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Psychometric properties of the European Portuguese Internet Gaming Disorder Test (IGD-20): relation with friendships and physical exercise

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Resumo

Este estudo visou validar o *Internet Gaming Disorder Test* (IGD-20; Pontes et al., 2014), um instrumento para avaliação da Perturbação de Jogo pela Internet (PJI), em Portugal. Adicionalmente, testaram-se as correlações entre o nível de PJI e número de amigos (NA), frequência de encontros sociais (FES) e exercício físico (EF).

Um total de 556 participantes, com média de idades de 23.3 (*DP* = 6.4), dos quais 61.7% homens, responderam a um protocolo online constituído por questões sociodemográficas, sobre sintomas de ansiedade e depressão, frequência de jogo, NA, FES, horas semanais de EF, PJI e Perturbação de Jogo (PJ). Esta amostra permitiu calcular as consistências internas e realizar Análises Fatoriais Confirmatórias (AFC) com o modelo original e com uma versão curta, o Internet Gaming Disorder-10 Short Version (IGD-10SV), de três fatores (Faraci et al., 2023). Utilizou-se uma subamostra de 379 participantes (M_{idade} = 23.5, *DP* = 6.4; 61.2% homens) cujo término do protocolo permitiu estimar a validade convergente e de critério, a fidelidade teste-reteste, e testar a relação das pontuações do IGD-20 com as variáveis antes indicadas.

As AFC mostraram um melhor ajuste ao modelo de três fatores, favorecendo uma versão mais curta. O IGD-10SV demonstrou valores moderados de consistência interna, boas validades convergente e de critério e boa fidelidade teste-reteste. Adicionalmente, a pontuação do IGD-10SV demonstrou-se negativamente correlacionada com o NA e com a FES, mas não com o EF.

Apesar das características psicométricas genericamente boas do teste, a ambiguidade da sua estrutura fatorial requer estudo adicional.

Palavras-chave: perturbação de jogo pela internet, IGD-20 test, IGD-10SV, propriedades psicométricas, dependência a videojogos

Abstract

This study aimed to validate the Internet Gaming Disorder Test (IGD-20; Pontes et al., 2014), an instrument for the assessment of Internet Gaming Disorder (IGD), in Portugal. Additionally, the correlations between the level of IGD and number of friends (NF), social gathering frequency (SGF) and physical exercise (PE) were tested.

A total of 556 participants with a mean age of 23.3 (*SD* = 6.4), of which 61.7% were men, answered an online protocol composed of sociodemographic questions, about anxiety and depression symptoms, gaming frequency, NF, SGF, weekly hours of PE, IGD and Gaming Disorder (GD). This sample allowed the calculation of internal consistencies and computation of Confirmatory Factor Analyses (CFA) with the original model and with a short version, the Internet Gaming Disorder-10 Short Version (IGD-10SV), of three factors (Faraci et al., 2023). A subsample of 379 participants (M_{age} = 23.5, *SD* = 6.4; 61.2% men) that finished the protocol was used to estimate convergent and criterion validity, test-retest reliability, and test the correlation of IGD-20 scores with the previously indicated variables.

The CFAs showed a better fit for the three-factor model, favoring a shorter version. The IGD-10SV showed moderate values of internal consistency, good convergent and criterion validity, and good test-retest reliability. Additionally, IGD-10SV scores showed to be negatively correlated with NF and SGF, but not with PE.

Despite the scale's good overall psychometric properties, the ambiguity of its factorial structure warrants further study.

Keywords: internet gaming disorder, IGD-20 test, IGD-10SV, psychometric properties, videogame addiction

Résumé

Cette étude a pour objectif valider le *Internet Gaming Disorder Test* (IGD-20 ; Pontes et al., 2014), un instrument d'évaluation du trouble du jeu sur Internet (IPD), au Portugal. En outre, les corrélations entre le niveau de PJI et le nombre d'amis (NA), la fréquence des rencontres sociales (FES) et l'exercice physique (EF) ont été testées.

Au total, 556 participants, âgés en moyenne de 23,3 ans (écart-type = 6,4), dont 61,7 % d'hommes, ont répondu à un protocole *online* comprenant des questions sociodémographiques, des symptômes d'anxiété et de dépression, la fréquence des jeux, NA, FES, le nombre d'heures par semaine d'EP, PJI et le trouble du jeu (PJ).

Cet échantillon a permis de calculer les cohérences internes et de réaliser des analyses factorielles confirmatoires (AFC) avec le modèle original et avec une version courte, l'*Internet Gaming Disorder-10 Short Version* (IGD-10SV), à trois facteurs (Faraci et al., 2023). Un sous-échantillon de 379 participants ($M_{âge}$ = 23,5, écart-type = 6,4 ; 61,2 % d'hommes) ayant complété le protocole a été utilisé pour estimer la validité convergente et la validité de critère, la fiabilité *test-retest* et pour tester la relation entre les scores de l'IGD et les variables susmentionnées.

Les AFC ont montré une meilleure adéquation au modèle à trois facteurs, favorisant une version plus courte. L'IGD-10SV a montré des valeurs de cohérence interne modérées, une bonne validité convergente et critérielle et une bonne fiabilité *test-retest.* En outre, le score IGD-10SV était négativement corrélé à la NA et à la FES, mais pas à l'EF.

Malgré les bonnes caractéristiques psychométriques générales du test, l'ambiguïté de sa structure factorielle nécessite une étude plus approfondie.

Mots-clés: trouble du jeu sur internet, IGD-20 test, IGD-10SV, propriétés psychométriques, dépendance aux jeux vidéo

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Introduction

Gaming is one of the most prevalent leisure activities in the world, involving approximately 3.2 billion active gamers in 2022 (Warman et al., 2022). Notwithstanding their potential benefits to cognitive performance (Boot et al., 2008; Green & Bavelier, 2015; Kovbasiuk et al., 2022) and therapeutic application (Bocci et al., 2023; Colder Carras et al., 2018; Mahon-Daly & Jeyasingam, 2021), video games, when played in excess, can contribute among vulnerable individuals to the development of pathological habits that may have detrimental effects on mental and physical health (Ko, 2014; Ko et al., 2020).

Researchers became more interested in the topic after the two current nosological manuals proposed criteria for labelling such problematic gaming behaviors. The 5th version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association [APA], 2013) introduced *Internet Gaming Disorder* (IGD) as a condition for further study, defining it as the "persistent and recurrent use of the Internet to engage in games, often with other players, leading to clinically significant impairment or distress" (pp. 795). According to APA (2013):

> At least five of the following criteria need to be present for 12 months:
>
> (1) preoccupation with Internet games, in anticipation of, or after, playing, (2) withdrawal symptoms such as irritability, anxiety or sadness when Internet gaming is taken away, (3) tolerance or the need to spend increasing amounts of time engaged in Internet Games, (4) unsuccessful attempts to control the participation in Internet games, (5) loss of interests in previous hobbies and entertainment as a result of, and with the exception of, Internet games, (6) continued excessive use of Internet games despite knowledge of psychosocial problems, (7) has deceived family members, therapists, or others regarding the amount of Internet gaming, (8) use of Internet games to escape or relieve a negative mood such as helplessness, guilt and anxiety, and (9) has jeopardized or lost a significant relationship, job, or educational or career opportunity because of participation in Internet games. (pp. 795-796)

Similarly, the 11th revision of the International Classification of Diseases (ICD-11; World Health Organization [WHO], 2022) added *Gaming Disorder* (GD) under the category of *disorders due to addictive behaviors* and defined it as a "pattern of persistent

or recurrent gaming behaviors, which may be *online* (i.e., over the internet) or *offline*". Individuals who exhibit such a pattern for at least 12 months may experience difficulties controlling their gaming behavior, which ends up taking precedence over other areas of life, leading to interpersonal and relational problems.

The estimated global prevalence of gaming addiction may lie between 1.4% and 3.3% (H. S. Kim et al., 2022) or 2.0% and 3.1% (Stevens et al., 2021), and individuals with a diagnosis are mostly men (Darvesh et al., 2020; Mihara & Higuchi, 2017). However, researchers do not consider these estimates very conclusive, highlighting limitations in the studies, such as the use of different conceptualizations, discrepancies in assessment tools, and low sample representativeness (H. S. Kim et al., 2022; Kircaburun et al., 2020; Stevens et al., 2021).

The use of different conceptualizations derives from an extensive debate in the scientific community (Griffiths et al., 2016; Király et al., 2015; Petry et al., 2014, 2016) that spans the legitimacy of the disorder (Starcevic, 2013; Van Rooij & Kardefelt-Winther, 2017), the pertinence of proposed criteria (Kuss et al., 2017) and the addictive potential of offline games (Krossbakken et al., 2017; Montag et al., 2021). In attempting to reach a consensus, researchers have appealed to research based in robust methodologies, theories and validated diagnostic tools (Griffiths et al., 2014, 2016; Kuss et al., 2017; Petry et al., 2014, 2016; Van Rooij & Kardefelt-Winther, 2017).

Notwithstanding the previously mentioned conceptual and methodological issues, there is also a problem related with a high comorbidity among individuals diagnosed with IGD, specifically depression (Laconi et al., 2017; Ostinelli et al., 2021), anxiety (Colder Carras et al., 2020; Huang et al., 2022), attention deficit/hyperactivity disorder (Barrangou-Poueys-Darlas et al., 2022; Dullur et al., 2021), social phobia (Gioia et al., 2022) and obsessive-compulsive disorder (González-Bueso et al., 2018). Considering that there is a lack of clarity regarding the directionality between the comorbidities and IGD (Colder Carras et al., 2020; Dullur et al., 2021; González-Bueso et al., 2018; Kircaburun et al., 2020; Laconi et al., 2017), it becomes difficult to determine whether IGD is a primary disorder with comorbidities, or the consequence of pre-existing pathologies.

Anxiety and depression appeared to be highly associated with IGD in a study by González-Bueso et al. (2018). Additionally, other studies have found positive and predictive relationships between the symptoms of both disorders and IGD (Gentile et al., 2011; S. Kim et al., 2022; Teng et al., 2021), as well as a mediation effect of IGD on anxiety and depression levels (Stavropoulos et al., 2022).

Concomitantly, IGD is associated with risk factors and psychosocial and physical consequences. However, not only are the relationships between variables unclear, but there is also a lack of distinction over what constitutes risk and consequence of IGD (Mestre-Bach et al., 2022; Paulus et al., 2018). The authors propose that the blurred lines between risk factors and consequences of the disorder are due to the lack of longitudinal studies, small sample sizes and an exacerbating cycle of the variables that first originated IGD.

A systematic review by Paulus et al. (2018) proposed a comprehensive model of etiological factors related to IGD. While their review covers topics beyond the scope of this study, it is important to highlight the associations found between IGD and the following variables: stress; affect dysregulation, or the tendency for negative, depressive and anxious affective states; low self-esteem; solitude; social isolation; reduced interpersonal relationships and lack of real-world friends; social inhibition; compromised social functioning; low quality relationships with parents and peers; and low involvement in leisure activities. Similarly, a recent meta-analysis identified the following risk factors: stress, average gaming time, family dysfunction, weak academic performance, engaging in bullying, either as a victim or aggressor, interpersonal problems, hyperactivity/attention deficit, anxiety, depression, emotional distress, and low self-esteem (Gao et al., 2022). On the other hand, a longitudinal study found a negative association between IGD and psychosocial well-being, but not the opposite, suggesting that the disorder may be a maladaptive response that leads to low self-esteem, limited social support and dissatisfaction with life (Teng et al., 2020).

Researchers hypothesize that the varying results across studies regarding the quality of interpersonal relationships among pathological gamers may be attributed to the replacement of real-world bonds with virtual-world ones, which may be safer and less anxiety-inducing (Király et al., 2023; Sublette & Mullan, 2012). In other words, while some gamers remain isolated and devoid of real-world friendships, other individuals find gratification in online bonds, reporting less dissatisfaction compared to the first group. Moreover, virtual-world relationships may contribute to addiction, as gamers play more in order to fulfil social needs that are unmet in real life (Heng et al., 2021; Király et al., 2023; Szolin et al., 2022).

Excessive gaming can also lead to negative physical consequences such as: visual problems, musculoskeletal problems, auditory hallucinations, enuresis, encopresis, sore tendons, tenosynovitis, skin blisters, calluses, hand-arm vibration syndrome, peripheral neuropathy, epileptic seizures, overweight, and obesity (Ayenigbara, 2018; Paulus et al.,

2018). Obesity and overweight may be associated with this disorder due to a sedentary lifestyle, typical among individuals who spend a lot of time sitting in front of a screen (Bullock et al., 2017). Consequently, a negative association between physical exercise (PE) and the severity of IGD is expected. However, the results from studies on this topic have been inconclusive (Huard Pelletier et al., 2020).

Three studies found no association between PE, body mass index (Bickham et al., 2013; Wack & Tantleff-Dunn, 2009), and IGD (Männikkö et al., 2015). On the other hand, both negative associations (Ballard et al., 2009) and reciprocal causality (Henchoz et al., 2016) were found between PE and IGD. Finally, Puolitaival et al. (2020) reported a higher incidence of sedentary behaviors, including lower practice of PE, among individuals who spent more time playing videogames.

As stated previously, researchers are attempting to gather data on the prevalence of IGD, to establish a consensus on its diagnostic criteria, and to develop reliable assessment tools (King et al., 2020; Petry et al., 2014). Consequently, several tools that attempt to assess IGD and standardize its screening methods have emerged. According to a qualitative content validity analysis by Karhulahti et al. (2021), there were 17 instruments designed for assessing IGD based on DSM-5 (APA, 2013) or ICD-11 (WHO, 2022) criteria. King et al. (2020) reported a total of 32 different instruments for assessing GD or IGD, regardless of their theoretical background. For the sake of comparing psychometric properties, the 20 instruments from these studies that were based on criteria from the two nosological manuals were selected and presented in Table 1.

Table 1

IGD and GD assessment instruments and psychometric properties

Instrument (authors)	IN	IC (*α*)	CV (*r*)	CRV (*r*)	TRR (*r*)
GAIA (Wong & Hodgins, 2014)	26	.94	-	SSBA: .79, YIAT: .80	-
IGDC (Petry et al., 2014)	9	.69 – .86	.24 – .59	IGCS: .51, GAS-7: .76	-
IGD-20 (Pontes et al., 2014)	20	.85 – .92	.27 – .77	BAM-VG: .44, DSM-5 criteria & IGDS9-SF: .82	-
IGDS (Lemmens et al., 2015)	9/ 27	.67 – .95/.94 – .95 [a]	.22 – .66/.23	YDQ: .39, PIGDS: .78/ - [a]	-

Instrument (authors)	IN	IC (α)	CV (*r*)	CRV (*r*)	TRR (*r*)
	[a]		– .56 [a]		
IGDS9-SF (Pontes & Griffiths, 2015)	9	.81 – .86	.32 – .55	GAS-7: .40, YIAT: .83	.87 (2 weeks)
GAIT (Vadlin et al., 2015)	15	.89 – .91	.48	GAS-7: .83	-
CSAS (Rehbein et al., 2015)	18	.92 – .94	-	-	-
PIE-9 (Pearcy et al., 2016)	9	.86 – .89	-	PVP: .43, IGD-20: .64	.77 (2 weeks)
BAM-VG (Sanders & Williams, 2016)	19	.87	-	IGD-20: .44	.73 (90 days)
IGDT-10 (Király et al., 2017)	10	.62 – .87	.03 (non-sig) – .45	PIUQ-6: .53, POGQ: .77	-
VASC (Yılmaz et al., 2017)	21	.89	-	-	-
CVAT 2.0 (Van Rooij et al., 2017)	11	-	-	-	-
C-IGDS (Sigerson et al., 2017)	9	.91	.41	CES-D: .62, SIAS: .37	-
IGUESS (Jo et al., 2018)	9	.85 – .94	IGD > non-IGD	YIAT: .90	-
IGD Scale (Finserås et al., 2019)	9	.78	-	GASA: .71	-
IGDS-23 (Borges et al., 2019)	23	.82	-	-	-
GADIS-A (Paschke et al., 2020)	10	.91	.42 [b]	IGDS: .7, PIGDS: .54	-
GDHGS (Balhara et al., 2020)	4	.91	-	IGDS9-SF: .88	-
TIGTOC (Jo et al., 2020)	3	.81	-	YIAT: .66, CDI: .41, K-ARS: .003	-
GDT (Pontes et al., 2021)	4	.84	- [c]	IGDS9-SF: .83	-

Note. Convergent validity was measured via bivariate correlation with gaming hours per week, when available. A dash was used whenever data was not reported. IN = Item Number; IC = Internal Consistency; CV = Convergent Validity; CRV = Criterion Validity; TRR = Test-Retest Reliability.
List of tools: BAM-VG: Behavioral Addiction Measure – Video Gaming; CDI: Child Depression Inventory (Kovacs, 2015); CES-D: Center for Epidemiologic Studies Depression Scale-Short Form (J. C. Cole et al., 2004); C-IGDS: Chinese Internet Gaming Disorder Scale; CSAS: Video Game Dependency Scale; CVAT 2.0: Clinical Video game Addiction Test 2.0; GAIA: Game Addiction Inventory for Adults; GADIS-A: Gaming Disorder Scale for Adolescents; GAIT: Gaming Addiction Identification Test; GASA: Gaming Addiction Scale for Adolescents (Lemmens et al., 2009); GAS-7: Game Addiction Scale (Lemmens et al., 2009); GDHGS: Gaming Disorder and Hazardous Gaming Scale; IGDC: Internet Gaming Disorder Checklist; GDT: Gaming Disorder Test; IGCS: Internet Gaming Cognition Scale (King & Delfabbro, 2016); IGD-20: Internet Gaming Disorder-20 Test; IGDS: Internet Gaming Disorder Scale; IGDS9-SF: Internet Gaming Disorder Scale-Short-Form; IGDT-10: Ten-Item Internet Gaming Disorder Test; IGUESS: Internet Game Use-Elicited Symptom Screen; K-ARS: Korean ADHD Rating Scale (DuPaul, 1991); PIE-9: Personal

Internet Gaming Disorder Evaluation 9; PIGDS: Parental version of the Internet Gaming Disorder Scale (Wartberg et al., 2019); PIUQ-6: Problematic Internet Use Questionnaire-6 items (Demetrovics et al., 2016); POGQ: Problematic Online Gaming Questionnaire (Demetrovics et al., 2012); PVP: Problematic Video game Playing Scale (Tejeiro Salguero & Morán, 2002); SIAS: Social Interaction Anxiety Scale-Short form (Peters et al., 2012); SSBA: Screener for Substance and Behavioral Addictions (Schluter et al., 2018); TIGTOC: The Three-Item Gaming disorder Test–Online Centered; VASC: Video Game Addiction Scale for Children; YDQ: Young Diagnostic Questionnaire (Young, 1998); YIAT: Young Internet Addiction Test (Young, 1998).

With the exception of the following tools: C-IGDS, IGD Scale, IGDS-23, GDT, GADIS-A, GDHGS and TIGTOC whose psychometric qualities were retrieved from their respective development studies, the table and its values were adapted from "Screening and assessment tools for gaming disorder: A comprehensive systematic review." by King, D. L., Chamberlain, S. R., Carragher, N., Billieux, J., Stein, D. J., Mueller, K., Potenza, M. N., Rumpf, H., Saunders, J. B., Starcevic, V., Demetrovics, Z., Brand, M., Lee, H. Y., Spada, M. M., Lindenberg, K., Wu, A. M. S., Leménager, T., Pallesen, S., Achab, S., . . . Delfabbro, P., 2020, Clinical Psychology Review, 77, 101831 (https://doi.org/10.1016/j.cpr.2020.101831). Copyright by Creative Commons Attribution Non-Commercial-No Derivatives License (CC BY NC ND).

[a] Refers to two versions of the scale with 9 and 27 items, respectively. [b] Gaming hours per day. [c] Data that demonstrates convergent validity: AVE ≥ .50; Composite Reliability ≥ .70; No cross-loadings. For more information refer to Pontes et al. (2021).

The *Internet Gaming Disorder Test* (IGD-20 Test; Pontes et al., 2014) was the first screening tool designed for the assessment of IGD, based on DSM-5 (APA, 2013) criteria. The original version showed good internal consistency and concurrent validity, exhibiting correlations that ranged from weak to strong with analogous tools (BAM-VG = .44; IGDS9-SF = .82; King et al., 2020). Regarding convergent validity, associations with weekly gaming hours ranged from weak (r = .27) to strong (r = .77). B.-N. Kim (2019) suggests that the variations observed in convergent validity may be related with the choice of the variable *weekly gaming time*, which is highly dependent on sample characteristics.

The *IGD-20 Test* was based on a six-factor model for addiction proposed by Griffiths (2005) that is theoretically equivalent to the nine DSM-5 criteria (Pontes et al., 2014). The six factors that compose the model are as follows: *salience*, *mood modification*, *tolerance*, *withdrawal*, *conflict* and *relapse*. Salience is related to the intruding importance that the addictive activity represents in daily life, oftentimes dominating thoughts, feelings and behaviors. Mood modification concerns the numbing or pleasant feelings and/or emotional states that are elicited while engaging in the addictive behavior. Tolerance is the ever growing need to increase the amounts of a particular addictive activity in order to experience previously felt pleasant or numbing effects. Withdrawal refers to “unpleasant feeling states and/or physical effects that occur when the activity” is halted or reduced (Griffiths, 2005, p.194). Conflict relates to any altercations and discordance that arise within the individual and between the individual and those around them, as a result of their addictive behavior. Finally, relapse pertains to the tendency to quickly resume patterns of

addiction even after a period of abstinence or control.

While in the scale's development study a Confirmatory Factor Analysis (CFA) demonstrated a good fit for Griffith's addiction model (Pontes et al., 2014), its subsequent validations reported a variety of results. Specifically, other acceptable six-factor structures were found (Fuster et al., 2016; B.-N. Kim, 2019; Pontes et al., 2014) as well as very good five-factor (Cakiroglu & Soylu, 2019; Grajewski & Dragan, 2021; Yu et al., 2019) and one-factor (L. I. Andrade et al., 2022; Hawi & Samaha, 2017) structures. In both unifactorial solutions, an Exploratory Factor Analysis (EFA) was utilized alongside the CFA, which may explain the results. Additionally, all five-factor structures opted to combine the factors salience and tolerance, as they were highly correlated (Cakiroglu & Soylu, 2019; Grajewski & Dragan, 2021; Yu et al., 2019).

The recent Italian validation concluded that the factorial structure of the scale was fundamentally flawed to some extent, leading to very high correlations among latent variables and mixed results of factorial internal consistency (Faraci et al., 2023). As a result of their study, the scale was cut down to 10 items and its factorial structure was changed to three factors: (a) *prevalence*, or the negative contextual impact that the time devoted to pathological gaming has on individuals; (b) withdrawal, defined like Griffiths (2005); and (c) *craving*, which is based on Caretti et al.'s (2008) work, is described as the "longing desire" to play videogames that pervades day-to-day life. The new scale, or *Internet Gaming Disorder Scale-10 Short Version* (*IGD-10SV*), remained faithful to the theoretical framework of addiction while showing an overall good fit and solving the high intercorrelations among factors present in all of the previous validations.

Finally, the IGD-20 has been translated and validated in Spain (Fuster et al., 2016), for the Arabic population (Hawi & Samaha, 2017), Korea (B.-N. Kim, 2019), China (Yu et al., 2019), Turkey (Cakiroglu & Soylu, 2019), Poland (Grajewski & Dragan, 2021), Ecuador (L. I. Andrade et al., 2022) and Italy (Faraci et al., 2023).

In Portugal, to date, only two gaming addiction scales have been validated for the European Portuguese population (Beirão et al., 2019). These scales are the Videogame Addiction Scale (Escala de Adição ao Jogo Electrónico [EAJE]; Barroso et al., 2011), and the IGDS9-SF (Pontes & Griffiths, 2016). Additionally, both scales were validated in an adolescent sample, which only represents a portion of the population affected by IGD (Gao et al., 2022). Furthermore, the EAJE does not reflect the DSM-5 criteria (APA, 2013) as it was developed before their release. Lastly, the IGD-20, in theory, may reduce measurement error (Böckenholt & Lehmann, 2015) as it consists of 20 items, whereas the

IGDS9-SF only comprises nine. Additionally, its factorial structure could provide further insights to the IGD debate.

Given the extant literature, this study aimed to validate the IGD-20 for the European Portuguese population and examine its psychometric properties. Such validation intends to tackle the lack of IGD assessment tools in Portugal and provide a new screening tool for researchers and mental health professionals. Simultaneously, this work intended to estimate the correlations among the variables under study, stablishing the following hypotheses:

a) The number of friends (NF) will be negatively correlated with IGD scores;
b) The social gathering frequency (SGF) will be negatively correlated with IGD scores;
c) The weekly hours of PE will be negatively correlated with IGD scores.

Methods

1. Sample

Participants were recruited through different methods, as detailed in the procedures section below.

Only participants who were (a) at least 18 years of age, (b) of European Portuguese nationality and who (c) played on electronic platforms (d) for more than 0 days per week were included in the analyses.

According to Kyriazos (2018), in order to conduct a successful CFA, the ratio of cases (N) to parameters (q) should be at least 10:1. Since the IGD-20 questionnaire consists of 20 questions, a minimum of 200 participants was considered necessary for factor analysis. For test-retest reliability, a minimum sample of 100 respondents was considered to achieve the desired results (Kennedy, 2022).

All collected responses were screened for missing values. Any participants who did not fully complete the IGD-20 were excluded, leaving 633 participants in the sample. Following this step, every participant who did not meet inclusion criteria was filtered out of all analyses, leaving a final sample of 556 respondents, aged from 18 to 55 years old

(see full characteristics in Table 2).

Additionally, a subsample of 379 participants was established after filtering 177 respondents who did not complete the full data collection protocol (i.e., those who only completed the IGD-20). Participants of this subsample ranged in age from 18 to 55 years old (see Table 2).

Table 2 contains the descriptive statistics regarding variables of interest that characterize the sample and subsample (means and standard deviations or frequencies, depending on the variables). For more information on the sample's national representativeness, Appendix A can be consulted.

Table 2

Descriptive statistics of the total sample, subsample used in the CFA, and subsample that completed the retest

Variable	**Main Sample (*N* = 556)**		**Subsample (*n* = 379)**		**Retest Subsample (*n* = 112)**	
	M	***SD***	***M***	***SD***	***M***	***SD***
Age	23.3	6.36	23.5	6.39	23.1	5.72
N. years of formal education	14.2	2.14	14.3	2.26	14.5	2.44
Daily gaming hours	2.28	1.67	2.28	1.71	2.46	1.95
Weekly gaming days	4.22	2.03	4.29	2.04	4.62	2.02
Physical exercise	2.97	3.63	3.16	3.87	2.94	3.75
	n	***%***	***n***	***%***	***n***	***%***
Gender						
Men	343	61.7	232	61.2	71	63.4
Women	213	38.3	147	38.8	41	36.6
Region of Residence						
Northern	320	57.6	220	58.0	72	64.3
Central	86	15.5	57	15.0	9	8.0
Lisbon and Tagus Valley	62	11.2	44	11.6	14	12.5
Alentejo	33	5.9	20	5.3	6	5.4
Algarve	38	6.8	25	7.0	7	6.3
Madeira	11	2.0	9	2.4	2	1.8
Azores	6	1.1	4	1.1	2	1.8

2. Materials

The original data collection protocol was part of a larger study being conducted online by the research team of the Laboratory of Neuropsychophysiology, of the Faculty of Psychology and Education Sciences, University of Porto (FPCEUP), in cooperation with the School of Health, Polytechnic of Porto (ESS-P.PORTO, see Appendix B). Online data collection provides easier access for participants, facilitated advertising and recruitment, automation of certain tasks and shorter time of data collection (Wood & Griffiths, 2007; Wright, 2006). This method is also suitable for studying behavioral addictions, since most gamers are probably familiar with browsing the internet (Wood & Griffiths, 2007).

A select number of materials and measures from the original protocol were used in this study, as described below.

Questionnaire on Sociodemographic Data, Gaming Frequency, Number of Friends (NF), Social Gathering Frequency (SGF), and Physical Exercise (PE)

The research team developed and administered a questionnaire intended to collect:

- sociodemographic data, including age, gender, district of residence, current degree, current year of study, and number of years of formal education;
- *weekly gaming days* with response options ranging from 0 to 7;
- *daily gaming hours*, answered in an open-ended format limited to numbers only;
- FQ was assessed on a scale from 1 (*none*) to 4 (*many*);
- SGF was answered on a scale from 1 (*none*) to 5 (*very frequently*);
- PE through open text entry.

European Portuguese Version of the Internet Gaming Disorder Test (IGD-20; Pontes et al., 2014)

The IGD-20 (Pontes et al., 2014) is a self-report tool designed for the assessment of recurrent and persistent IGD, for both online and offline games, over the course of the past 12 months. It totals 20 items, answered on a 5-point Likert scale: 1 (*totally disagree*), 2 (*disagree*), 3 (*neither agree or disagree*), 4 (*agree*) and 5 (*totally agree*). Scores range from 20 to 100, where a higher level indicates higher IGD. In the original version a cut-off of 71 distinguished non-disordered gamers from disordered ones. Moreover, the items are organized by six factors: salience (items 1, 7 and 13), mood modification (items 2, 8 and

14), tolerance (items 3, 9 and 15), withdrawal symptoms (items 4, 10 and 16), conflict (items 5, 11, 17, 19 and 20) and relapse (items 6, 12 and 18). Only items 2 and 19 are inverted.

Additionally, the internal consistency of the original version as revealed by Cronbach's Alpha was .88.

Finally, the original author, who is bilingual, had already directly translated the scale to European Portuguese.

European Portuguese Version of the Gaming Disorder Test (GDT; Pontes et al., 2021)

The GDT is a short scale that measures the severity of GD, in the past 12 months, based on the ICD-11 criteria (WHO, 2022). It comprises four items, rated on a 5-point scale: 1 (*never*), 2 (*rarely*), 3 (*sometimes*), 4 (*often*) and 5 (*very often*). Scores can range from 4 to 20 with higher scores indicating higher degrees of GD. In order to differentiate disordered gamers from non-disordered gamers, all four items need to be answered with 4 (*often*) and 5 (*very often*).

The GDT was also directly translated by the original author, who is bilingual, and it showed good internal consistency in this sample (ω = .85). The internal consistency coefficient found in this sample is similar to that of the original study, where the Cronbach's Alpha of the overall sample was .84 (Pontes et al., 2021).

Hospital Anxiety and Depression Scale (HADS; European Portuguese validation by Pais-Ribeiro et al., 2007)

The HADS is a 14 item self-report tool that evaluates depressive and anxious affective states (Zigmond & Snaith, 1983). Its items are divided equally by two subscales, anxiety and depression, and are rated from 0 to 3 on a 4-point scale with a variety of possible answers unique to each item. Odd numbered items belong to the anxiety subscale whereas even numbered items pertain to the depression subscale. The total scores of both subscales can range from 0 to 21 with a score of 11 potentially indicating the presence of a mood disorder. Items 1, 3, 5, 6, 8, 10, 11 and 13 are inverted.

Finally, internal consistency for the anxiety and depression subscales showed good (ω = .83) and acceptable scores (ω = .74), respectively. In the original version, Cronbach's alpha for the anxiety scale was acceptable (α = .76) whereas, for the depression scale, it was good (α = .81), differing slightly from this sample.

3. Data Collection and Analysis Procedures

The surveys were created on Qualtrics, version 04-2023 (Qualtrics, Provo, Utah, USA), and hosted in the same platform from June 2022, for a total of 10 months and 10 days.

A total of 1021 participants were recruited through a link shared on Facebook, Instagram and Portuguese internet gaming forums, communities, and Discord servers. Besides these recruitment methods, Higher Education Institutions in the country were contacted via e-mail and asked to share the survey with their respective academic communities. Finally, a snowball sampling method, in which participants were encouraged to recruit other participants, was employed.

The study was approved by the Ethics Committee of the ESS-P.PORTO (CE0100C, see Appendix C), and followed the European Code of Conduct for Research Integrity (ALLEA, 2023) and the General Data Protection Regulation recently approved for EU countries (Regulation 2016/679). All participants actively accepted the informed consent prior to responding. Additionally, in order to enable the sending of a link for the retest and to pair of both sets of responses, the participants could choose to provide their e-mail addresses. All addresses were then associated with a unique Respondent ID and kept separate from other sensitive data. Subsequently, Microsoft Office Excel was used to execute a command line that mass replaced all e-mails with their corresponding IDs in the retest database. Therefore, the investigators only had to access the association key when a participant indicated a different or misspelled e-mail address.

Eight days after completion of the first survey, a link to the retest of IGD-20 was sent to the e-mail addresses previously provided by the participants. The association file containing all e-mails and IDs was destroyed afterwards, alongside the databases downloaded from Qualtrics.

Regarding statistical analysis, every variable of interest was screened for out-of-range values and outliers. The main sample contained two out-of-range values of 0 in the variable *Age* that were replaced with their most likely values, considering the respondent's number of years of formal education, current degree and current year of study. Moreover, five outliers were discovered in the IGD-20 total scores. In the subsample, the variables IGD-20, daily gaming hours, GDT and HADS depression scale showed three, eight, 10 and four outliers, respectively. The variable PE showed nine outliers which belonged to participants with much longer time devoted to physical exercise (>13 weekly hours) than

the remaining sample. All outliers were considered plausible, expected, and naturally occurring. Additionally, the analyses were run with and without the outliers, but no significant differences were found (see Appendix D).

Not all variables were normally distributed, but none deviated heavily from normality (H.-Y. Kim, 2013, see Table 3).

Table 3

Skewness and Kurtosis

Variable	Main Sample (*N* = 556)		Subsample (*n* = 379)		Retest Sample (*n* = 112)	
	Skewness	**Kurtosis**	**Skewness**	**Kurtosis**	**Skewness**	**Kurtosis**
IGD-20	0.71	0.28	0.67	-0.00	0.48	-0.80
Daily gaming hours			1.55	3.83		
Weekly gaming days			0.03	-1.37		
GDT			1.43	2.40		
HADS_A			0.46	-0.45		
HADS_D			0.86	0.92		
Physical exercise			1.60	3.29		

Note. Blank spaces = not applicable in the analyses. HADS_A = anxiety subscale of HADS; HADS_D = depression subscale of HADS; IGD-20_II = Retest phase of the IGD-20.

To test the original six-factor model of the IGD-20, a CFA using Maximum Likelihood with Robust Standard Errors (MLR) was performed. Following model rejection, the modification indices (MI) were analysed and an attempt at respecifying the model was made. Given the rejection of the respecification (i.e., redefining the relations between the variables contained in the model; Kline, 2023), the three-factor solution proposed recently by Faraci et al. (2023) was tested using the Unweighted Least Squares (ULS) estimation method. The ULS was chosen over the Diagonal Weighted Least Squares (DWLS) estimation method because it showed better performance for ordinal measures (Forero et al., 2009). All global fit indices were judged based on commonly used thresholds: Comparative Fit Index (CFI) and Tucker Lewis Index (TLI) were considered acceptable within the .90-.95 margin and excellent when >.95. Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Residual (SRMR) were considered acceptable when values lay within the .06-.08 range, whereas values < .05 were considered excellent (Hu & Bentler, 1999). The assessment of overall and local fit of the models

followed the guidelines proposed by Kline (2023).

To investigate the internal consistency of the scale, a reliability analysis using McDonald's Omega and Cronbach's Alpha was conducted on both models. Cronbach's Alpha is more commonly used, but McDonald's Omega is preferred (Hayes & Coutts, 2020; McNeish, 2018).

In order to verify convergent and concurrent validity, as well as the test-retest reliability, correlational analyses were conducted using Pearson's *r*. Convergent validity was measured by correlating the total scores of the IGD-10SV with both HADS subscales and the total scores of the GDT. Concurrent validity was measured by correlating the total score of the IGD-10SV with both gaming frequency variables, namely daily gaming hours and weekly gaming days. Since all variables contained outliers, Spearman's Rho was also estimated. According to Khamis (2008), Spearman's coefficient is more adequate when one or more assumptions are violated or outliers are present, even though Puth et al. (2015) have argued that the "robustness of approaches based on Pearson's measure makes this approach unnecessary" (p. 78). The results from both coefficients showed very similar results (see Appendix D).

Finally, Kendall's Tau-b was used to test the first two hypotheses. In concordance with Woods (2007), the Kendall's Tau-b is more adequate than Spearman's Rho when conducting a correlation between a continuous variable and a categorical variable with four or five levels. For the third hypothesis, Pearson's *r* was used instead, since both of the involved variables were quantitative.

Both RStudio for R version 4.3.0 (R Core Team, 2023) with the lavaan package (version 0.6-16; Rosseel, 2012) and JASP (version 0.17.3; JASP Team, 2023) were used for the CFA's. Descriptive analyses, internal consistency, convergent validity, criterion validity, test-retest reliability and hypotheses testing were all performed in Jamovi (version 2.3.21; The jamovi project, 2023).

Results

1. Confirmatory Factor Analysis

The six-factor model did not produce an acceptable fit, $\chi^2_{(155,\ N\ =\ 556)} = 498.07$, $p <$

.001; CFI = .899; TLI = .876; RMSEA = .068 (90% CI: .062 — .075); SRMR = .061. An analysis of the MI led to the error correlation of items 6 and 18 (MI = 32.10), because they belonged to the same latent factor and could correlate due to similar wording.

The correlation of the errors of these items produced a marginally acceptable fit: $\chi^2_{(154,\ N = 556)} = 466.62$, $p < .001$; CFI = .908; TLI = .886; RMSEA = .066 (90% CI: .059 — .072); SRMR = .054. However, this model was rejected due to the high chi-square value (although a $\chi^2/df \leq 3$ indicates an acceptable fit according to Kline, 1998) in combination with three inadmissible correlations of > 1 among factors (see Table 4), which produced a covariance matrix not positive-definite.

Table 4

Pattern Coefficients and estimated latent factor correlation matrix

Items	**Latent Factors**					
	Salience	**Mood Modification**	**Tolerance**	**Withdrawal**	**Conflict**	**Relapse**
Item 1	.51					
Item 7	.65					
Item 13	.60					
Item 2		.41				
Item 8		.87				
Item 14		.84				
Item 3			.38			
Item 9			.72			
Item 15			.53			
Item 4				.70		
Item 10				.66		
Item 16				.75		
Item 5					.62	
Item 11					.62	
Item 17					.59	
Item 19					.43	
Item 20					.71	
Item 6						.61
Item 12						.48
Item 18						.61
Salience	-					
Mood Modification	.66	-				
Tolerance	**1.03**	.68	-			

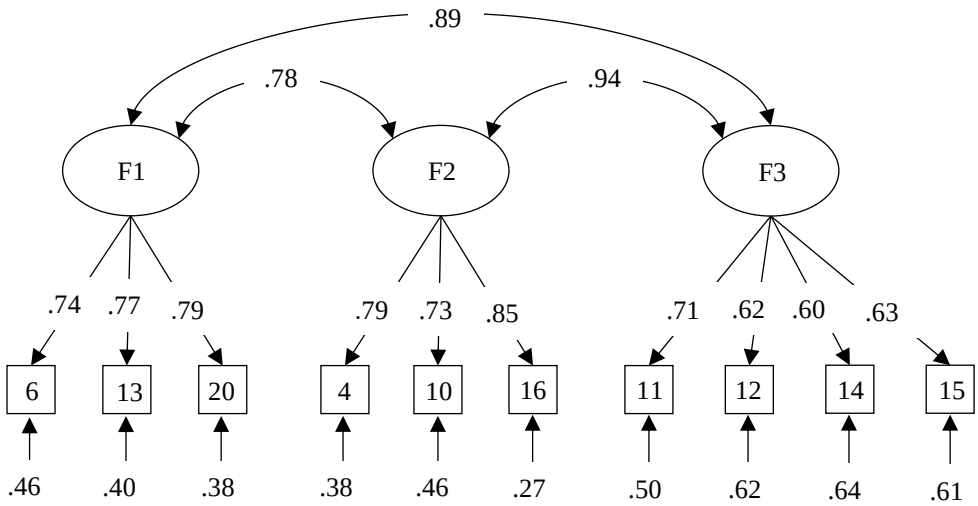
Items	Latent Factors					
	Salience	**Mood Modification**	**Tolerance**	**Withdrawal**	**Conflict**	**Relapse**
Withdrawal	.90	.57	.93	-		
Conflict	.86	.48	.77	.80	-	
Relapse	**1.04**	.62	.90	.87	**1.06**	-

Similar problems were highlighted by Faraci et al. (2023) who found that a three-factor solution best fit their data. Ultimately, a CFA using an ULS estimation method was performed with that model, which yielded acceptable results on a global level: $\chi^2_{(32,\ N\ =\ 556)} = 93.57$, $p < .001$; CFI = .989; TLI = .985; RMSEA = .059 (90% CI: .045 — .073); SRMR = .055. Figure 1 shows the accepted three-factor model with its pattern coefficients. Except for the high correlation between withdrawal and craving, the model was considered satisfactory. Furthermore, an analysis of the residuals' matrix showed six values exceeding .10 (see Table 5), meaning that the model does not account for all of the observed correlations. However, because these items derive from the same instrument, the results are somewhat expected (D. A. Cole, 1987). Additionally, some authors have established cut-offs of .20 in misfit plots (Kordoutis et al., 2021).

Since the model was retained, it was used in the remaining analyses instead of the 20-item version.

Figure 1

Confirmatory factor analysis of the three-factor model of the IGD-10SV



Note. F1 = Prevalence; F2 = Withdrawal; F3 = Craving.

Table 5

Correlation Residuals of the IGD-10SV

Indicator	**6**	**13**	**20**	**4**	**10**	**16**	**11**	**12**	**14**	**15**
Prevalence										
Item 6	-									
Item 13	.07	-								
Item 20	**.13**	.06	-							
Withdrawal										
Item 4	.09	.01	.03	-						
Item 10	.08	.01	**.10**	.02	-					
Item 16	0	0	.02	.02	.01	-				
Craving										
Item 11	.05	0	.09	.04	.09	0	-			
Item 12	.05	**.10**	.08	.08	**.11**	.03	.01	-		
Item 14	0	.02	.02	.07	**.11**	.05	.04	.01	-	
Item 15	**.12**	.03	.04	.03	.09	.03	.06	.04	.08	-

2. Internal Consistency

The overall internal consistency of the IGD-10SV was good in this sample (see Table 6). Contrary to what Faraci et al. (2023) reported, all factors showed only modest internal consistency. Additionally, by excluding Item 13 in the factor Prevalence, both internal consistency coefficients would increase to .75. Consequently, since the value of internal consistency would remain almost the same, and excluding the item would lead to model underidentification (i.e., due to a lack of information in the sample it is impossible to estimate all of the free model parameters; Kline, 2023), the item was not excluded. The Internal Consistency of both CFA models and their factors is represented in Table 6 for comparison.

Table 6

Internal consistency of both scales and their factors

Tool	**Factor**	**α**	**ω**
IGD-10SV	Prevalence	.73	.74
	Withdrawal	.72	.75

Tool	Factor	α	ω
	Craving	.62	.62
	Total	.83	.84
IGD-20	Salience	.62	.62
	Mood Modification	.74	.77
	Tolerance	.49	.61
	Withdrawal Symptoms	.72	.75
	Conflict	.72	.74
	Relapse	.64	.71
	Total	.89	.90

Note. IGD-10SV = Internet Gaming Disorder-10 Short Version; IGD-20 = Internet Gaming Disorder Test

3. Convergent and Criterion Validity

The IGD-10SV showed good convergent validity as evidenced by its significant positive correlation with the GDT, $r_{(377)} = .75$, $p < .001$, and significant, but weak, positive correlations with both anxiety, $r_{(377)} = .18$, $p < .001$, and depression, $r_{(377)} = .28$, $p < .001$, scores of HADS.

Criterion validity was verified via the significant positive moderate correlation with daily gaming hours, $r_{(377)} = .43$, $p < .001$, and the significant positive, though weak correlation with weekly gaming days, $r_{(377)} = .29$, $p < .001$.

4. Test-retest Reliability

The scale showed a significant positive strong correlation with the retest application, $r_{(110)} = .88$, $p < .001$, supporting good test-retest reliability.

5. Hypotheses testing

The IGD-10SV total scores were significantly negatively correlated with the number of friends, however with a very weak relationship, $\tau_{b\,(377)} = -.08$, $p = .02$.

Similarly, the IGD-10SV total scores were significantly negatively correlated with

the social gathering frequency, albeit with a very weak association, $\tau_{b\,(377)} = -.11$, $p = .004$.

Contrary to the remaining hypothesis, the total scores of the IGD-10SV were not negatively correlated with weekly hours of physical exercise, $r_{\,(377)} = -.04$, $p = .248$.

Discussion

This study aimed to validate the Internet Gaming Disorder Test (IGD-20; Pontes et al., 2014) for the Portuguese population as well as study the hypothesized negative associations between the scores of Internet Gaming Disorder (IGD) and the number of friends (NF), social gathering frequency (SGF) and weekly hours of physical exercise (PE). The results challenged the factorial structure of the IGD-20, in favor of a smaller, theoretically updated and culturally adapted scale. Notwithstanding that the IGD-10SV showed good overall internal consistency, convergent validity, criterion validity and test-retest reliability in a Portuguese sample, its factorial structure needs further scrutiny. Moreover, IGD presented very weak negative correlations with the NF and SGF but, contrary to the hypotheses, showed no connection with weekly PE.

In line with previous validation studies (e.g., L. I. Andrade et al., 2022; Cakiroglu & Soylu, 2019; Faraci et al., 2023; Grajewski & Dragan, 2021; Hawi & Samaha, 2017; Yu et al., 2019), the Portuguese version of the IGD-20 struggled to fit within its original conceptual framework and showed very high latent factor intercorrelations. The results of the Confirmatory Factor Analysis (CFA) suggested that some of the concepts outlined initially for this scale tend to overlap and become almost undistinguishable. Moreover, the problems of local fit detected in the correlation matrix are believed to be caused by associations between items that (a) either do not have enough discriminant validity, or (b) are just naturally correlated. Consequently, some items from this scale should be revised to accommodate for a more parsimonious instrument. For instance, the salience and tolerance factors contain several items that pertain to “time” spent gaming, which could explain their systematic overlap.

Alternatively, IGD may not “fit” well enough within the conceptual framework it was initially based on. In other words, perhaps the latent factors of IGD behave differently compared to substance use addictions, leading to a six-factor model of addiction that does not correctly replicate. For example, Griffiths et al. (2016) have stated that:

> The ‘tolerance’ criterion is clearly a consequence of modelling IGD criteria on that of substance disorder criteria and grounded in physiological reasons for requiring a greater intake. Consequently, this may not be as useful an indicator for problematic gaming as for other addictions. (p. 169)

The same authors also contend that other DSM-5 criteria (APA, 2013) are inadequate or poorly understood in their current formulation across several scales. Since the IGD-20 is heavily based on DSM-5 criteria, the mixed results from its subsequent validations might be indicative of those conceptual misunderstandings. One such example is item three: “I have significantly increased the amount of time I play games over last year.”. Belonging to the tolerance latent factor, item three showed the lowest pattern coefficient of the entire scale in this study. Therefore, in the context of IGD, tolerance might not manifest itself as increased time spent gaming, since at a certain point that is no longer possible (Griffiths et al., 2016; Ko, 2014). More item formulations and wording of the DSM-5 criteria (APA, 2013) are contested in several papers, as that is still an ongoing debate (Griffiths et al., 2016; Krossbakken et al., 2017; Kuss et al., 2017; Petry et al., 2014, 2016; Van Rooij & Kardefelt-Winther, 2017). Future studies could evaluate the items of the IGD-20 separately by combining exploratory factor analysis (EFA), CFA, and exploratory structural equation modelling (ESEM) techniques to rule out other potential problems with the scale. The ESEM allows for item intercorrelation, which is probably a more realistic premise than the more stringent CFA assumptions. Additionally, the works of Griffiths et al. (2016) and Van Rooij et al. (2017) discuss interesting suggestions that can aid in the challenging task of modifying or creating items.

Similarly to the Italian validation (Faraci et al., 2023), the internal consistency of the Portuguese IGD-10SV was good overall. However, the factor Craving showed only a modest internal consistency in this study. Moreover, that same factor was highly correlated with Withdrawal and shared correlation residuals with items 12 and 14. This could result from cultural or linguistic differences and should be properly investigated in future studies before research and especially clinical application in Portugal.

Additionally, just like previous studies have concluded, the IGD-10SV scores were positively correlated with anxiety and depression symptoms, even if showing weak positive correlations (Colder Carras et al., 2020; Ostinelli et al., 2021; Stavropoulos et al., 2022; Teng et al., 2021; Yu et al., 2019). The weaker correlations between IGD and symptoms of anxiety and depression could be the result of survey fatigue leading to less thought-out answers by the participants. Since the HADS was the last instrument presented

in a long questionnaire, both subscales could have suffered from this effect, leading to lower coefficients. The weaker correlations could also indicate discriminant validity. Unfortunately, without a clinical sample to compare the results to, it is not possible to assert whether anxiety and depression are more prevalent in disordered gamers than they are in the remaining population. Still, these results add to the convergent validity of the IGD-10SV and support the association between anxiety, depression and IGD. The very high association with the GDT also advocates for convergent validity of the scale. However, this assertion needs to be taken with caution as the GDT lacks a proper Portuguese validation. Their very high association in this sample shows that, at the very least, they measure analogous constructs. Other validation studies have reported similar high correlations between the IGD scale and measures of established problematic gaming or internet related behavior scales (Faraci et al., 2023; B.-N. Kim, 2019; Yu et al., 2019).

In order to further test this instrument's validity in Portugal, as well as the negative effects of IGD, future studies could implement additional measures of loneliness, stress, social interaction anxiety, self-esteem and perceived social support, as Faraci et al. (2023) have done.

The statistically significant positive and moderate correlation of the IGD-10SV with daily gaming hours is reminiscent of the criterion validity set by the Italian validation (Faraci et al., 2023). Together with the weaker, but statistically significant correlation with weekly gaming days, the results suggest a satisfactory criterion validity for this scale. However, as B.-N. Kim (2019) have theorized, gaming frequency may be too dependent on sample characteristics to be used as the best possible criterion for IGD. For example, gamers may play on specific days, such as weekends, for longer periods of time, while attending to other responsibilities during the rest of the week. This could explain the weaker correlation between IGD and weekly days engaged in gaming activities, as playing weekly requires juggling other psychosocial responsibilities for non-disordered gamers. Moreover, playing daily may not be related to any pathology whatsoever since gamers can play daily, but still not neglect any important aspects of their lives. Potentially, including a clinical sample of gamers with severe problematic gaming could reveal a higher association between both measures of gaming frequency, as the neglect of real-life responsibilities would be more prevalent. Alternatively, and as B.-N. Kim (2019) has outlined, "the core component of addiction might lie in the dysfunctional rather than excessive nature of engagement" (p. 5).

Additionally, if professional e-sports players or streamers are accounted for, more

days and longer time devoted to gaming activity would not necessarily be indicative of a higher correlation with problematic gaming. In that case, gaming would be considered a full-time job that requires a long time engaged in videogames, instead of a disorder (Maldonado-Murciano et al., 2022). This reasoning could also explain the findings, but since these gamers were not differentiated from the remaining participants in this study, it remains a conjecture. Until more stringent criteria and a "gold standard" is established in the area, this is the most widely defined approximation for criterion validity. Subsequently, it is considered that the IGD-10SV showed good enough criterion validity in this study.

Regarding test-retest reliability, the IGD-10SV showed good temporal stability for the eight days of difference between responses. Despite the good results, it is important to note that the interval between responses might have been too low, meaning that most participants probably still remembered their responses. Consequently, future researchers could try a 2-weeks interval between responses, like most similar instrument validations (King et al., 2020). This procedure supports that enough time has passed that the disordered behavior persists, but participants do not remember most of their responses. It is worth mentioning, however, that Marx et al. (2003) found no significant differences between the retest coefficients for 2-day and 2-weeks intervals.

Finally, our hypotheses were only partially verified in this sample. Both the measures of NF and SGF were negatively correlated with IGD scores, which seems to indicate that people with higher levels of problematic gaming have less friends and socialize less with their peers. These results are in line with Paulus et al.'s (2018) meta-analysis. Nevertheless, caution is warranted while interpreting these associations, as the effect sizes in the present study were very low. The lower correlations could be associated with the replacement of real-world friendships with similarly gratifying ones in the virtual world, like Sublette and Mullan (2012) have previously suggested. Additionally, both measures of friendship quality were probably lackluster in capturing other parts of the social world, such as satisfaction with friendships and social situations. While some people may consider having "many" friends and "going out" a lot as something positive, others might prefer lower amounts of both. Whether or not these relationships are fulfilling is probably more important in detecting the deleterious effects of IGD.

In this sample, the weekly hours of PE were not correlated with IGD scores, suggesting that the weekly practice of PE does not increase or decrease with the level of IGD. These results are in line with other studies that found no association between both variables (Bickham et al., 2013; Männikkö et al., 2015; Wack & Tantleff-Dunn, 2009).

One possible explanation for this phenomenon is that individuals without IGD are as sedentary as individuals with the disorder, in an ever-growing world where people are less physically active than recommended (OECD/WHO, 2023). In order to test this hypothesis, comparisons between clinical samples and control groups would be beneficial.

This study is not without limitations. Firstly, the data gathering protocol was lengthy, which could have had negative effects on the quality of the collected data. It is known that higher rates of non-responses, missing values or incomplete surveys increase with the length of the evaluation protocol (Chudoba, n.d.; Sharma, 2022). The HADS was probably the most affected instrument, because it was in the last section of the survey and no measures, such as section randomization, were taken to ensure response reliability. Future studies should consider smaller sections of the protocol to preserve the participants' interest and increase sample size. Researchers should also consider randomizing the instruments to control for participants' fatigue and order effects.

The forced-response format used in the survey may have also impacted the sample size (Stieger et al., 2007) as participants were forced to full completion and more people dropped. This decision was done with the intent of limiting the number of missing values; however, having a shorter survey would have been a better option.

The self-report nature of the protocol also presents biases well-known in the literature (e.g., social desirability, acquiescent responding, recall bias). These biases induce measurement error that may affect the reliability of the results (Kreitchmann et al., 2019). Future studies are advised to compare the results with those of clinical interviews and diagnostics to control for self-report bias. Alternatively, including social desirability scales may help in the identification of this type of bias.

In addition, the protocol was completely hosted online, which may generate self-selection bias and difficulty in describing the population (C. Andrade, 2020). The disadvantages of online surveys include the possibility for multiple responses, false demographic information, the requirement of internet connection and a device to participate. However, according to Wood and Griffiths (2007) these issues are alike those encountered in pen and paper surveys.

This study recruited a convenience sample and employed a non-probability snowball sampling method. Consequently, it is not possible to assert that it was representative or random, limiting the generalizability of the results. Moreover, despite the best efforts of the research team, gender, age and national representativeness were not achieved. Future studies should balance demographic characteristics to ensure a more

representative sample and generalizable results.

Furthermore, the CFA estimation method utilized for the three-factor model differed from the one used in the Italian validation. When measuring ordinal variables, while some argue that Maximum Likelihood (ML) or MLR perform well for five or more response levels (Rhemtulla et al., 2012), others advocate for the use of Weighted Least Squares Mean and Variance Adjusted (WLSMV), ULS or DWLS instead (Beauducel & Herzberg, 2006; Forero et al., 2009; Koğar & Yilmaz Koğar, 2015; Li, 2016), as it was done in this study. With the use of ML, the results might differ significantly. As such, additional analyses of these results or a thorough comparison and exploration of the factorial structure of the scale is important before further clinical or research application.

Due to time and planning constraints, this study could not deeply explore the factorial structure of the IGD-20 with more advanced and recent methods. Future researchers should first explore the scale via EFA and later confirm its results with another sample. Also, the global fit thresholds for model assessment were based on commonly established values, which are considered less reliable when the exact-fit test fails (Kline, 2023). Hence, an analysis with ESEM techniques, as previously stated, might be a good way to assess the factorial structure of the scale in the future. Additionally, including a clinical sample would be very important to establish a proper cut-off score for clinical screening and differentiate highly engaged gamers from disordered ones.

Thus, the current version is adapted the Portuguese population, but its validation is still an on-going process.

Conclusion

Perhaps as a symptom of the conceptual ambiguities surrounding IGD, the validation studies of the IGD-20 seem to systematically struggle to adjust to its original conceptual model. In its current formulation, the items of the full scale do not seem to replicate sufficiently well across different cultures, suggesting that some dimensions and items are not well suited to measure the construct as they are currently presented.

In this study, the IGD-10SV seemed like an overall better option than the full 20-item scale when considering their fit to a factorial structure rooted in a theoretical framework of addiction. The smaller version of the scale showed moderate internal

consistency and good convergent validity, criterion validity, and test-retest reliability, supporting its possible adequacy in measuring IGD in the Portuguese population. Globally considered, the results of this study favour the revision of the items of the 20-item scale and its conceptual framework to establish a more adequate factorial structure.

Moreover, this study suggests that people with higher levels of IGD tend to report having less friends as well as meeting with them less often, but the IGD total scores were not associated with the practice of PE in this sample.

The IGD field of study needs a consensus over what aspects characterize the disorder and how to best assess them. One way of approaching a consensus, other than conceptual debate, is through the statistical evaluation of assessment scales and item performance across cultures. Despite its limitations, this study is a useful step towards that end.

References

ALLEA. (2023). The European Code of Conduct for Research Integrity – Revised Edition 2023. https://doi.org/http://www.doi.org/10.26356/ECOC

American Psychiatric Association. (2013). Diagnostic and Statistical Manual of Mental Disorders (5th ed.). American Psychiatric Association. https://doi.org/10.1176/appi.books.9780890425596

Andrade, C. (2020). The Limitations of Online Surveys. Indian Journal of Psychological Medicine, 42(6), 575–576. https://doi.org/10.1177/0253717620957496

Andrade, L. I., Viñán-Ludeña, M. S., & Alvarado, J. (2022). Psychometric Validation of the Internet Gaming Disorder-20 Test among Ecuadorian Teenagers and Young People. International Journal of Environmental Research and Public Health, 19(9), Article 5109. https://doi.org/10.3390/ijerph19095109

Ayenigbara, I. O. (2018). Gaming Disorder and Effects of Gaming on Health: An Overview. Journal of Addiction Medicine and Therapeutic Science, 001–003. https://doi.org/10.17352/2455-3484.000025

Balhara, Y. P. S., Singh, S., Saini, R., Kattula, D., Chukkali, S., & Bhargava, R. (2020). Development and validation of gaming disorder and hazardous gaming scale (GDHGS) based on the WHO framework (ICD-11 criteria) of disordered gaming. Asian Journal of Psychiatry, 54, Article 102348. https://doi.org/10.1016/j.ajp.2020.102348

Ballard, M., Gray, M., Reilly, J., & Noggle, M. (2009). Correlates of video game screen time among males: Body mass, physical activity, and other media use. Eating Behaviors, 10(3), 161–167. https://doi.org/10.1016/j.eatbeh.2009.05.001

Barrangou-Poueys-Darlas, M., Cabelguen, C., Garrouste, V., Leboucher, J., Rocher, B., Challet-Bouju, G., & Grall-Bronnec, M. (2022). Gaming Disorder Seen Through the Prism of Dual Diagnosis: Prevalence and Associated Factors. Frontiers in Psychiatry, 13. https://doi.org/10.3389/fpsyt.2022.821432

Barroso, T. M. M. D. de A., Baptista, E. de C., Viegas, P. M. P., & Gradil, S. de J. (2011). Tradução e adaptação da Escala de adição ao Jogo Electrónico: estudo realizado numa amostra de adolescentes portugueses [Atas de Eventos Científicos]. http://repositorio.esenfc.pt/?url=mbiDLC

Beauducel, A., & Herzberg, P. Y. (2006). On the Performance of Maximum Likelihood Versus Means and Variance Adjusted Weighted Least Squares Estimation in CFA. Structural Equation Modeling: A Multidisciplinary Journal, 13(2), 186–203. https://doi.org/10.1207/s15328007sem1302_2

Beirão, D., Sousa, T., Assunção, P., Malheiro, A., & Gonzaga, D. (2019). Perturbação de Jogos de Internet: Revisão da Evidência Científica. Gazeta Médica, 6(3), 169–178. https://doi.org/10.29315/gm.v6i3.268

Bickham, D. S., Blood, E. A., Walls, C. E., Shrier, L. A., & Rich, M. (2013). Characteristics of Screen Media Use Associated With Higher BMI in Young Adolescents. Pediatrics, 131(5), 935–941. https://doi.org/10.1542/peds.2012-1197

Bocci, F., Ferrari, A., & Sarini, M. (2023). Putting the Gaming Experience at the Center of the Therapy—The Video Game Therapy® Approach. Healthcare, 11(12), Article 1767. https://doi.org/10.3390/healthcare11121767

Böckenholt, U., & Lehmann, D. R. (2015). On the limits of research rigidity: the number of items in a scale. Marketing Letters, 26(3), 257–260. https://doi.org/10.1007/s11002-015-9373-y

Boot, W. R., Kramer, A. F., Simons, D. J., Fabiani, M., & Gratton, G. (2008). The effects of video game playing on attention, memory, and executive control. Acta Psychologica, 129(3), 387–398. https://doi.org/10.1016/j.actpsy.2008.09.005

Borges, G., Orozco, R., Benjet, C., Martínez Martínez, K. I., Contreras, E. V., Jiménez Pérez, A. L., Peláez Cedrés, A. J., Hernández Uribe, P. C., Díaz Couder, M. A. C., Gutierrez-Garcia, R. A., Quevedo Chavez, G. E., Albor, Y., Mendez, E., Medina-Mora, M. E., Mortier, P., & Rumpf, H.-J. (2019). DSM-5 Internet gaming disorder among a sample of Mexican first-year college students. Journal of Behavioral Addictions, 8(4), 714–724. https://doi.org/10.1556/2006.8.2019.62

Bullock, V. E., Griffiths, P., Sherar, L. B., & Clemes, S. A. (2017). Sitting time and obesity in a sample of adults from Europe and the USA. Annals of Human Biology, 44(3), 230–236. https://doi.org/10.1080/03014460.2016.1232749

Cakiroglu, S., & Soylu, N. (2019). Adaptation of Internet Gaming Disorder Questionnaire to Turkish: Reliability and Validity Study. Turkish Journal of Psychiatry, 30(2), 130–136. https://doi.org/10.5080/u23537

Caretti, V., Craparo, G., & Schimmenti, A. (2008). Psicodinamica delle dipendenze patologiche. Noos. Aggiornamenti in Psichiatria, 2, 107–116.

Chudoba, B. (n.d.). How long should a survey be? What is the ideal survey length? SurveyMonkey. Retrieved August 28, 2023, from https://www.surveymonkey.com/curiosity/survey_completion_times/

Colder Carras, M., Shi, J., Hard, G., & Saldanha, I. J. (2020). Evaluating the quality of evidence for gaming disorder: A summary of systematic reviews of associations between gaming disorder and depression or anxiety. PLOS ONE, 15(10), e0240032. https://doi.org/10.1371/journal.pone.0240032

Colder Carras, M., Van Rooij, A. J., Spruijt-Metz, D., Kvedar, J., Griffiths, M. D., Carabas, Y., & Labrique, A. (2018). Commercial Video Games As Therapy: A New Research Agenda to Unlock the Potential of a Global Pastime. Frontiers in Psychiatry, 8, 1–7. https://doi.org/10.3389/fpsyt.2017.00300

Cole, D. A. (1987). Utility of confirmatory factor analysis in test validation research. Journal of Consulting and Clinical Psychology, 55(4), 584–594. https://doi.org/10.1037/0022-006X.55.4.584

Cole, J. C., Rabin, A. S., Smith, T. L., & Kaufman, A. S. (2004). Development and Validation of a Rasch-Derived CES-D Short Form. Psychological Assessment, 16(4), 360–372. https://doi.org/10.1037/1040-3590.16.4.360

Darvesh, N., Radhakrishnan, A., Lachance, C. C., Nincic, V., Sharpe, J. P., Ghassemi, M., Straus, S. E., & Tricco, A. C. (2020). Exploring the prevalence of gaming disorder and Internet gaming disorder: a rapid scoping review. Systematic Reviews, 9(1), Article 68. https://doi.org/10.1186/s13643-020-01329-2

Demetrovics, Z., Király, O., Koronczai, B., Griffiths, M. D., Nagygyörgy, K., Elekes, Z., Tamás, D., Kun, B., Kökönyei, G., & Urbán, R. (2016). Psychometric Properties of the Problematic Internet Use Questionnaire Short-Form (PIUQ-SF-6) in a Nationally Representative Sample of Adolescents. PLOS ONE, 11(8), e0159409. https://doi.org/10.1371/journal.pone.0159409

Demetrovics, Z., Urbán, R., Nagygyörgy, K., Farkas, J., Griffiths, M. D., Pápay, O., Kökönyei, G., Felvinczi, K., & Oláh, A. (2012). The Development of the Problematic Online Gaming Questionnaire (POGQ). PLoS ONE, 7(5), e36417. https://doi.org/10.1371/journal.pone.0036417

Dullur, P., Krishnan, V., & Diaz, A. M. (2021). A systematic review on the intersection of attention-deficit hyperactivity disorder and gaming disorder. Journal of Psychiatric Research, 133, 212–222. https://doi.org/10.1016/j.jpsychires.2020.12.026

DuPaul, G. J. (1991). Parent and Teacher Ratings of ADHD Symptoms: Psychometric Properties in a Community-Based Sample. Journal of Clinical Child Psychology, 20(3), 245–253. https://doi.org/10.1207/s15374424jccp2003_3

Faraci, P., Bottaro, R., Nasonte, G., Valenti, G. D., & Craparo, G. (2023). A New Short Version of Internet Gaming Disorder-20: An Exploratory Structural Equation Modeling. Clinical Neuropsychiatry, 20(3), 205–218. https://doi.org/10.36131/cnfioritieditore20230305

Finserås, T. R., Pallesen, S., Mentzoni, R. A., Krossbakken, E., King, D. L., & Molde, H. (2019). Evaluating an Internet Gaming Disorder Scale Using Mokken Scaling Analysis. Frontiers in Psychology, 10, Article 911. https://doi.org/10.3389/fpsyg.2019.00911

Forero, C. G., Maydeu-Olivares, A., & Gallardo-Pujol, D. (2009). Factor Analysis with Ordinal Indicators: A Monte Carlo Study Comparing DWLS and ULS Estimation. Structural Equation Modeling: A Multidisciplinary Journal, 16(4), 625–641. https://doi.org/10.1080/10705510903203573

Fuster, H., Carbonell, X., Pontes, H. M., & Griffiths, M. D. (2016). Spanish validation of the Internet Gaming Disorder-20 (IGD-20) Test. Computers in Human Behavior, 56, 215–224. https://doi.org/10.1016/j.chb.2015.11.050

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

Gentile, D. A., Choo, H., Liau, A., Sim, T., Li, D., Fung, D., & Khoo, A. (2011). Pathological Video Game Use Among Youths: A Two-Year Longitudinal Study. Pediatrics, 127(2), 319–329. https://doi.org/10.1542/peds.2010-1353

Gioia, F., Colella, G. M., & Boursier, V. (2022). Evidence on Problematic Online Gaming and Social Anxiety over the Past Ten Years: a Systematic Literature Review. Current Addiction Reports, 9(1), 32–47. https://doi.org/10.1007/s40429-021-00406-3

González-Bueso, V., Santamaría, J., Fernández, D., Merino, L., Montero, E., & Ribas, J. (2018). 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(4), 668. https://doi.org/10.3390/ijerph15040668

Grajewski, P., & Dragan, M. (2021). Polish Validation of the Internet Gaming Disorder-20 (IGD-20) Test. Psychiatria Polska, 55(6), 1275–1292. https://doi.org/10.12740/PP/125656

Green, C. S., & Bavelier, D. (2015). Action video game training for cognitive enhancement. Current Opinion in Behavioral Sciences, 4, 103–108. https://doi.org/10.1016/j.cobeha.2015.04.012

Griffiths, M. D. (2005). A 'components' model of addiction within a biopsychosocial framework. Journal of Substance Use, 10(4), 191–197. https://doi.org/10.1080/14659890500114359

Griffiths, M. D., King, D. L., & Demetrovics, Z. (2014). DSM-5 internet gaming disorder needs a unified approach to assessment. Neuropsychiatry, 4(1), 1–4. https://doi.org/10.2217/npy.13.82

Griffiths, M. D., Van Rooij, A. J., Kardefelt-Winther, D., Starcevic, V., Király, O., Pallesen, S., Müller, K., Dreier, M., Colder Carras, M., Prause, N., King, D. L., Aboujaoude, E., Kuss, D. J., Pontes, H. M., Lopez Fernandez, O., Nagygyorgy, K., Achab, S., Billieux, J., Quandt, T., … Demetrovics, Z. (2016). Working towards an international consensus on criteria for assessing internet gaming disorder: a critical commentary on Petry et al. (2014). Addiction, 111(1), 167–175. https://doi.org/10.1111/add.13057

Hawi, N. S., & Samaha, M. (2017). Validation of the Arabic Version of the Internet Gaming Disorder-20 Test. Cyberpsychology, Behavior, and Social Networking, 20(4), 268–272. https://doi.org/10.1089/cyber.2016.0493

Hayes, A. F., & Coutts, J. J. (2020). Use Omega Rather than Cronbach's Alpha for Estimating Reliability. But…. Communication Methods and Measures, 14(1), 1–24. https://doi.org/10.1080/19312458.2020.1718629

Henchoz, Y., Studer, J., Deline, S., N'Goran, A. A., Baggio, S., & Gmel, G. (2016). Video Gaming Disorder and Sport and Exercise in Emerging Adulthood: A Longitudinal Study. Behavioral Medicine, 42(2), 105–111. https://doi.org/10.1080/08964289.2014.965127

Heng, S., Zhao, H., & Wang, M. (2021). In-game Social Interaction and Gaming Disorder: A Perspective From Online Social Capital. Frontiers in Psychiatry, 11. https://doi.org/10.3389/fpsyt.2020.468115

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation

Modeling: A Multidisciplinary Journal, 6(1), 1–55. https://doi.org/10.1080/10705519909540118

Huang, X., Shi, H., Li, H., Guo, W., Luo, D., & Xu, J. (2022). Differential Effects of Anxiety on Internet Gaming Disorder: A Large-Scale Cross-Sectional Survey. Frontiers in Psychiatry, 12, Article 2611. https://doi.org/10.3389/fpsyt.2021.802513

Huard Pelletier, V., Lessard, A., Piché, F., Tétreau, C., & Descarreaux, M. (2020). Video games and their associations with physical health: a scoping review. BMJ Open Sport & Exercise Medicine, 6(1), Article e000832. https://doi.org/10.1136/bmjsem-2020-000832

JASP Team. (2023). JASP (Version 0.17.3) [Computer software]. https://jasp-stats.org/

Jo, S.-J., Jeong, H., Son, H. J., Lee, H. K., Lee, S.-Y., Kweon, Y.-S., & Yim, H. W. (2020). Diagnostic usefulness of an ultra-brief screener to identify risk of online gaming disorder for children and adolescents. Psychiatry Investigation, 17(8), 762–768. https://doi.org/10.30773/pi.2019.0279

Jo, S.-J., Yim, H. W., Lee, H.-K., Lee, H. C., Choi, J.-S., & Baek, K.-Y. (2018). The Internet Game Use-Elicited Symptom Screen proved to be a valid tool for adolescents aged 10-19 years. Acta Paediatrica, 107(3), 511–516. https://doi.org/10.1111/apa.14087

Karhulahti, V.-M., Martončik, M., & Adamkovič, M. (2023). Measuring Internet Gaming Disorder and Gaming Disorder: A Qualitative Content Validity Analysis of Validated Scales. Assessment, 30(2), 402–413. https://doi.org/10.1177/10731911211055435

Khamis, H. (2008). Measures of Association: How to Choose? Journal of Diagnostic Medical Sonography, 24(3), 155–162. https://doi.org/10.1177/8756479308317006

Kim, B.-N. (2019). Korean Validation of the Internet Gaming Disorder-20 Test. Cyberpsychology, Behavior, and Social Networking, 22(4), 271–276. https://doi.org/10.1089/cyber.2018.0096

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

Kim, H.-Y. (2013). Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. Restorative Dentistry & Endodontics, 38(1), 52–54. https://doi.org/10.5395/rde.2013.38.1.52

Kim, S., Champion, K. E., Gardner, L. A., Teesson, M., Newton, N. C., & Gainsbury, S. M. (2022). The directionality of anxiety and gaming disorder: An exploratory analysis of longitudinal data from an Australian youth population. Frontiers in Psychiatry, 13, Article 2522. https://doi.org/10.3389/fpsyt.2022.1043490

King, D. L., Chamberlain, S. R., Carragher, N., Billieux, J., Stein, D., Mueller, K., Potenza, M. N., Rumpf, H. J., Saunders, J., Starcevic, V., Demetrovics, Z., Brand, M., Lee, H. K., Spada, M., Lindenberg, K., Wu, A. M. S., Lemenager, T., Pallesen, S., Achab, S., … Delfabbro, P. H. (2020). Screening and assessment tools for gaming disorder: A comprehensive systematic review. Clinical Psychology Review, 77, Article 101831. https://doi.org/10.1016/j.cpr.2020.101831

King, D. L., & Delfabbro, P. H. (2016). The Cognitive Psychopathology of Internet Gaming Disorder in Adolescence. Journal of Abnormal Child Psychology, 44(8), 1635–1645. https://doi.org/10.1007/s10802-016-0135-y

Király, O., Griffiths, M. D., & Demetrovics, Z. (2015). Internet Gaming Disorder and the DSM-5: Conceptualization, Debates, and Controversies. Current Addiction Reports, 2(3), 254–262. https://doi.org/10.1007/s40429-015-0066-7

Király, O., Koncz, P., Griffiths, M. D., & Demetrovics, Z. (2023). Gaming disorder: A summary of its characteristics and aetiology. Comprehensive Psychiatry, 122, Article 152376. https://doi.org/10.1016/j.comppsych.2023.152376

Király, O., Sleczka, P., Pontes, H. M., Urbán, R., Griffiths, M. D., & Demetrovics, Z. (2017). Validation of the Ten-Item Internet Gaming Disorder Test (IGDT-10) and evaluation of the nine DSM-5 Internet Gaming Disorder criteria. Addictive Behaviors, 64, 253–260. https://doi.org/10.1016/j.addbeh.2015.11.005

Kircaburun, K., Pontes, H. M., Stavropoulos, V., & Griffiths, M. D. (2020). A brief psychological overview of disordered gaming. Current Opinion in Psychology, 36, 38–43. https://doi.org/10.1016/j.copsyc.2020.03.004

Kline, R. B. (1998). Principles and practice of structural equation modeling. In Principles and practice of structural equation modeling. Guilford Press.

Kline, R. B. (2023). Principles and Practice of Structural Equation Modeling (5th ed.). Guilford Press.

Ko, C.-H. (2014). Internet Gaming Disorder. Current Addiction Reports, 1(3), 177–185. https://doi.org/10.1007/s40429-014-0030-y

Ko, C.-H., Lin, H.-C., Lin, P.-C., & Yen, J.-Y. (2020). Validity, functional impairment and complications related to Internet gaming disorder in the DSM-5 and gaming

disorder in the ICD-11. Australian & New Zealand Journal of Psychiatry, 54(7), 707–718. https://doi.org/10.1177/0004867419881499

Koğar, H., & Yilmaz Koğar, E. (2015). Comparison of Different Estimation Methods for Categorical and Ordinal Data in Confirmatory Factor Analysis. Eğitimde ve Psikolojide Ölçme ve Değerlendirme Dergisi, 6(2). https://doi.org/10.21031/epod.94857

Kordoutis, P., Daoultzis, K. C., Argyroudi, A., & Masoura, E. (2021). Perceptions of love and sex in young and middle Greek adults, relationship satisfaction and duration. https://doi.org/https://doi.org/10.31234/osf.io/bryk7

Kovacs, M. (2015). Children's Depression Inventory (CDI and CDI 2). In R.L. Cautin & S.O. Lilienfeld (Eds.), The Encyclopedia of Clinical Psychology. Wiley. https://doi.org/10.1002/9781118625392.wbecp419

Kovbasiuk, A., Lewandowska, P., Brzezicka, A., & Kowalczyk-Grębska, N. (2022). Neuroanatomical predictors of complex skill acquisition during video game training. Frontiers in Neuroscience, 16. https://doi.org/10.3389/fnins.2022.834954

Kreitchmann, R. S., Abad, F. J., Ponsoda, V., Nieto, M. D., & Morillo, D. (2019). Controlling for Response Biases in Self-Report Scales: Forced-Choice vs. Psychometric Modeling of Likert Items. Frontiers in Psychology, 10, Article 2309. https://doi.org/10.3389/fpsyg.2019.02309

Krossbakken, E., Pallesen, S., Molde, H., Mentzoni, R. A., & Finserås, T. R. (2017). Not good enough? Further comments to the wording, meaning, and the conceptualization of Internet Gaming Disorder. Journal of Behavioral Addictions, 6(2), 114–117. https://doi.org/10.1556/2006.6.2017.013

Kuss, D. J., Griffiths, M. D., & Pontes, H. M. (2017). Chaos and confusion in DSM-5 diagnosis of Internet Gaming Disorder: Issues, concerns, and recommendations for clarity in the field. Journal of Behavioral Addictions, 6(2), 103–109. https://doi.org/10.1556/2006.5.2016.062

Laconi, S., Pirès, S., & Chabrol, H. (2017). Internet gaming disorder, motives, game genres and psychopathology. Computers in Human Behavior, 75, 652–659. https://doi.org/10.1016/j.chb.2017.06.012

Lemmens, J. S., Valkenburg, P. M., & Gentile, D. A. (2015). The Internet Gaming Disorder Scale. Psychological Assessment, 27(2), 567–582. https://doi.org/10.1037/pas0000062

Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2009). Development and Validation of a Game Addiction Scale for Adolescents. Media Psychology, 12(1), 77–95. https://doi.org/10.1080/15213260802669458

Lesieur, H. R., & Blume, S. B. (1987). The South Oaks Gambling Screen (SOGS): a new instrument for the identification of pathological gamblers. The American Journal of Psychiatry, 144(9), 1184–1188. https://doi.org/https://doi.org/10.1176/ajp.144.9.1184

Li, C.-H. (2016). The performance of ML, DWLS, and ULS estimation with robust corrections in structural equation models with ordinal variables. Psychological Methods, 21(3), 369–387. https://doi.org/10.1037/met0000093

Lopes, H. (2008). Versão Portuguesa da Escala SOGS. Calibração para a população Portuguesa. Centro de Estudos Aplicados da Faculdade de Ciências Económicas e Empresariais da Universidade Católica Portuguesa.

Mahon-Daly, S., & Jeyasingam, N. (2021). A narrative literature review: the application of video games as therapeutic tools for psychological therapy. Australasian Psychiatry, 29(6), 614–616. https://doi.org/10.1177/10398562211022751

Maldonado-Murciano, L., Guilera, G., Montag, C., & Pontes, H. M. (2022). Disordered gaming in esports: Comparing professional and non-professional gamers. Addictive Behaviors, 132, Article 107342. https://doi.org/10.1016/j.addbeh.2022.107342

Männikkö, N., Billieux, J., & Kääriäinen, M. (2015). Problematic digital gaming behavior and its relation to the psychological, social and physical health of Finnish adolescents and young adults. Journal of Behavioral Addictions, 4(4), 281–288. https://doi.org/10.1556/2006.4.2015.040

Marx, R. G., Menezes, A., Horovitz, L., Jones, E. C., & Warren, R. F. (2003). A comparison of two time intervals for test-retest reliability of health status instruments. Journal of Clinical Epidemiology, 56(8), 730–735. https://doi.org/10.1016/S0895-4356(03)00084-2

McNeish, D. (2018). Thanks coefficient alpha, We'll take it from here. Psychological Methods, 23(3), 412–433. https://doi.org/10.1037/met0000144

Mestre-Bach, G., Fernandez-Aranda, F., & Jiménez-Murcia, S. (2022). Exploring Internet gaming disorder: an updated perspective of empirical evidence (from 2016 to 2021). Comprehensive Psychiatry, 116, Article 152319. https://doi.org/10.1016/j.comppsych.2022.152319

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., Schivinski, B., & Pontes, H. M. (2021). Is the proposed distinction of gaming disorder into a predominantly online vs. offline form meaningful? Empirical evidence from a large German speaking gamer sample. Addictive Behaviors Reports, 14, Article 100391. https://doi.org/10.1016/j.abrep.2021.100391

OECD/WHO. (2023). Step Up! Tackling the Burden of Insufficient Physical Activity in Europe. OECD. https://doi.org/10.1787/500a9601-en

Ostinelli, E. G., Zangani, C., Giordano, B., Maestri, D., Gambini, O., D'Agostino, A., Furukawa, T. A., & Purgato, M. (2021). Depressive symptoms and depression in individuals with internet gaming disorder: A systematic review and meta-analysis. Journal of Affective Disorders, 284, 136–142. https://doi.org/10.1016/j.jad.2021.02.014

Pais-Ribeiro, J., Silva, I., Ferreira, T., Martins, A., Meneses, R., & Baltar, M. (2007). Validation study of a Portuguese version of the Hospital Anxiety and Depression Scale. Psychology, Health & Medicine, 12(2), 225–237. https://doi.org/10.1080/13548500500524088

Paschke, K., Austermann, M. I., & Thomasius, R. (2020). Assessing ICD-11 Gaming Disorder in Adolescent Gamers: Development and Validation of the Gaming Disorder Scale for Adolescents (GADIS-A). Journal of Clinical Medicine, 9(4), Article 993. https://doi.org/10.3390/jcm9040993

Patrick, C. J., Fowles, D. C., & Krueger, R. F. (2009). Triarchic conceptualization of psychopathy: developmental origins of disinhibition, boldness, and meanness. Development and Psychopathology, 21(3), 913–938. https://doi.org/10.1017/S0954579409000492

Paulus, F. W., Ohmann, S., von Gontard, A., & Popow, C. (2018). Internet gaming disorder in children and adolescents: a systematic review. Developmental Medicine & Child Neurology, 60(7), 645–659. https://doi.org/10.1111/dmcn.13754

Pearcy, B. T. D., Roberts, L. D., & McEvoy, P. M. (2016). Psychometric Testing of the Personal Internet Gaming Disorder Evaluation-9: A New Measure Designed to Assess Internet Gaming Disorder. Cyberpsychology, Behavior, and Social Networking, 19(5), 335–341. https://doi.org/10.1089/cyber.2015.0534

Peters, L., Sunderland, M., Andrews, G., Rapee, R. M., & Mattick, R. P. (2012). Development of a short form Social Interaction Anxiety (SIAS) and Social Phobia Scale (SPS) using nonparametric item response theory: The SIAS-6 and the SPS-6. Psychological Assessment, 24(1), 66–76. https://doi.org/10.1037/a0024544

Petry, N. M., Rehbein, F., Gentile, D. A., Lemmens, J. S., Rumpf, H., Mößle, T., Bischof, G., Tao, R., Fung, D. S. S., Borges, G., Auriacombe, M., González-Ibáñez, A., Tam, P., & O'Brien, C. P. (2016). Griffiths et al.'s comments on the international consensus statement of internet gaming disorder: furthering consensus or hindering progress? Addiction, 111(1), 175–178. https://doi.org/10.1111/add.13189

Petry, N. M., Rehbein, F., Gentile, D. A., Lemmens, J. S., Rumpf, H.-J., Mößle, T., Bischof, G., Tao, R., Fung, D. S. S., Borges, G., Auriacombe, M., González Ibáñez, A., Tam, P., & 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

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

Pontes, H. M., & Griffiths, M. D. (2016). Portuguese Validation of the Internet Gaming Disorder Scale–Short-Form. Cyberpsychology, Behavior, and Social Networking, 19(4), 288–293. https://doi.org/10.1089/cyber.2015.0605

Pontes, H. M., Király, O., Demetrovics, Z., & Griffiths, M. D. (2014). The Conceptualisation and Measurement of DSM-5 Internet Gaming Disorder: The Development of the IGD-20 Test. PLoS ONE, 9(10), Article e110137. https://doi.org/10.1371/journal.pone.0110137

Pontes, H. M., Schivinski, B., Sindermann, C., Li, M., Becker, B., Zhou, M., & Montag, C. (2021). Measurement and Conceptualization of Gaming Disorder According to the World Health Organization Framework: the Development of the Gaming Disorder Test. International Journal of Mental Health and Addiction, 19(2), 508–528. https://doi.org/10.1007/s11469-019-00088-z

Puolitaival, T., Sieppi, M., Pyky, R., Enwald, H., Korpelainen, R., & Nurkkala, M. (2020). Health behaviours associated with video gaming in adolescent men: a cross-sectional population-based MOPO study. BMC Public Health, 20(1), Article 415. https://doi.org/10.1186/s12889-020-08522-x

Puth, M.-T., Neuhäuser, M., & Ruxton, G. D. (2015). Effective use of Spearman's and Kendall's correlation coefficients for association between two measured traits. Animal Behaviour, 102, 77–84. https://doi.org/10.1016/j.anbehav.2015.01.010

R Core Team. (2023). R: A Language and Environment for Statistical Computing [Computer software]. https://www.R-project.org/

Regulation 2016/679. Consolidated text: 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) (Text with EEA relevance). http://data.europa.eu/eli/reg/2016/679/2016-05-04

Rehbein, F., Kliem, S., Baier, D., Mößle, T., & Petry, N. M. (2015). Prevalence of internet gaming disorder in German adolescents: diagnostic contribution of the nine DSM-5 criteria in a state-wide representative sample. Addiction, 110(5), 842–851. https://doi.org/10.1111/add.12849

Rhemtulla, M., Brosseau-Liard, P. É., & Savalei, V. (2012). When can categorical variables be treated as continuous? A comparison of robust continuous and categorical SEM estimation methods under suboptimal conditions. Psychological Methods, 17(3), 354–373. https://doi.org/10.1037/a0029315

Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. Journal of Statistical Software, 48(2). https://doi.org/10.18637/jss.v048.i02

Sanders, J. L., & Williams, R. J. (2016). Reliability and Validity of the Behavioral Addiction Measure for Video Gaming. Cyberpsychology, Behavior, and Social Networking, 19(1), 43–48. https://doi.org/10.1089/cyber.2015.0390

Schluter, M. G., Hodgins, D. C., Wolfe, J., & Wild, T. C. (2018). Can one simple questionnaire assess substance-related and behavioural addiction problems? Results of a proposed new screener for community epidemiology. Addiction, 113(8), 1528–1537. https://doi.org/10.1111/add.14166

Sharma, H. (2022). How short or long should be a questionnaire for any research? Researchers dilemma in deciding the appropriate questionnaire length. Saudi Journal of Anaesthesia, 16(1), 65–68. https://doi.org/10.4103/sja.sja_163_21

Sigerson, L., Li, A. Y.-L., Cheung, M. W.-L., Luk, J. W., & Cheng, C. (2017). Psychometric properties of the Chinese Internet Gaming Disorder Scale. Addictive Behaviors, 74, 20–26. https://doi.org/10.1016/j.addbeh.2017.05.031

Starcevic, V. (2013). Is Internet addiction a useful concept? Australian & New Zealand Journal of Psychiatry, 47(1), 16–19. https://doi.org/10.1177/0004867412461693

Stavropoulos, V., Vassallo, J., Burleigh, T. L., Gomez, R., & Colder Carras, M. (2022). The role of internet gaming in the association between anxiety and depression: A preliminary cross-sectional study. Asia-Pacific Psychiatry, 14(2), Article e12474. https://doi.org/10.1111/appy.12474

Stevens, M. W., 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

Stieger, S., Reips, U.-D., & Voracek, M. (2007). Forced-response in online surveys: Bias from reactance and an increase in sex-specific dropout. Journal of the American Society for Information Science and Technology, 58(11), 1653–1660. https://doi.org/10.1002/asi.20651

Sublette, V. A., & Mullan, B. (2012). Consequences of Play: A Systematic Review of the Effects of Online Gaming. International Journal of Mental Health and Addiction, 10(1), 3–23. https://doi.org/10.1007/s11469-010-9304-3

Szolin, K., Kuss, D., Nuyens, F., & Griffiths, M. D. (2022). Gaming Disorder: A systematic review exploring the user-avatar relationship in videogames. Computers in Human Behavior, 128, Article: 107124. https://doi.org/10.1016/j.chb.2021.107124

Tejeiro Salguero, R. A., & Morán, R. M. B. (2002). Measuring problem video game playing in adolescents. Addiction, 97(12), 1601–1606. https://doi.org/10.1046/j.1360-0443.2002.00218.x

Teng, Z., Pontes, H. M., Nie, Q., Griffiths, M. D., & Guo, C. (2021). Depression and anxiety symptoms associated with internet gaming disorder before and during the COVID-19 pandemic: A longitudinal study. Journal of Behavioral Addictions, 10(1), 169–180. https://doi.org/10.1556/2006.2021.00016

Teng, Z., Pontes, H. M., Nie, Q., Xiang, G., Griffiths, M. D., & Guo, C. (2020). Internet gaming disorder and psychosocial well-being: A longitudinal study of older-aged adolescents and emerging adults. Addictive Behaviors, 110, Article 106530. https://doi.org/10.1016/j.addbeh.2020.106530

The jamovi project. (2023). jamovi [Computer Software]. https://www.jamovi.org

Vadlin, S., Åslund, C., & Nilsson, K. W. (2015). Development and content validity of a screening instrument for gaming addiction in adolescents: The Gaming Addiction Identification Test (GAIT). Scandinavian Journal of Psychology, 56(4), 458–466. https://doi.org/10.1111/sjop.12196

Van Rooij, A. J., & Kardefelt-Winther, D. (2017). Lost in the chaos: Flawed literature should not generate new disorders. Journal of Behavioral Addictions, 6(2), 128–132. https://doi.org/10.1556/2006.6.2017.015

Van Rooij, A. J., Schoenmakers, T. M., & Van de Mheen, D. (2017). Clinical validation of the C-VAT 2.0 assessment tool for gaming disorder: A sensitivity analysis of the proposed DSM-5 criteria and the clinical characteristics of young patients with 'video game addiction.' Addictive Behaviors, 64, 269–274. https://doi.org/10.1016/j.addbeh.2015.10.018

Vieira, J. B., Almeida, P. R., Ferreira-Santos, F., Moreira, P. S., Barbosa, F., & Marques-Teixeira, J. (2014). The Triarchic Psychopathy Measure (TriPM): translation and adaptation to European Portuguese. https://hdl.handle.net/10216/85346

Wack, E., & Tantleff-Dunn, S. (2009). Relationships between Electronic Game Play, Obesity, and Psychosocial Functioning in Young Men. CyberPsychology & Behavior, 12(2), 241–244. https://doi.org/10.1089/cpb.2008.0151

Warman, P., Wijman, T., Meehan, O., & De Heij, B. (2022). Global games market report. https://newzoo.com/products/reports/global-games-market-report

Wartberg, L., Zieglmeier, M., & Kammerl, R. (2019). Accordance of Adolescent and Parental Ratings of Internet Gaming Disorder and Their Associations with Psychosocial Aspects. Cyberpsychology, Behavior, and Social Networking, 22(4), 264–270. https://doi.org/10.1089/cyber.2018.0456

Wong, U., & Hodgins, D. C. (2014). Development of the game addiction inventory for adults (GAIA). Addiction Research & Theory, 22(3), 195–209. https://doi.org/10.3109/16066359.2013.824565

Wood, R. T. A., & Griffiths, M. D. (2007). Online Data Collection From Gamblers: Methodological Issues. International Journal of Mental Health and Addiction, 5(2), 151–163. https://doi.org/10.1007/s11469-007-9055-y

Woods, C. M. (2007). Confidence intervals for gamma-family measures of ordinal association. Psychological Methods, 12(2), 185–204. https://doi.org/10.1037/1082-989X.12.2.185

World Health Organization. (2022). International Classification of Diseases (11th ed.). https://icd.who.int/en

Wright, K. B. (2006). Researching Internet-Based Populations: Advantages and Disadvantages of Online Survey Research, Online Questionnaire Authoring Software Packages, and Web Survey Services. Journal of Computer-Mediated Communication, 10(3), Article JCMC1034. https://doi.org/10.1111/j.1083-6101.2005.tb00259.x

Yılmaz, E., Griffiths, M. D., & Kan, A. (2017). Development and Validation of Videogame Addiction Scale for Children (VASC). International Journal of Mental Health and Addiction, 15(4), 869–882. https://doi.org/10.1007/s11469-017-9766-7

Young, K. S. (1998). Caught in the Net: How To Recognize the Signs of Internet Addiction and a Winning Strategy for Recovery. John Wiley.

Yu, S. M., Ivan Jacob, A. P., Meng Xuan, Z., & Anise M. S., W. (2019). Psychometric validation of the Internet Gaming Disorder-20 Test among Chinese middle school and university students. Journal of Behavioral Addictions, 8(2), 295–305. https://doi.org/10.1556/2006.8.2019.18

Zigmond, A. S., & Snaith, R. P. (1983). The Hospital Anxiety and Depression Scale. Acta Psychiatrica Scandinavica, 67(6), 361–370. https://doi.org/10.1111/j.1600-0447.1983.tb09716.x

Appendices

Appendix A - District of Residence Frequencies

Table 7

District of Residence frequencies

District	Main Sample (*n* = 556)		Subsample (*n* = 379)		Retest Sample (*n* = 112)	
	n	***%***	***n***	***%***	***n***	***%***
Porto	280	50.4	192	50.7	58	51.8
Lisbon	49	8.8	35	9.2	14	12.5
Faro	38	6.8	25	6.6	7	6.3
Viseu	31	5.6	23	6.1	7	6.3
Aveiro	28	5.0	19	5.0	2	1.8
Braga	25	4.5	19	5.0	10	8.9
Portalegre	20	3.6	11	2.9	2	1.8
Leiria	14	2.5	9	2.4	0	0
Setúbal	13	2.3	9	2.4	0	0
Madeira	11	2.0	9	2.4	2	1.8
Coimbra	8	1.4	2	0.5	0	0
Açores	6	1.1	4	1.1	2	1.8
Santarém	6	1.1	4	1.1	2	1.8
Viana do Castelo	6	1.1	3	0.8	1	0.9
Vila Real	6	1.1	4	1.1	1	0.9
Évora	4	0.7	3	0.8	1	0.9
Beja	3	0.5	2	0.5	1	0.9
Bragança	3	0.5	2	0.5	2	1.8
Guarda	3	0.5	3	0.8	0	0
Castelo Branco	2	0.4	1	0.3	0	0

Appendix B - Full Protocol

1. **Demographic questionnaire:** Age, Gender (M/F), District of Residence (dropdown list), Education Level (in years), Degree Enrolment, Enrolment Year, Academic Study Area, Faculty/School and University/Higher Education Institution, Number of Disapprovals and Civil Status.
2. **Gaming related variables:** Gaming Platforms (i.e., Computer, Playstation, Wii, Xbox, Nintendo DS, PSP, Gameboy, Phone, Tablet, Others), Game Genres (i.e., Strategy, Simulation, Adventure, Platforming, Massive Multiplayer Online, Social Media, Luck-based, First-Person Shooter, Others), daily gaming hours, weekly gaming days, friend quantity, social gathering frequency and physical exercise weekly hours.
3. **Gaming Addiction measures:** Internet Gaming Disorder Test (IGD-20; Pontes et al., 2014) and Gaming Disorder Test (GDT; Pontes et al., 2021).
4. **Pathological Gambling measures:** South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987; European Portuguese adaptation by Lopes, 2008) and Gambling Disorder DSM-5 criteria (APA, 2013).
5. **Psychopathy Measure:** Triarchic Psychopathy Measure (TriPM; Patrick et al., 2009; European Portuguese translation and adaptation by Vieira et al., 2014).
6. **Anxiety and Depression Symptoms:** Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983; European Portuguese validation by Pais-Ribeiro et al., 2007)
7. **Comorbidity:** Present and Past formally diagnosed psychopathology categories according to DSM-5 (APA, 2013).

Appendix C - Ethics Committee Approval

P.PORTO

ESCOLA
SUPERIOR
DE SAÚDE
POLITÉCNICO
DO PORTO

PARECER DA COMISSÃO DE ÉTICA

Número de Registo da Comissão de Ética: **CE0100C** Data receção do Documento: 07/11/2022 Existência de entradas anteriores: Não

TÍTULO DO TRABALHO:
Validação Portuguesa do *Internet Gaming Disorder Test* Relação com estilos de vida e quadros clínicos.

INVESTIGADOR RESPONSÁVEL:
Artemisa Rocha Dores

DATA PREVISTA PARA A REALIZAÇÃO DO TRABALHO: Início 03/01/2023 Fim 31/12/2023

RESUMO DO ESTUDO

OBJETIVOS:
Nada a referir.

AMOSTRA:
Nada a referir.

FORMULÁRIO DE DADOS A RECOLHER:
Presentes e autorizado a sua utilização pelos seus próprios autores. Nada a referir.

MATERIAL:
Nada a referir.

MÉTODOS:
Nada a referir.

RISCOS:
Nada a referir.

CONSENTIMENTO INFORMADO:
Solicitado no início do questionário

AUTORIZAÇÃO PELOS RESPONSÁVEIS LOCAIS:
Presentes. Nada a referir.

APRECIAÇÃO DA COMISSÃO DE ÉTICA:
Processo bem instruído. Apresenta o link para consulta e análise do questionário.

PARECER FINAL DA COMISSÃO DE ÉTICA:
De acordo com todos os dados analisados, o parecer é "favorável", desde que cumpridas todas as diretrizes submetidas a esta Comissão, recomendando-se que a decisão seja suspensa caso haja algum incumprimento grave.

Assinado por: **PEDRO MANUEL RIBEIRO DA ROCHA MONTEIRO**
Num. de Identificação: 09132856
Data: 2022.12.07 13:25:04 +0000

06/12/2022

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Appendix D - Correlation Comparisons

Table 8

Correlation Comparisons

Variable	IGD-10SV					
	Outliers			No Outliers		
	r	r_s	***df***	***r***	r_s	***df***
GDT	.75***	.71***	377	.71***	.70***	366
HADS_A	.18***	.18***	377	.17***	.18***	376
HADS_D	.28***	.30***	377	.29***	.30***	372
Daily gaming hours	.43***	.50***	377	.48***	.50***	368
Weekly gaming days	.29***	.30***	377	.29***	.30***	376
IGD-10SV_II	.88***	.87***	110			
Weekly hours of physical exercise	-.04	-.04	377	-.04	-.04	367

Note. GDT = Gaming Disorder Test; HADS_A = anxiety subscale of HADS; HADS_D = depression subscale of HADS; IGD-10SV = Internet Gaming Disorder-10 Short Version, IGD-10SV_II = Retest phase of the IGD-10SV.

***$p < .001$

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