addiction were neuroticism (p = .040), clinical maladjustment (p = .020), school maladjustment (p = .048) and total emotional symptoms index (p = .006). The variables that predicted gaming disorders were being man (p = .029) and school maladjustment (p = .047).

Discussion

The main purpose of this study was to explore the relationship between IGD, personality, and psychopathology, as well as its delimitation as a new addiction diagnosis and its differences with substance addiction. This knowledge is crucial to positioning IGD as a behavioural addiction but also, given that SMC is associated with this disorder, to facilitate the development of IGD prevention programs.

Regarding personality, a positive association between IGD and neuroticism as well as a negative association between IGD and extraversion and conscientiousness (Borzikowsky et al., 2018; Bouna-Pyrrou et al., 2018; Laier et al., 2018) have been found. In fact, neuroticism and conscientiousness are not only associated with IGD, but also with a general propensity to develop addictive disorders (Dash et al., 2019). Along these lines, in the discriminant equations we found that healthy people differed from addicts in conscientiousness, according to studies finding that conscientiousness is a protective factor against addiction (Dash et al., 2019) and

Table 4. ***Multinomial logistic regression (Reference category: Healthy).***

	SUBSTANCE ADDICTION		VIDEO GAME ADDICTION	
VARIABLE	**OR (95% CI) *p***	**AUC (95% CI) *p***	**OR (95% CI) *p***	**AUC (95% CI) *p***
SEX: MAN	1.59 (0.48-5.28) 0.441		4.82 (1.17-19.81) 0.029*	0.34 (0.22-0.47) 0.024*
CONCIENTIOUSNESS	0.92 (0.83-1.02) 0.130		0.89 (0.79-1.00) 0.053	
OPENNESS	1.01 (0.92-1.11) 0.718		1.09 (0.99-1.21) 0.072	
AGREEABLENESS	1.03 (0.95-1.11) 0.431		0.97 (0.88-1.07) 0.606	
NEUROTICISM	1.07 (1.00-1.14) 0.040*	0.71 (0.62-0.81) <0.001**	0.98 (0.91-1.05) 0.688	
CLINICAL MALADJUSTMENT	1.10 (1.01-1.20) 0.020*	0.71 (0.62-0.82) <0.001**	0.95 (0.85-1.05) 0.352	
SCHOOL MALADJUSTMENT	1.06 (1.00-1.13) 0.048*	0.72 (0.63-0.81) <0.001**	1.08 (1.00-1.17) 0.047*	0.61 (0.49-0.74) 0.78
PERSONAL ADJUSTMENT	0.94 (0.88-0.99) 0.047*	0.34 (0.23-0.44) 0.006**	1.02 (0.92-1.13) 0.621	
TOTAL EMOTIONAL SYMPTOMS INDEX	0.86 (0.78-0.96) 0.006*	0.60 (0.49-0.71) 0.079	1.10 (0.98-1.24) 0.098	

Note. OR: Odds Ratio, AUC: Area Under the Curve, CI: Confidence Interval.

a negative association between IGD and conscientiousness (Vollmer, Randler, Horzum & Ayas, 2014). In terms of substance addiction, most studies only analysed a limited number of traits or focused on a single substance, making it difficult to integrate the body of evidence across traits or substances. However, low conscientiousness seems to be consistently associated with tobacco, marijuana, heroin, or cocaine use (Terracciano, Löckenhoff, Crum, Bienvenu & Costa, 2008).

In regression, neuroticism predicted addiction to substances, but not to video games. Our results show that neuroticism was a risk factor for substance addiction. Although neuroticism is a relevant personality trait in adult population, we found no association between neuroticism and IGD in line with previous studies done with adolescents. This might be because emotionality instability is less important in younger population with GD than in adults (López-Fernández et al., 2020). It could also be because the difference between healthy and addicted to substances in this variable is so considerable that it masks the possible difference between healthy and addicted to video games. In fact, the studies that find a relationship between neuroticism and conscientiousness and video game addiction directly compare with healthy ones, without including the comparison with substance addicts (Bouna-Pyrrou et al., 2018; Laier et al., 2018).

We found no significant association between IGD and extraversion. This might be because introverts usually prefer to engage in relationships that reduce face-to-face communication and feel more comfortable in the anonymity of the internet (Braun, Stopfer, Müller, Beutel & Egloff, 2016). Moreover, a wide range of videogame genres is now available, allowing some people to use gaming as a way to connect with their peers and strengthen their relationships. In fact, many games are designed for multiple players and encourage them to work together, supporting the hypothesis that cooperative gaming may promote prosocial behaviour (Lobel et al., 2017).

Focusing on psychopathology, compared to healthy controls, our results showed higher SMC scores for both substance addiction and IGD, with no significant differences between these addictions. While some authors propose that the use of new technologies and electronic media may be useful for creating positive social behaviour, to prevent violence, and enhance academic performance (Khatib et al., 2018), most authors have focused on the strong association between IGD and poor academic performance, including ignoring school homework and falling grades (Buiza-Aguado et al., 2018; Naskar et al., 2016; Singh, 2019). In fact, some authors propose that academic decline should be considered a screening tool or as a 'red flag' in clinical interviews for diagnosing IGD (Sussman, Harper, Stahl & Weigle, 2018). We showed a significant relationship between both addictions and high SMC scores; although we did not establish a direct relationship between IGD and school failure, we can affirm that a bad attitude towards school and teachers and SMC are related to IGD.

Our data also indicate that good personal adjustment was protective against substance addiction. In other words, self-confident individuals who felt satisfaction in their relationships with equals and families, were better able to deal with their emotions and cope with daily difficulties and were therefore more protected from developing an addiction.

Others have reported that IGD was associated with depression, anxiety, and social phobia (González Bueso et al., 2018a; Krossbakken et al., 2018). However, CMC and ESI scores in our work were related to addiction to substances but not to video games. Once again, the difference between healthy and addicted to substances could mask the difference with addicted to video games. Nonetheless, we do not know if addictive behaviour is a consequence or a trigger of psychopathology and so the relationship between psychopathology and addiction remains unclear (González-Bueso et al., 2018b). Similarly, we do not know if a specific psychiatric problem leads to the development of IGD, or if its negative consequences cause psychiatric disorders (González-Bueso et al., 2018b). However, the absence of statistical difference between both addictions in this current study suggests that there may be a common neurobiological basis or shared personality traits that could generally predispose individuals to addictive behaviour. This would mean that other factors would determine the development of one addiction or another. For example, in our work being man increased the probability of addiction to video games. This is also supported by the fact that many personality traits are protective for addictive behaviours, without discriminating between substances or behavioural addictions. Thus, perhaps our findings were the result of addiction and psychopathology sharing underlying biological, sociodemographic, or psychological mechanisms, making people vulnerable to both and, therefore, explaining their co-occurrence (González-Bueso et al., 2018a).

According to the review by King et al. (2018), most prevention programs use selective strategies (aimed at a subpopulation with a higher risk of developing IGD) and involved psycho-education modules designed to help participants understand the problematic use of videogames; teach stress management and self-control techniques; develop social relationships; internet time limit-setting and time management skills; and identify alternative activities. In this current work we found that the profile of participants with an IGD was male, with low conscientiousness and SMC. Thus, modules to help prevent IGD would likely be more effective if they (1) detect emotional distress or psychopathology

(i.e., working on self-awareness) and teach emotional regulation strategies; (2) promote conscientiousness; and (3) explore adaptations and attitudes towards school.

It is important to interpret our findings in light of their limitations. First, there is still no consensus on which diagnostic criteria or psychometric instruments should be used to research IGD; some of the tests we used omitted important variables such as video game type, time spent playing, or academic performance, which later limited comparisons with other studies and the extrapolation of our conclusions. Although the terms Internet Gaming Disorder (IGD), Gaming Disorder (GD) and substance use disorders (SUDs) have been used in the text, given that these categories have been obtained through screening tests, readers may consider them as high risk of disorder rather than disorders themselves. Second, the cross-sectional design of this work means that causality could not be established; longitudinal studies could help establish causality and detect the directionality of the relationship between addictions and psychopathology. It would also be helpful to continue studying personality traits in addictive behaviours and in reference to different videogame types, which might be helpful in developing more specific prevention programs for certain personality styles. Third, although the subjects included and excluded from the study did not show differences in sex, age and having repeated course, there were differences in coexistence, with the subjects included in a greater proportion living with a single parent. This could suppose a selection bias because all addicted subjects were included, since addiction has been related to parental loss and the separation or divorce of parents (Abasi & Mohammadkhani, 2016).

In conclusion, high levels of conscientiousness are protective and school maladjustment is a risk factor in developing both substance and video games addictions. The equation that predicted classification into the studied groups included the male sex, conscientiousness, and SMC variables. The risk factors for developing GD were male sex and SMC. The risk factors for developing SUD were neuroticism, CMC, SMC, ESI and low PAC.

Author contributions

MSMI, BA & HG conceptualized the paper. HG obtained the founding sources and ethics authorizations. MSMI, AI & CGF collected the data. SLM & RRF performed quality assurance for all data. SLM coordinated database activities. BA performed the data analysis. SLM drafted the paper. All authors assisted with subsequent drafts and were responsible for reviewing and approving the final manuscript. HG supervised the study and all manuscript elaboration.

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Conflict of interests

All the authors declare no conflict of interest.

References

Abasi, I. & Mohammadkhani, P. (2016). Family risk factors among women with addiction-related problems: An integrative review. *International Journal of High Risk Behaviors and Addiction, 5*. doi:10.5812/ijhrba.27071.

Adachi, P. J. C. & Willoughby, T. (2013). More than just fun and games: The longitudinal relationships between strategic video games, self-reported problem solving skills, and academic grades. *Journal of Youth and Adolescence, 42,* 1041-1052. doi:10.1007/s10964-013-9913-9.

Álvarez, S., Gallego, P., Latorre, C. & Bermejo, F. (2001). Papel del Test AUDIT (Alcohol use disorders identification test) para la detección de consumo excesivo de alcohol en Atención Primaria. *Revista de Medicina de Familia y Comunitaria, 11*, 553-557.

Allen, J. P., Litten, R. Z., Fertig, J. B. & Babor, T. (1997). A review of research on the Alcohol Use Disorders Identification Test (AUDIT). *Alcoholism: Clinical and Experimental Research, 21*, 613-619.

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Asociación española de videojuegos (2017). *The Yearbook of Videogames 2017*. Retrieved at http://www.aevi.org.es/web/wp-content/uploads/2018/07/AEVI_Anuario2017.pdf.

Araujo, M., Golpe, S., Braña, T., Varela, J. & Rial, A. (2018). Psychometric validation of the POSIT for screening alcohol and other drugs risk consumption among adolescents. *Adicciones,* 30, 130-139. doi:10.20882/adicciones.958.

Barbaranelli, C., Caprara, G. V., Rabasca, A., Barrio, M. V., Carrasco Ortíz, M. A. & Holgado-Tello, F. P. (2013). *BFQ-NA: Cuestionario "Big Fiwe" de personalidad para niños y adolescentes: Manual (3a ed. rev.)*. Madrid: TEA.

Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B. & Monteiro, M. G. (2000). *The alcohol use disorders identification test: Guidelines for use in primary care (Audit)*. World Health Organization. Retrieved at https://apps.who.int/iris/bitstream/handle/10665/67205/WHO_

MSD_MSB_01.6a.pdf;jsessionid=36D81C1C16B-CE8647809E7DDEA7B57EE?sequence=1.

Bhat, P. S., Prakash, J. & Srivastava, K. (2019). Game of thorns: Modern day opium. *Medical journal Armed Forces India*, *75*, 130-133. doi:10.1016/j.mjafi.2018.12.006.

Bonnaire, C. & Baptista, D. (2019). Internet gaming disorder in male and female young adults: The role of alexithymia, depression, anxiety and gaming type. *Psychiatry Research*, *272*, 521-530. doi:10.1016/j.psychres.2018.12.158.

Borzikowsky, C. & Bernhardt, F. (2018). Lost in virtual gaming worlds: Grit and its prognostic value for online game addiction. *American Journal on Addictions*, 27, 433-438. doi:10.1111/ajad.12762.

Bouna-Pyrrou, P., Aufleger, B., Braun, S., Gattnar, M., Kallmayer, S., Wagner, H.,… Lenz, B. (2018). Cross-sectional and longitudinal evaluation of the social network use disorder and internet gaming disorder criteria. *Frontiers in Psychiatry*, *9*, 692. doi:10.3389/fpsyt.2018.00692.

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. doi:10.1016/j.neubiorev.2016.08.033.

Braun, B., Stopfer, J. M., Müller, K. W., Beutel, M. E. & Egloff, B. (2016). Personality and video gaming: Comparing regular gamers, non-gamers, and gaming addicts and differentiating between game genres. *Computers in Human Behavior, 55*, 406-412.

Brooks, F. M., Chester, K. L., Smeeton, N. C. & Spencer, N. H. (2016). Video gaming in adolescence: Factors associated with leisure time use. *Journal of Youth Studies*, *19*, 36-54. doi:10.1080/13676261.2015.1048200.

Buiza-Aguado, C., Alonso-Canovas, A., Conde-Mateos, C., Buiza-Navarrete, J. J. & Gentile, D. (2018). Problematic video gaming in a young Spanish population: Association with psychosocial health. *Cyberpsychology, Behavior and Social Networking*, *21*, 388-394. doi:10.1089/cyber.2017.0599.

Canale, N., Marino, C., Griffiths, M. D., Scacchi, L., Monaci, M. G. & Vieno, A. (2019). The association between problematic online gaming and perceived stress: The moderating effect of psychological resilience. *Journal of Behavioral Addictions*, *8*, 174-180. doi:10.1556/2006.8.2019.01.

Caprara, G. V. & Zimbardo, P. G. (1996). Aggregation and amplification of marginal deviations in the social construction of personality and maladjustment. *European Journal of Personality, 10*, 79-110.

Chamarro, A., Carbonell, X., Manresa, J. M., Munoz-Miralles, R., Ortega-Gonzalez, R., Lopez-Morron, M. R.,… Toran-Monserrat, P. (2014). The questionnaire of experiences associated with video games (CERV): An instrument to detect the problematic use of video games in Spanish adolescents. *Adicciones, 26*, 303-311.

Chung, T., Sum, S. & Chan, M. (2018). Time to call for a global public health approach in prevention of the onset and progression of problematic gaming. *Journal of Behavioral Addictions*, *7*, 548-552. doi:10.1556/2006.7.2018.86.

Costa, S. & Kuss, D. J. (2019). Current diagnostic procedures and interventions for gaming disorders: A systematic review. *Frontiers in Psychology*, *10*, 578. doi:10.3389/fpsyg.2019.00578.

Dash, G. F., Slutske, W. S., Martin, N. G., Statham, D. J., Agrawal, A. & Lynskey, M. T. (2019). Big Five personality traits and alcohol, nicotine, cannabis, and gambling disorder comorbidity. *Psychology of Addictive Behaviors*, *33*, 420-429. doi:10.1037/adb0000468.

Del Barrio, V., Carrasco, M. & Holgado-Tello, F. (2006). Análisis transversal de los cinco factores de personalidad por sexo y edad en niños españoles. *Revista Latinoamericana de Psicología*, *38*, 567-577.

Dong, G., Zheng, H., Liu, X., Wang, Y., Du, X. & Potenza, M. N. (2018). Gender-related differences in cue-elicited cravings in Internet gaming disorder: The effects of deprivation. *Journal of Behavioral Addictions*, *7*, 953-964. doi:10.1556/2006.7.2018.118.

Estévez, A., Jauregui, P. & López-González, H. (2019). Attachment and behavioral addictions in adolescents: The mediating and moderating role of coping strategies. *Scandinavian Journal of Psychology*, *60*, 348-360. doi:10.1111/sjop.12547.

European Parliament and Council. (2016). Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation). Retrieved at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02016R0679-20160504.

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

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 (Supl. 2)*, 81-85. doi:10.1542/peds.2016-1758H.

González-Bueso, V., Santamaría, J. J., Fernández, D., Merino, L., Montero, E., Jiménez-Murcia, S.,… Ribas, J. (2018a). Internet gaming disorder in adolescents: Personality, psychopathology and evaluation of a

psychological intervention combined with parent psychoeducation. *Frontiers in Psychology*, *9*, 787. doi:10.3389/fpsyg.2018.00787.

González-Bueso, V., Santamaría, J. J., Fernández, D., Merino, L., Montero, E. & Ribas, J. (2018b). Association between internet gaming disorder or pathological video-game use and comorbid psychopathology: A comprehensive review. *International Journal of Environmental Research and Public Health*, *15*, 668. doi:10.3390/ijerph15040668.

Granic, I., Lobel, A. & Engels, R. C. (2014). The benefits of playing video games. *The American Psychologist*, *69*, 66-78. doi:10.1037/a0034857.

Khatib, M. N., Sinha, A., Gaidhane, A. M., Simkhada, P., Behere, P. B., Saxena, D.,… Syed, Z. Q. (2018). A systematic review on effect of electronic media among children and adolescents on substance abuse. *Indian Journal of Community Medicine*, *43 (Supl. 1),* 66-72. doi:10.4103/ijcm.IJCM_116_18.

Kim, Y. J., Lim, J. A., Lee, J. Y., Oh, S., Kim, S. N., Kim, D. J.,… Choi, J. S. (2017). Impulsivity and compulsivity in Internet gaming disorder: A comparison with obsessive-compulsive disorder and alcohol use disorder. *Journal of Behavioral Addictions, 6*, 545-553. doi:10.1556/2006.6.2017.069.

King, D. L., Delfabbro, P. H., Doh, Y. Y., Wu, A., Kuss, D. J., Pallesen, S.,… Sakuma, H. (2018). Policy and prevention approaches for disordered and hazardous gaming and internet use: An international perspective. *Prevention Science, 19*, 233-249. doi:10.1007/s11121-017-0813-1.

King, D. L. & Potenza, M. N. (2019). Not playing around: Gaming disorder in the International Classification of Diseases (ICD-11). *The Journal of Adolescent Health, 64*, 5-7. doi:10.1016/j.jadohealth.2018.10.010.

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*. doi:10.2196/jmir.3515.

Kircaburun, K., Griffiths, M. D. & Billieux, J. (2019). Psychosocial factors mediating the relationship between childhood emotional trauma and internet gaming disorder: A pilot study. *European Journal of Psychotraumatology*, *10*. doi:10.1080/20008198.2018.1565031.

Knight, J. R., Goodman, E., Pulerwitz, T. & Durant R.H. (2001). Reliability of the Problem Oriented Screening Instrument for Teenagers (POSIT) in adolescents medical practice. *Journal of Adolescent Health*, *29*, 125-130.

Knight, J. R., Sherritt, L., Shrier, L. A., Harris, S. K. & Chang, G. (2002). Validity of the CRAFFT substance abuse screening test among adolescent clinical patients. *Archives of Pediatrics & Adolescent Medicine*, *156,* 607-614. doi:10.1001/archpedi.156.6.607.

Kökönyei, G., Kocsel, N., Király, O., Griffiths, M. D., Galambos, A., Magi, A.,… Demetrovics, Z. (2019). The role of cognitive emotion regulation strategies in problem gaming among adolescents: A nationally representative survey study. *Frontiers in Psychiatry*, *10*, 273. doi:10.3389/fpsyt.2019.00273.

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. doi:10.3389/fpsyg.2018.02239.

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

Kuss, D. J., Pontes H. M. & Griffiths M. D. (2018). Neurobiological correlates in internet gaming disorder: A systematic literature review. *Frontiers in Psychiatry, 9*, 166. doi:10.3389/fpsyt.2018.00166.

Laier, C., Wegmann, E. & Brand, M. (2018). Personality and cognition in gamers: Avoidance expectancies mediate the relationship between maladaptive personality traits and symptoms of internet-gaming disorder. *Frontiers in Psychiatry*, *9*, 304. doi:10.3389/fpsyt.2018.00304.

Latimer, W., Winters, K. C. & Stinchfield, R. D. (1997). Screening for drug abuse among adolescents in clinical and correctional settings using the problem oriented screening instrument for teenagers. *American Journal of Drug and Alcohol Abuse*, *23*, 79-98. doi:10.3109/00952999709001689.

Lehenbauer-Baum, M., Klaps, A., Kovacovsky, Z., Witzmann, K., Zahlbruckner, R. & Stetina, B. U. (2015). Addiction and engagement: An explorative study toward classification criteria for internet gaming disorder. *Cyberpsychology, Behavior and Social Networking, 18*, 343–349. doi:10.1089/cyber.2015.0063.

Lemmens, J. S., Valkenburg, P. M. & Peter, J. (2009). Development and validation of a game addiction scale for adolescents. *Media Psychology*, *12*, 77-95.

Lloret, D., Morell, R., Marzo, J. C. & Tirado, S. (2018). Spanish validation of Game Addiction Scale for Adolescents (GASA). *Atención Primaria, 50*, 350-358. doi:10.1016/j.aprim.2017.03.015.

Lobel, A., Engels, R. C., Stone, L. L., Burk, W. J. & Granic, I. (2017). Video gaming and children's psychosocial wellbeing: A longitudinal study. *Journal of Youth and Adolescence*, *46*, 884-897. doi:10.1007/s10964-017-0646-z.

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. doi:10.20882/adicciones.1370.

Naskar, S., Victor, R., Nath, K. & Sengupta, C. (2016). "One level more:" A narrative review on internet gaming disorder. *Industrial Psychiatry Journal*, *25*, 145-154. doi:10.4103/ipj.ipj_67_16.

Paulus, F. W., Ohmann, S., Von Gontard, A. & Popow, C. (2018). Internet gaming disorder in children and adolescents: A systematic review. *Developmental Medicine and Child Neurology*, *60*, 645–659. doi:10.1111/dmcn.13754.

Porter, G., Starcevic, V., Berle, D. & Fenech, P. (2010). Recognizing problem video game use. *Australian and New Zealand Journal of Psychiatry, 44,* 120-128. doi:10.3109/00048670903279812.

Reynolds, C. R. & Kamphaus, R. W. (2004). *BASC: Sistema de evaluación de la conducta de niños y adolescentes: Manual.* Madrid: TEA.

Rial, A., Kim-Harris, S., Knight, J., Araujo, M., Gómez, P., Braña, T.,… Golpe, S. (2019). Empirical validation of the CRAFFT abuse screening test in a Spanish sample. *Adicciones, 31*,160-169. doi:10.20882/adicciones.1105.

Saunders, J. B., Hao, W., Long, J., King, D. L., Mann, K., Fauth-Bühler, M.,… Poznyak, V. (2017). Gaming disorder: Its delineation as an important condition for diagnosis, management, and prevention. *Journal of Behavioral Addictions*, *6*, 271-279. doi:10.1556/2006.6.2017.039.

Singh, M. (2019). Compulsive digital gaming: An emerging mental health disorder in children. *Indian Journal of Pediatrics, 86*, 171-173. doi:10.1007/s12098-018-2785-y.

Soto, G., Ferrándiz, C., Sáinz, M., Ferrando, M., Prieto, M. D., Bermejo, R. & Hernández, D. (2011). Características psicométricas del cuestionario de personalidad BFQ-NA (Big five questionnaire- niños y adolescentes). *Aula Abierta*, *39*, 13-24.

Statista (2020). *La industria de los videojuegos en España.* Retrieved at https://es.statista.com/temas/2851/industria-del-videojuego-en-espana/.

Sussman, C. J., Harper, J. M., Stahl, J. L. & Weigle, P. (2018). Internet and video game addictions: Diagnosis, epidemiology, and neurobiology. *Child and Adolescent Psychiatric Clinics of North America*, *27*, 307-326. doi:10.1016/j.chc.2017.11.015.

Terracciano, A., Löckenhoff, C. E., Crum, R. M., Bienvenu, O. J. & Costa, P. T. Jr. (2008). Five-factor model personality profiles of drug users. *BMC Psychiatry*, *8*, 22. doi:10.1186/1471-244X-8-22.

Throuvala, M. A., Janikian, M., Griffiths, M. D., Rennoldson, M. & Kuss, D. J. (2019). The role of family and personality traits in Internet gaming disorder: A mediation model combining cognitive and attachment perspectives. *Journal of Behavioral Addictions*, *8*, 48-62. doi:10.1556/2006.8.2019.05.

Vollmer, C., Randler, C., Horzum, M. B. & Ayas, T. (2014). Computer game addiction in adolescents and its relationship to chronotype and personality. *SAGE Open*, *4*, 1-9. doi:10.1177/2158244013518054.

World Health Organization. (2018). *11th edition of the International Classification of Diseases.* Retrieved at https://www.who.int/news/item/18-06-2018-who-releases-new-international-classification-of-diseases-(icd-11).

World Medical Association. (2013). Declaration of Helsinki: Ethical principles for medical research involving human subjects. *JAMA*, 310, 2191–2194. doi:10.1001/jama.2013.281053.