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# Prevalence of internet gaming disorder and its psychological correlates

*Prevalência do transtorno do jogo pela internet e seus correlatos psicológicos*

## ABSTRACT

**Objective:** To investigate the prevalence of internet gaming disorder (IGD) symptoms in a sample of Brazilian adults, and its association with personality, psychiatric symptoms and psychosocial measures. **Methods:** We evaluated 219 adults online recruited using questionnaires and psychometric scales. We evaluated the behavior and pattern of internet games using the Game Addiction Scale (GAS). We tested the association of the previous measures with the GAS scores by spearman correlations and multiple regression analysis. **Results:** Of our sample, 74% played games online. We found correlations between IGD symptoms and most symptoms of mental disorders, with small or moderate effect sizes, as well as correlations with the personality traits of agreeableness (r = -0.272; p < 0.001), conscientiousness (r = - 0.314; p < 0.001), and neuroticism (r = 0.299; p < 0.001). Additionally, we found a negative association with psychosocial outcomes such as quality of life (r = -0.339; p < 0.001) and life satisfaction (r = - 0.202; p < 0.003). The multivariate model included the personality traits of conscientiousness and agreeableness and symptoms of dissociation and somatization as predictors. The prevalence of IGD was 9% in those who played online games. **Conclusion:** IGD is correlated with different areas of the individual's life, such as personality, quality of life, and several common symptoms of mental disorders. The prevalence can be considered high among players (9%). Conscientiousness, agreeability, somatic symptoms, and dissociative symptoms were associated with the symptoms of IGD.

### KEYWORDS

Electronic games, video games, mental health, behavioral addictions, internet gaming disorder.

## RESUMO

**Objetivo:** Investigar a prevalência de sintomas do transtorno do jogo pela internet (TJI) em uma amostra de adultos brasileiros e sua associação com personalidade, sintomas psiquiátricos e medidas psicossociais. **Métodos:** Avaliamos 219 adultos recrutados *on-line* por meio de questionários e escalas psicométricas. Avaliamos o comportamento e o padrão dos jogos na internet usando a *Game Addiction Scale* (GAS). Testamos a associação das medidas anteriores com as pontuações na GAS por meio de correlações de Spearman e análise de regressão múltipla. **Resultados:** De nossa amostra, 74% jogavam jogos *on-line*. Encontramos correlações entre sintomas do TJI e a maioria dos sintomas de transtornos mentais, com tamanhos de efeito pequenos ou moderados, bem como correlações com os traços de personalidade de amabilidade (r = -0,272; p < 0,001), conscienciosidade (r = - 0,314; p < 0,001) e neuroticismo (r = 0,299; p < 0,001). Além disso, encontramos uma associação negativa com resultados psicossociais, como qualidade de vida (r = -0,339; p < 0,001) e satisfação com a vida (r = - 0,202; p < 0,003). O modelo multivariado incluiu os traços de personalidade de conscienciosidade e amabilidade e sintomas de dissociação e somatização como preditores. A prevalência de TJI foi de 9% entre os que jogavam jogos *on-line*. **Conclusão:** O TJI está correlacionado com diferentes áreas da vida do indivíduo, como personalidade, qualidade de vida e vários sintomas comuns de transtornos mentais. A prevalência pode ser considerada alta entre os jogadores (9%). Conscienciosidade, amabilidade, sintomas somáticos e sintomas dissociativos estavam associados aos sintomas do TJI.

### PALAVRAS-CHAVE

Jogos eletrônicos, *videogames*, saúde mental, vícios comportamentais, transtorno do jogo pela internet.

## INTRODUCTION

Several new technologies and the increasing online media and games mark the 21st century. Investment in consoles and computers took place in 1980, popularizing these devices and causing more significant investment in creating and developing electronic games[1,2]. Progressive technological development, reduced production costs, and easier access to a smartphone and personal computers allowed a large market expansion and reached virtually everyone with access to the internet[3,4].

Previous research suggests that moderate use of video games can improve psychological functioning, including working memory, learning, and procedural knowledge[2]. Video games would also enhance social skills in patients with anxiety disorders and introverted personalities or alleviate cognitive symptoms in neurodevelopmental disorders[2,5-7]. However, these potential benefits may be hindered by excessive play, which may sometimes characterize a behavioral addiction.

The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) included internet gaming disorder (IGD) in section III, under "*Conditions for Further Studies*". The manual refers to IGD as a maladaptive game behavior, with a loss of a sense of control over the time spent on electronic games. In addition, it emphasizes that only non-gambling internet games are included in the disorder. However, microtransactions and random rewards during gameplay make it difficult for this classification. Internet use for work, recreational, social, and pornographic purposes should not be considered[8]. Even with the development of studies that prove several negative consequences of the excessive use of online games, the diagnosis of IGD is still controversial due to the difficulty in classification and incipient research studies. Still, this area is in excellent expansion[9]. According to the DSM-5, the diagnostic criteria[8] for IGD are

> Persistent and recurrent use of the Internet to engage in games, often with other players, leading to clinically significant impairment or distress as indicated by five (or more) of the following in 12 months: 1. Preoccupation with Internet games. (The individual thinks about previous gaming activity or anticipates playing the next game; Internet gaming becomes the dominant activity in daily life). People's Internet gambling, which is included under gambling disorder. 2. Withdrawal symptoms when Internet gaming is taken away (These symptoms are typically described as irritability, anxiety, or sadness, but no physical signs of pharmacological withdrawal.) 3. Tolerance – the need to spend increasing time engaged in Internet games. 4. Unsuccessful attempts to control participation

in Internet games. 5. Loss of interest in previous hobbies and entertainment as a result of, and except for, 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 Internet games to escape or relieve a negative mood (*e.g.*, feelings of helplessness, guilt, anxiety). 9. Has jeopardized or lost a significant relationship, job, or educational or career opportunity because of participation in Internet games. (p. 795)

Also, according to the manual, there is a need to classify the disorder's severity. Depending on the frequency, intensity, and dysfunctionality symptoms, it can be classified as mild, moderate, or severe. IGD prevalence according to standard criteria is still controversial, although it might be more frequent in males at a young age (under 25 years) and may vary geographically, especially in different cultures[8,9].

Given the above, we aim to investigate how IGD symptoms present in Brazilian adults, their association with other psychiatric symptoms and psychological factors, and establish their prevalence and comorbidities in an online-recruited sample.

## METHODS

### Participants

This was a cross-sectional, descriptive study that used quantitative methods. The sample (n = 219) was recruited online using the Google forms app through a link sent in advertisements on social media. The inclusion criteria were playing electronic/video games online on a cell phone, tablet, video game console, computer, or other device and the respondent's age (18 years or older). We removed the selected players from the general population, asking if "they were playing online games" in the last 6 months. We used a structured questionnaire to collect sociodemographic data and psychometric scales for further assessment. Subjects with a self-reported history of mental disorders were not excluded from the sample, and this data was used in the study analysis. This sample size allowed for detecting associations (5% error) of large and medium effect sizes with 99% power but only 31% of small effect sizes.

### Ethical considerations

The survey did not present any immediate risks to participants, and they could cancel their participation at any

time. The only immediate benefit for the participants was receiving a report of their psychometric scale scores. This study project was submitted and approved by the ethical board of *Faculdade de Ciências Médicas de Minas Gerais*, Belo Horizonte, Brazil (approval number/year: 2.905.499/2018). All participants consented, and all data was anonymized and securely managed following the Brazilian General Law of Data Security (*Lei Geral de Proteção de Dados*).

## Participants' assessment

We used standardized scales to evaluate game addiction, personality, mental health, and psychosocial outcomes (quality of life and life satisfaction). All tests were developed and validated to ensure a valid and precise measure of each phenomenon. They were previously translated and adapted to Brazil, minimizing possible biases in test measurements.

- *Game Addiction Scale (GAS):* The GAS has 21 items designed to assess game addiction: salience, tolerance, change in mood, setback, relapse, conflict, and problems. The scale is scored on a Likert scale of 5 items. Higher scores are representative of more maladaptive and addicted gaming behavior[10]. Problematic use was defined if at least four of the seven dimensions of the scale were considered pathological, and Addiction was defined if all items were considered pathological[11].
- *Inventory of the Five Big Personality Factors (IGFP-5):* This relatively short personality assessment comprises 44 items representative of the "Big Five" personality traits (Openness, Conscientiousness, Extroversion, Agreeableness, and Neuroticism). All items are scored on a Likert scale of 5 points. Higher scores represent a higher expression of the personality trait[12].
- *Adult Self-Report Scale for Attention Deficit Hyperactivity Disorder (ADHD) using DSM-5 criteria (ASRS)*: This standardized questionnaire is designed to assess inattention, hyperactivity, and executive dysfunction, which are core symptoms of ADHD. Scores on this scale range from 0 to 24, with higher scores indicating more frequent and intense ADHD symptoms[13-15].
- *World Health Organization Quality of Life assessment (WHOQOL-BREF):* This instrument measures the quality of life. It is scored in four broad domains (physical, psychological, social relations, and environment) using a set of 26 questions scored on how well the subject assesses their quality of life (scores ranging from 1 to 5). Higher scores are indicative of a higher quality of life[16].
- *Satisfaction with life scale (SWLS):* It is a self-report scale designed to assess how satisfied the subject is with their life, purpose, and current situation, regardless of the environmental conditions in which they live. The SWLS comprises five seven-point Likert scale questions with higher scores indicating higher satisfaction with life[17].
- *The DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure (CCSM):* designed to screen for symptoms of depression, anger, mania, anxiety, somatic symptoms, suicidal ideation, psychosis, sleep disturbance, memory, repetitive thinking and behavior, dissociation, personality functioning, and substance use according to DSM-5 classification. The scale has 23 items scored on a 5-point Likert scale based on severity. Higher scores are indicative of more severe symptoms[8].

## Statistical analysis

We used Spearman's correlation to test the association of the study variables. Then, we used a multiple regression analysis (stepwise) to determine which variables related to mental health, personality, and psychosocial factors were associated with GAS scores. We selected the variables significantly correlated with GAS scores as predictors in a stepwise model since multiple predictors might be intercorrelated. The statistical procedures were performed using the SPSS 22.0 software.

## RESULTS

Tables 1 and 2 show participants' descriptions. Table 1 stratifies our sample into online gamers and the general population. There were no significant differences between these two groups regarding sociodemographic factors. Our sample was predominantly composed of young adults (age $25 \pm 6$ years), with a balanced proportion of male and female participants currently enrolled in college/university studies (69%). Most of the participants were single (84%), living with a family (63%), and had an average family income of 3 to 4 minimum wages (31%). About 78% of the participants had a sleep routine between 4 to 8 hours, and almost half of our sample had a history of mental disorders (48%), mainly ADHD (31%), anxiety disorders (15%), and depression (8%). The most common psychiatric treatment was a combination of prescribed psychotropic drugs and psychotherapy (43%).

**Table 1.** Participant's description

| | | All participants (n = 219) | Online-gamers (n = 162) |
|---|---|---|---|
| Age | Mean | 25 | 24 |
| | SD | 6.06 | 5.82 |
| Sex | Male | 50% | 60% |
| | Female | 50% | 40% |
| Occupation | Doesn't study and doesn't work | 7% | 6% |
| | Study | 35% | 36% |
| | Work | 24% | 25% |
| | Study and Work | 34% | 33% |
| Area of study | Humanities | 42% | 47% |
| | Sciences | 22% | 25% |
| | Mathematical sciences | 18% | 23% |
| | Multiple areas | 4% | 5% |
| | Not a student | 14% | 15% |
| Marital status | Single | 84% | 84% |
| | Married | 15% | 15% |
| | Divorced | 1% | 1% |
| Live with | Family's house | 63% | 60% |
| | Alone | 11% | 12% |
| | With a colleague | 12% | 13% |
| | With a partner | 14% | 15% |
| Income* | 1 to < 2 minimum wages | 17% | 17% |
| | 3 to < 4 minimum wages | 31% | 31% |
| | 4 to < 5 minimum wages | 13% | 13% |
| | 5 to < 10 minimum wages | 26% | 26% |
| | > 10 minimum wages | 13% | 13% |
| Total time sleeping | 2 to < 4 hours | 2% | 3% |
| | 4 to < 8 hours | 78% | 75% |
| | 8 to < 12 hours | 20% | 22% |
| Self-reported history of mental disorder | No | 52% | 53% |
| | Yes | 48% | 47% |
| Psychiatric/ psychological treatment | Psychotherapy and medication | 43% | 38% |
| | Psychotherapy | 12% | 14% |
| | Medication | 23% | 23% |
| | No treatment | 35% | 25% |
| | Others | 2% | 0% |

*ABEP – Associação Brasileira de Empresas de Pesquisa (2019). Critério de Classificação Econômica Brasil. São Paulo. Available from: http://www.abep.org/criterio-brasil.

Regarding the subsample of online gamers (74% of the total sample), participants were relatively divided in the amount of time spent playing games daily (27% less than 1 hour, 30% 1 to 2 hours, 16% 2 to 3 hours, and 27% more than 4 hours per day). Most participants predominantly played games using their smartphones (46%) or computers (41%), and a significant proportion mainly played online

**Table 2.** Gaming profiles from the subjects who play games (n = 162, 74% of the full sample)

| | | |
|---|---|---|
| Average play time (daily) | < 1 hour | 27% |
| | 1 to < 2 hours | 30% |
| | 2 to < 3 hours | 16% |
| | > 3 hours | 27% |
| Main gaming platform | Computer | 41% |
| | Smartphone | 46% |
| | Video game | 11% |
| | Tablet | 12% |
| Play mainly multiplayer online games | No | 60% |
| | Yes | 40% |
| Game addiction (based in GAS scores) | No | 59% |
| | Problematic | 33% |
| | Addiction | 9% |

GAS: Game Addiction Scale.

multiplayer games (40%). According to GAS scores, 74% of the sample showed no evidence of addiction, while 26% showed a problematic pattern of gaming and 10% a pattern of IGD.

Table 3 shows the correlations between the study variables and GAS scores. The largest correlations were moderate and observed with the conscientiousness personality factor (-0.314), quality of life (-0.339), symptoms of depression (0.336), somatic symptoms (0.336), symptoms of personality disorders (0.371), symptoms of dissociation (0.371), and ADHD symptoms of executive dysfunction (0.341). This preliminary analysis suggests that conscientiousness might be a protective factor regarding IGD, several psychiatric symptoms might be associated with this disorder, and its intensity might impact the quality of life.

Table 4 shows the multiple regression model. The final model consisted of two personality factors (Conscientiousness and Agreeability) and two psychiatric symptoms (somatic and dissociation). Both personality factors showed a negative association with GAS scores, suggesting they are protective regarding IGD. At the same time, somatic symptoms and dissociation are positively associated, suggesting they may be risk factors or comorbidities for the disorder.

## DISCUSSION

Our results showed that about 25% of the sample exhibited dysfunctional/addictive online gaming behavior. GAS scores were associated with most psychiatric symptoms, personality traits, and a lower quality of life and satisfaction. In the multivariate analysis, Conscientiousness and Agreeableness

**Table 3.** Spearman correlations between personality, psychosocial measures, and psychiatric symptoms with Game Addiction Scale (GAS) scores

| Dimension | Variables | r | r2 | p |
|---|---|---|---|---|
| | IGFP Opening | 0.132 | 2% | 0.051 |
| | IGFP Conscientiousness | -0.314 | 10% | <0.001* |
| Personality | IGFP Extroversion | -0.155 | 2% | 0.022 |
| | IGFP Agreeableness | -0.272 | 7% | <0.001* |
| | IGFP Neuroticism | 0.299 | 9% | <0.001* |
| Quality of life | WHOQOL-Bref | -0.339 | 11% | <0.001* |
| Satisfaction with life | SWLS | -0.202 | 4% | 0.003 |
| | CCSM Depression | 0.336 | 11% | <0.001* |
| | CCSM Anger | 0.232 | 5% | <0.001* |
| | CCSM Mania | 0.239 | 6% | <0.001* |
| | CCSM Anxiety | 0.247 | 6% | <0.001* |
| | CCSM Somatic Symptoms | 0.336 | 11% | <0.001* |
| | CCSM Suicidal Ideation | 0.289 | 8% | <0.001* |
| Psychiatric symptoms | CCSM Psychosis | 0.252 | 6% | <0.001* |
| | CCSM Sleep Problems | 0.282 | 8% | <0.001* |
| | CCSM Memory | 0.211 | 4% | 0.002 |
| | CCSM Repetitive Thoughts and Behaviors | 0.279 | 8% | <0.001* |
| | CCSM Dissociation | 0.301 | 9% | <0.001* |
| | CCSM Personality Functioning | 0.371 | 14% | <0.001* |
| | CCSM Substance Use | 0.089 | 1% | 0.190 |
| | ASRS Inattention | 0.215 | 5% | 0.001 |
| ADHD symptoms | ASRS Hyperactivity | 0.224 | 5% | <0.001* |
| | ASRS Executive Dysfunction | 0.351 | 12% | <0.001* |

GAS: Game Addiction Scale; IGFP: Inventory of the Five Big Personality Factors; WHOQOL-Bref: World Health Organization Quality of Life Instrument – abbreviated version; SWLS: Satisfaction with life scale; CCSM: DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure; ASRS: World Health Organization Adult Attention-Deficit/Hyperactivity Disorder Self-Report Screening Scale for DSM-5.

**Table 4.** Predictors of Game Addiction Scale (GAS) scores in a stepwise multiple regression model

| F | df | p | Adj. R² | Predictors | Std.β | p |
|---|---|---|---|---|---|---|
| 23.69 | -218 | <0.001* | 29.4% | IGFP Conscientiousness | -0.234 | <0.001* |
| | | | | CCSM Somatic symptoms | 0.226 | 0.001 |
| | | | | IGFP Agreeableness | -0.164 | 0.006 |
| | | | | CCSM Dissociation | 0.174 | 0.015 |

GAS: Game Addiction Scale; IGFP: Inventory of the Five Big Personality Factors; CCSM: DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure. *Statistically significant values.

personality traits were associated with lower GAS scores, while somatic and dissociation symptoms were associated with higher scores. Most studies regarding IGD tend to focus on children and adolescents[18]. However, the symptoms of IGD may persist into adulthood and cause psychosocial problems, as documented in our results.

Despite the similarity of its cognitive, behavioral, and neurobiological characteristics with substance-related disorders[19], the main correlates of IGD were different from those of addictions. Somatic and Dissociative symptoms can be related to addictive behavior, but they are usually less pronounced than ADHD symptoms, impulsivity, disinhibition, or internalizing symptoms[19]. Although it may still be speculative since this is not a longitudinal study, we can interpret our data as suggesting risk factors (dissociative and somatic symptoms) and protective factors (Conscientiousness and Agreeableness).

Conscientiousness is a personality trait associated with self-directed behavior, representing individuals who are more organized and efficient with high self-control[12]. This trait may help to exert self-regulation while playing online, reducing the risk of excessive time, conflict, or loss of control.

The agreeableness factor relates to more friendly, socially prone, and compassionate behavior, which usually leads to healthy and meaningful social relationships[12]. These aspects may reduce the time spent alone playing online games, although a significant proportion (40%) of the sample engages in multiplayer games. Social interaction and support are protective factors for most addictions[19], including IGD[1,3,4].

However, somatic and dissociative symptoms were related to higher GAS scores and, consequently, more problematic online-gaming behavior in our sample. Somatic symptoms are usually nonspecific and can occur in disorders such as depression, anxiety, stress-related disorders, addiction, or an independent disorder[8]. Although we can not know for sure based on our data, these symptoms may represent psychiatric morbidity rather than a somatoform disorder. Since GAS scores were related to most psychopathologies, including the ones cited above, it makes sense that a more general symptom appears as a predictor in a stepwise multivariate analysis. On the other hand, dissociative symptoms could be more directly associated with IGD. These symptoms include disconnectedness from oneself and the environment and difficulty monitoring and registering time, events, and specific information[8]. Such states during gaming may be related to more time spent playing or difficulties in exerting self-control during this activity, possibly suggesting changes in attentional states activated by gaming. Han and colleagues[19] reported a strong activation of the orbital prefrontal cortex and anterior cingulate gyrus, areas related to attentional states and self-perception. Future studies could investigate this hypothesis.

Some authors have suggested that virtual reality and game addiction may be used impulsively to either face or escape from reality[20,21]. Although there are studies suggesting that for most users, playing video games is a form of relaxation or fun, for some people, it can be associated with several psychological and behavioral problems, including worse mental health, obesity, violent behavior, lower school performance, and absenteeism[22,23].

The prevalence of IGD in our sample (7% among the total sample and 10% among people who play games) was higher than that usually reported in population studies (4%)[8]. This prevalence probably reflects specific characteristics of our sample, which may have occurred due to our recruitment methods. We also used an adapted questionnaire to identify IGD cases and conducted a clinical interview, which may have increased the prevalence of mental disorders.

Our study has limitations that may hinder its generalizability. First, the Game Addiction Scale (GAS), used to measure the level of addiction in players, was developed and validated for adolescents, whereas the audience evaluated in the present study was the adult population. Additionally, the recruitment strategy resulted in a convenience sample that differs greatly from the Brazilian population. Future studies should address these issues and expand the present analysis by incorporating other measures to understand IGD better.

## CONCLUSION

Our study found an estimated prevalence of 10% for IGD among young adults who play video games in our sample. Our findings indicated that individuals with a more agreeable and conscientious personality tend to exhibit fewer symptoms of game abuse, while those with somatic and dissociative symptoms tend to experience more frequent dysfunctional/addictive online gaming behavior.

## INDIVIDUAL CONTRIBUTIONS

All authors contributed substantially to the conception, design, analysis, and interpretation of the data in this research.

## CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

## ACKNOWLEDGMENTS

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