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Online gaming and internet gaming disorder in Iran: patterns, motivations, and correlates

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Abstract

Online gaming may be associated with adverse outcomes in a minority of players. While some suggest that pathological patterns of online gaming are a public health concern in Iran, the evidence on pathological gaming among Iranian online gamers remains scarce. This study aims to investigate the patterns, motivations, and correlates of pathological online gaming in Iran. An online survey in Persian was performed among adult online gamers recruited across Iranian universities and social media. The 10-item Internet Gaming Disorder Test (IGDT-10) was used to screen for Internet Gaming Disorder (IGD). Motivations for gaming were assessed using the Motives for Online Gaming Questionnaire (MOGQ) and correlated psychiatric symptoms were assessed using the Brief Symptom Inventory (BSI). After the estimation of descriptive statistics and bivariate tests, multivariate linear and logistic regressions were used to assess the correlates of the IGDT-10 score and IGD. A total of 791 individuals (75.4% men) responded to the survey. More than 5% played 42 h or more per week. Only 3.7% of respondents met the threshold for IGD. IGD was 9.4 times more common among male than female gamers. The most commonly endorsed criteria were "continuation", "negative consequences", and "preoccupation". Younger age, time spent on gaming, using a PC instead of a smartphone for gaming, "escape" and "fantasy" gaming motivations and psychiatric symptoms were associated with the IGDT-10 score. A small minority of Iranian online gamers may be at risk of pathological gaming and its associated harms, especially younger gamers who play long hours and play with escapist and "fantasy"-related motivations. Further research is needed to elucidate the causes and consequences of gaming-related problems and to evaluate proposed diagnostic criteria and screening instruments.

Keywords Pathological gaming · Psychometrics · Video games · Online gaming, internet gaming disorder

Introduction

Online video games are increasingly popular leisure activities and have a growing number of end-users across the world (Gough, 2020), and while video games have never been so pervasive as they now are, discourse about their potential health effects is nearly as old as commercial video games (Gwinup et al., 1983). After decades of research, it is increasingly clear that video games have a nuanced and complex impact on players, based on the interaction of player characteristics, game features and gaming context (Gentile, 2011; Johnson et al., 2013). Relatedly, it seems that many players are either not significantly impacted by video games or derive cognitive and psychosocial benefits from playing (Granic et al., 2014; Kovess-Masfety et al., 2016), while a growing body of research also suggests that a minority

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of players experience patterns of potentially pathological gaming which may lead to adverse behavioral, psychiatric and social outcomes (Mihara & Higuchi, 2017), with online video gamers potentially at higher risk (Smohai et al., 2017). This has led to the addition of the new diagnosis of "Internet Gaming Disorder" (IGD) in the International Classification of Diseases (ICD-11) and the research appendix of the latest Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association, 2013; World Health Organization, 2019).

The concept of "pathological gaming" and especially the proposed diagnosis of IGD as a distinct addictive disorder has been controversial. Several consensus papers and an official statement by the Society of Media Psychology and Technology division of the American Psychological Association have noted a lack of clarity on the definition of IGD, questionable reliability and validity of the construct, and inconsistent epidemiological findings, arguing that validated instruments, transparent and reproducible studies, and an expanded evidence base are required to justify a unique diagnosis of "addiction to video games" (Aarseth et al., 2017; Ferguson et al., 2018; Van Rooij et al., 2018). Furthermore, a set of large international surveys have found mixed links between adverse outcomes and IGD (Przybylski et al., 2017). On the other hand, a growing number of scholar have argued that clinical data from several countries including Iran supports the new diagnostic entity (Rumpf et al., 2018; Saunders et al., 2017; Shadloo et al., 2017) and suggests that a distinct pattern of problems associated with online game playing could emerge as a psychiatric disorder (Kuss et al., 2012).

In 2019, the Iran Computer and Video Games Foundation estimated that 28 million gamers play at least one hour per week, which is more than one-fourth of the country's population (Iran Computer and Video Games Foundation, 2016). Simultaneously, the proportion of online video game players has increased from 14% in 2010 to 65% in 2019 (DIREC, 2019). However, most Iranian studies on the subject have assessed gaming disorder without distinguishing between offline and online video gaming (Lin et al., 2019; T. Y. Wu et al., 2017). Despite this, pathological online gaming is widely discussed as a public health concern in the media and the scientific community, and there is an emerging consensus that preventive and treatment measures are required (Shadloo et al., 2018).

An important criticism of proposed IGD diagnoses has been that they are largely based on criteria for other addictive disorders, primarily substance abuse disorders and gambling disorder (Kardefelt-Winther, 2015), necessitating further research to support the validity of these criteria (Griffiths et al., 2016). It has also been noted that patterns and correlates of online video gaming and pathological online gaming vary across cultural landscapes (O'Farrell et al., 2020; Przybylski et al., 2017), suggesting that the recent concern about pathological online gaming in Iranian media and academia should be tempered with nuanced research using cross-culturally validated instruments and carefully adapted definitions. To our knowledge, no previous study has specifically assessed the patterns and correlated factors of online video gaming and pathological online video gaming in Iran. This study aims to assess patterns and motivations of online gaming, the symptomatology and prevalence of IGD and its health implications, and the correlates of these phenomena in an Iranian population of online gamers. While we acknowledge the diversity of terminologies used in the field, for the sake of clarity we will use "pathological gaming" to refer to online gaming patterns that are associated with adverse outcomes, and "Internet Gaming Disorder" or "IGD" to refer specifically to the recently proposed diagnostic category.

Methods

The current study was conducted as a part of a national survey in collaboration with a cross-cultural study in 2016 (Király et al., 2019). Inclusion criteria consisted of being at least 18 years of age and having played an online game in the past twelve months. No separate exclusion criteria were applied.

After translation and psychometric assessment of the Persian version of the questionnaires, they were uploaded to a website with public access. Using the URL for the questionnaire, the Iranian National Center for Addiction Studies (INCAS) recruited participants through repeated rounds of announcements via its website, calls on several social networking sites popular among the Iranian youth, and pamphlets and poster announcements in several universities. Participants clicking on the questionnaire link were provided with a description of the study's aims and inclusion criteria, and assured that their data would be anonymized and used only towards the study's stated purposes. No sample size was calculated, with the aim of recruiting a convenience sample with as many individuals as possible online.

Participation in the study was voluntary and anonymous. To motivate participation, individuals were informed that a small monetary sum would be provided to randomly selected participants, but that those who were interested in the monetary incentive needed to provide their email addresses. The research protocol was approved by the Ethics Committee of Tehran University of Medical Sciences in Iran (No. IR.TUMS.VCR.REC.1395.800). All the data necessary for analyses in the paper are available on the following repository: https://osf.io/723ty/.

Measures

Original versions of the questionnaires used in this study as well as the STROBE checklist can be viewed on an online repository (https://osf.io/723ty/). The 10-item Internet Gaming Disorder Test (IGDT-10) (Király et al., 2019): The IGDT-10 has been developed to operationalize the nine proposed IGD criteria in DSM-5 and screen for IGD. Each criterion is assessed through a single item, except for the last criterion (negative consequences) which is operationalized via two items. Respondents can respond with either "*never*", "*sometimes*" or "*often*" to each IGDT-10 item, and only "*often*" responses are considered positive.

IGD (categorical) and IGDT-10 score (continuous) were the main outcomes of interest and were assessed using the IGDT-10. According to the DSM-5, the endorsement of at least five out of nine criteria is required for the assessment of Internet Gaming Disorder (Király et al., 2017a). While more than 30 tools have been developed for screening of pathological gaming (Daniel L King et al., 2020; Király et al., 2019), the IGDT-10 stands out in its coverage of both the DSM-5 and ICD-11 criteria, conceptual rigor and ease of application, volume of evidentiary support for psychometric properties, and validation by independent research teams in both western and eastern countries (Y.-C. Chiu et al., 2018; Daniel L King et al., 2020; Király et al., 2017b) and it has already been translated into Persian and validated in a population of Iranian players (article in print).

The Motives for Online Gaming Questionnaire (MOGQ) (Demetrovics et al., 2011): The MOGQ is a 27-item self-administered instrument assessing an individual's motivations for gaming. The instrument consists of the following domains: escape, coping, fantasy, skill development, recreation, competition, and social motivation. Each item has a 5-point Likert scale, with higher scores showing greater motivation in that domain. The MOGQ has been assessed in several languages and shown to have acceptable to very good psychometric properties (Ballabio et al., 2017; Demetrovics et al., 2011; Edy et al., 2017; A. M. Wu et al., 2016). The MOGQ has been translated into Persian and validated in a population of Iranian players in a separate study, and has acceptable content validity (scale validity indices for clarity and relevancy of 0.89 to 1) and test-retest reliability (intraclass correlation coefficient of 0.85) (article in print). The scores of different MOGQ domains were adjusted according to the number of the items so that all domains weighted equally and could be compared.

The Brief Symptom Inventory (BSI-53) (Derogatis & Spencer, 1993): The BSI was used to assess mental health and psychiatric symptomatology. The instrument consists of 53 items rated on 5-point Likert scales, with 49 items factoring into one of nine "primary symptom dimensions (such as depression, anxiety, somatization, etc.) and 4 items used only in estimating global symptom severity. Besides the total BSI-53 score, three global symptom severity indices can be calculated: the Global Severity Index (GSI) is the sum of the calculated scores for the nine dimensions plus the four additional items, divided by the total number of answered items; the Positive Symptom Total (PST) is the count of all items with non-zero responses and reveals the number of experienced symptoms; and the Positive Symptom Distress Index (PSDI) is the total BSI-53 score (sum of the items with non-zero responses) divided by the PST, providing information about the average distress level. Of the three, the GSI is the most sensitive indicator of the respondent's distress level (Derogatis, 1975) and we interpret a GSI above 1 as indicating the presence of any severe symptoms, in line with previous research (Olsen et al., 2006; Sereda & Dembitskyi, 2016). Internal consistency and other psychometric properties for the GSI and other indices have been acceptable to very good in various languages as well as in Persian (Derogatis & Melisaratos, 1983; Mohammadkhani et al., 2010).

Current gaming time was assessed using a single question with ordinal response categories. Participants were asked "How much time do you spend playing currently, on average? You can provide the time spent playing per day or week". The possible responses were "*Less than 7 hours per week (less than an hour per day)*", "*Between 7 to 14 hours per week (1-2 hours per day)*", "*Between 15 to 28 hours per week (2-4 hours per day)*", "*Between 29 to 42 hours per week (4-6 hours per day)*", and "*More than 42 hours per week (more than 6 hours per day)*". Participants were also asked to specify the frequency of playing different genres of games on daily, weekly, monthly, and less-than-monthly bases, with the genres including "*Multiplayer Online Role-Playing Games (MORPG)*", "*Multiplayer Online First-Person Shooters (MOFPS)*", "*Multiplayer Online Real-Time Strategy (MORTS)*", "*Turn-Based Strategy (TBS)*", "*Multiplayer Online Battle Arena (MOBA)*" and "*Other Online Games*" (coded as "*Genre Not Specified*"). Participants were then asked to write down the name of the game they predominantly play, and the predominant gaming genre was coded by the researchers. Many participants provided answers such as "mobile games", "Facebook games" or "fight games" which were impossible to code into a specific genre. For these participants, gaming genre was coded as "*Genre Not Specified*".

Statistical Analysis

Descriptive analysis was conducted on the demographics, patterns, time spent, gaming platform, genre, as well as the three utilized instruments. For the MOGQ, the scores of different domains were adjusted according to the number of the items, so that all domains weighted equally and could be

compared. Fisher's exact and chi-square tests were used for comparisons of categorical variables, whereas Mann–Whitney U test and the independent t-test and one-way ANOVA were used to compare numerical variables. Responses which did not include complete answers to at least one of the three main questionnaires (the IGDT-10, MOGQ and BSI-53) were removed entirely from the study. Response with individual missing values across the variables of interest for analyses were removed from the corresponding quantitative analysis. Descriptive statistics were only reported for data that was available.

The normality of variables was assessed with the Shapiro–Wilk test and graphical approaches, such as Q-Q plots and histograms. We calculated frequencies and percentages for categorical variables, means and standard deviations (SD) for normally distributed numerical variables and medians and interquartile ranges (IQR) for non-normally distributed numerical variables, such as the Brief Symptom Inventory (BSI) dimensions and indices. Since we were interested in the effect of large changes in MOGQ and BSI scores and using raw scores would have led to small effect sizes for each unitary increase, MOGQ and BSI quartiles were used in the regression analyses rather than raw scores. Cronbach's alpha indices were estimated to assess the internal reliability of the IGDT-10, MOGQ and BSI in the sample.

We used linear regression analyses with IGDT-10 score as the dependent variables to assess their correlates. Univariate and multivariate regressions were performed with all independent variables. Also, we conducted linear regression analyses with BSI score as the dependent variables to assess their correlates. We then performed logistic regression to investigate the association of different covariates with IGD. Since the number of those with IGD was low and to avoid the possible sparse data bias for categorical variables, we used penalized logistic regression. Penalized logistic regression is one way to tackle the numerical problems associated with low prevalence (Greenland et al., 2016; Heinze, 2006). In our analysis, we used STATA's penlogit command with a prior distribution of (0.2, 5) (Discacciati et al., 2015). The threshold for statistical significance was $P < 0.05$. Statistical analyses were performed using the STATA software, version 14 (College Station, TX: StataCorp LLC) and SPSS software package, version 25 (SPSS Inc., Chicago, IL, USA).

Results

Participants

A total of 1350 unique responses were recorded, but 559 were removed since they did not include complete answers to at least one of the main questionnaires (the IGDT-10, MOGQ and BSI-53). The remaining 791 participants, including 592 (75.4%) men, provided complete answers to at least one of the questionnaires and were included in the study. The age of these participants ranged from 18 to 50, with a mean of 23.4 years (SD = 8.8). A plurality of the participants (48.3%) was in the 20–25 age group. About 81.7% were students, and 13.9% were employed. Years of education ranged from 6 to 24 years, with an average of 15.1 years (SD = 2.4). The majority had higher education, and only 15% had less than 12 years of education. Nine out of ten participants were single. For the BSI, the means of GSI, PST, and PSDI indices were 0.88, 22.8, and 1.8, respectively, and averages did not significantly differ between men and women. Severe symptoms (GSI > 1) were found in 36.5% (95% CI: 33.1–40.0) of participants.

All instruments had appropriate internal reliability in the sample based on Cronbach's alpha indices, with values of 0.856 for IGDT-10, 0.939 for MOGQ, and 0.977 for BSI-53.

Patterns of Gaming

Most respondents (59.3%) reported playing online games less than seven hours per week (<one hour per day), 18.2% reported playing for 1–2 h per day (7–14 h per week), 10.5% reported playing for 2–4 h per day (15–28 h per week), and 6.2% reported playing for 4–6 h per day (29–42 h per week). Only 5.4% of respondents played more than 42 h per week (>6 h per day). Smartphones and tablets were the most common platforms used by online gamers (87.3%), followed by personal computers and notebooks (70.6%). Video game consoles (e.g., Xbox, PlayStation) were less frequently used (30.3%).

Figure 1 shows the distribution of played games by genre. Most participants reported playing games on a monthly basis that did not fall within a specific genre of game. These included responses such as "browser games", "Facebook games", "online mobile games", etc., and were categorized as "Genre Not Specified" (79%). The prevalence of

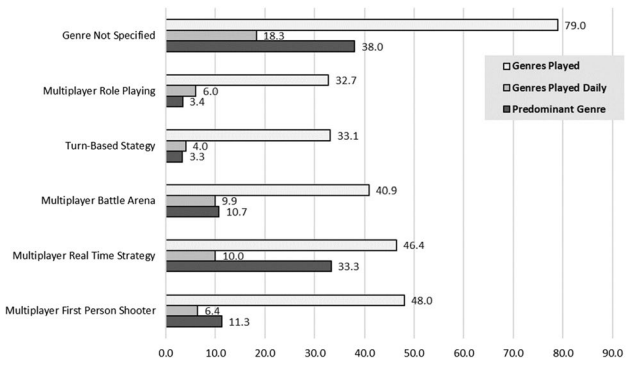

Fig. 1 Distribution of participants across the genres of online games they play, games played on a daily basis, and the genre played most predominantly; percentage

playing games from the five specific online game genres showed little difference, ranging from 32.7% for multiplayer online role-playing games (MORPG) to 48% for multiplayer first-person shooters (MOFPS). When asked to identify the most frequently played game, other games (38%) followed by Multiplayer Online Real-Time Strategy (MORTS) (33.3%) were the most common categories.

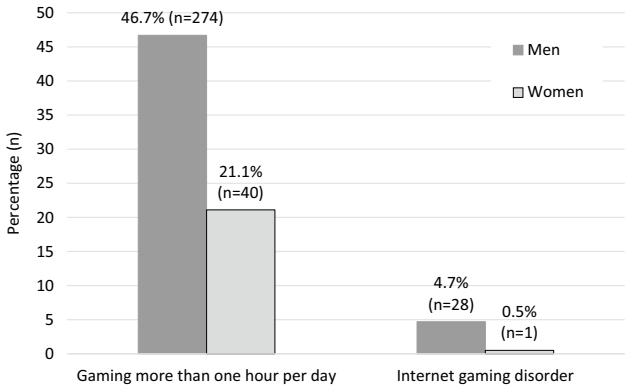

Fig. 2 Distribution of individuals who play more than an hour per day (7 h per week) across sex; percentage (n)

Pathological Gaming

Based on the IGDT-10, 3.7% of the respondents passed the threshold for IGD, defined as a rating of "*often*" on 5 or more IGDT-10 items, and IGD was found to be 9.4 times more common in men than women ($P = 0.007$) (Fig. 2).

Those with IGD were more than two years younger than those who did not meet the threshold (mean (SD): 21.1 (4.0) versus 23.4 (4.9); Cohen's d = 0.52, $P = 0.012$). Those who predominantly played "multiplayer online first-person shooter games" had a higher frequency of IGD (7.2%) compared to the sample average (3.7%) (Table 1). Based on the BSI-53, the presence of "severe psychiatric symptoms" (GSI > 1) was significantly more common in those with IGD

Table 1 Distribution of participants without any IGD criteria, participants positive for each of the criteria, and participants who meet the Internet Gaming Disorder threshold across predominant gaming genre [n (%)]

Criteria	Total (n = 734)	Gaming genres						Chi-square* (P Value)
		MORPG (n = 25)	MOFPS (n = 83)	MORTS (n = 244)	TBS (n = 24)	MOBA (n = 79)	GNS (n = 279)	
Without any IGD criteria	519 (65.8)	20 (80.0)	48 (57.8)	145 (59.4)	16 (66.7)	50 (63.3)	204 (73.1)	15.9 (0.007)
1- Preoccupation	83 (10.5)	1 (4.0)	15 (18.1)	25 (10.2)	1 (4.2)	10 (12.7)	24 (8.6)	8.8 (0.118)
2- Withdrawal	38 (4.8)	1 (4.0)	4 (4.8)	12 (4.9)	0 (0.0)	6 (7.7)	11 (3.9)	2.7 (0.715)
3- Tolerance	52 (6.6)	0 (0.0)	10 (12.0)	18 (7.4)	0 (0.0)	8 (10.1)	10 (3.6)	12.6 (0.019)
4- Loss of control	70 (8.9)	2 (8.3)	7 (8.4)	31 (12.8)	2 (8.3)	4 (5.1)	20 (7.2)	6.7 (0.241)
5- Giving up other activities	57 (7.2)	1 (4.0)	10 (12.0)	18 (7.4)	1 (4.2)	8 (10.1)	15 (5.4)	6.1 (0.297)
6- Continuation	103 (13.1)	2 (8.3)	15 (18.1)	38 (15.6)	2 (8.3)	15 (19.5)	26 (9.3)	10.2 (0.070)
7- Deception	65 (8.3)	1 (4.0)	8 (9.6)	23 (9.4)	1 (4.2)	5 (6.4)	23 (8.3)	2.1 (0.835)
8- Escape	71 (9.0)	1 (4.0)	10 (12.0)	23 (9.4)	6 (25.0)	9 (11.4)	20 (7.2)	10.3 (0.067)
9- Negative consequences (relationship problems or decrease in school/work performance)	85 (10.7)	2 (8.0)	10 (12.0)	30 (12.3)	2 (8.3)	5 (6.3)	31 (11.1)	2.7 (0.747)
Internet Gaming Disorder (IGD)	29 (3.7)	0 (0.0)	6 (7.2)	9 (3.7)	1 (4.2)	4 (5.1)	9 (3.2)	3.7 (0.528)

MORPG: (massively) multiplayer online role-playing games; MOFPS: multiplayer online first-person shooter; MORTS: multiplayer online real-time strategy; TBS: turn-based strategy; MOBA: multiplayer online battle arena; GNS: Genre not specified

(69.0%) compared to those who did not meet the threshold (35.2%). Almost all BSI dimensions were significantly more common among those with IGD (Table 2).

About 65.8% did not report any of the nine criteria of the IGDT-10; 15.3%, 6.8%, 4.9% and 3.4% of the individuals reported one, two, three and four positive criteria, respectively. The most common criteria were "continuation" (13.1%), "negative consequences" (10.7%), and preoccupation (10.5%). "Continuation" was the most common criterion across players of all genres. The least common criteria were "withdrawal" (4.8%) and "tolerance" (6.6%) (Table 1). As noted above, 3.7% of respondents (27 individuals) endorsed 5 or more of the criteria, with two respondents endorsing all criteria.

Motivations for Gaming

According to the MOGQ, "recreation" was the most common motivation for gaming in the total sample, followed by "competition" and "skill development". "Social motivation" was the least reported reason for gaming. Across all the domains of motivation, except for the "escape", the scores were higher in men than in women. Those who predominantly played MORTS showed a higher score in the "recreation" domain compared to those who played other genres. When comparing different genres, those who played MOFPS reported significantly higher scores in the "coping", "fantasy" and "social" domains. Participants who played turn-based strategy (TBS) games predominantly had higher scores in "competition", "skill development" and "escape" than others (Table 3). Also, individuals who reported daily gaming and those with IGD had higher scores than the sample average in all domains of motivation than those without such characteristics. Individuals who played with a console reported significantly higher motivation scores than average in the "skill development", "competition", "coping", "fantasy" and "social" domains than those who played with other platforms.

Correlated Factors of Internet Gaming Disorder and IGDT-10 Score

Multivariate logistic regression analysis for individuals who meet the threshold for IGD showed that younger age (OR = 0.87 for each year) and gaming time (OR = 15.20 for >42 h/week in comparison to <7 h/week) were associated with a higher risk for IGD (Table 4). Although both univariate and multivariate analyses indicated that higher weekly or daily gaming time is associated with IGD, low amounts of gaming time were also observed among individuals who met the IGD threshold, with 20.7% reporting a gaming time of less than 7 h a week (or one hour per day) (Fig. 3).

Multivariate linear regression analysis for IGDT-10 score showed that age ($\beta = -0.03$, $p = 0.015$), gaming time ($\beta = 1.55$, $p < 0.001$ for >42 h/week in comparison to <7 h/week), PC as gaming platform ($\beta = 1.55$, $p < 0.001$ in comparison to mobile), escape ($\beta = 0.01$, $p = 0.001$) and fantasy motives ($\beta = 0.05$, $p = 0.004$), and BSI score ($\beta = 0.01$, $p < 0.001$) were significantly correlated with IGDT-10 score. In this model, the effect size in terms of standardized regression coefficients for gaming time > 42 h/week (0.23) and BSI score (0.20) were at or above a commonly used threshold of 0.2 indicating "moderate" effect, with the rest of the variables having "weak" or non-significant effects on the IGDT-10 score (Acock, 2014) (Table 5).

Table 2 Participant scores on the symptom dimensions and global indices of the Brief Symptom Inventory, for individuals who meet and do not meet the Internet Gaming Disorder threshold (a rating of "often" on 5 or more IGDT-10 items)

BSI dimensions and indices	Total (n = 756)	Internet Gaming Disorder (IGD)		
		Yes (n = 29)	No (n = 727)	Z* (p value)
Somatization	0.29 (1.0)	0.57 (1.50)	0.43 (1.0)	−1.8 (0.079)
Obsession-Compulsion	1.0 (1.33)	1.67 (1.75)	1.0 (1.33)	−4.5 (<0.001)
Interpersonal Sensitivity	1.0 (1.75)	2.0 (2.13)	1.0 (1.50)	−4.4 (<0.001)
Depression	0.83 (1.50)	2.50 (2.33)	1.0 (1.33)	−4.1 (<0.001)
Anxiety	0.50 (1.17)	1.33 (2.0)	0.50 (1.0)	−3.5 (<0.001)
Hostility	0.60 (1.20)	1.40 (2.40)	0.60 (1.0)	−4.1 (<0.001)
Phobic Anxiety	0.40 (1.0)	0.80 (2.0)	0.40 (1.0)	−4.3 (<0.001)
Paranoid Ideation	1.0 (1.60)	2.40 (1.90)	1.0 (1.40)	−4.4 (<0.001)
Psychoticism	0.80 (1.60)	2.0 (2.20)	0.80 (1.40)	−4.6 (<0.001)
GSI	0.71 (1.15)	1.72 (1.79)	0.75 (1.08)	−3.2 (0.001)
PST	23.0 (29.75)	33.0 (24.50)	25.0 (26.0)	−3.2 (<0.001)
PSDI	1.67 (0.82)	2.48 (0.97)	1.64 (0.78)	−5.8 (<0.001)

*Z value based-on Mann-Whitney U test

BSI: Brief Symptoms Inventory; GSI: Global Severity Index; PSDI: Positive Symptom Distress Index; PST: Positive Symptom Total

Table 3 Participant scores on the Motives for Online Gaming Questionnaire (MOGQ) by sex and predominant gaming genre; Mean (SD)

Motivation Dimensions	Total (n = 785)	Sex		Cohen's d (P Value)	Genres of games						F value^ (P Value)
		Male (n = 592)	Female (n = 193)		MORPG (n = 25)	MOFPS (n = 83)	MORTS (n = 244)	TBS (n = 24)	MOBA (n = 79)	Other (n = 279)	
Social	8.30 (3.78)	8.58* (3.90)	7.49 (3.24)	0.30 (<0.001)	7.78 (3.71)	9.12* (4.44)	8.90 (4.07)	7.87 (3.40)	8.31 (4.16)	7.72 (3.29)	3.43 (0.005)
Escape	9.31 (4.68)	9.42 (4.72)	9.07 (4.59)	0.07 (0.372)	8.98 (3.85)	9.68 (5.15)	9.78 (4.92)	10.47* (5.47)	10.10 (5.20)	8.55 (4.31)	2.89 (0.014)
Competition	11.62 (5.24)	12.41* (5.29)	9.40 (4.34)	0.62 (<0.001)	10.49 (4.13)	12.56 (5.10)	12.09 (5.17)	13.47* (4.92)	12.93 (5.44)	10.59 (5.27)	4.97 (<0.001)
Coping	9.70 (4.46)	10.01* (4.55)	8.85 (4.06)	0.27 (0.002)	9.91 (3.66)	10.96* (5.22)	10.12 (4.63)	10.05 (3.60)	10.25 (4.91)	8.86 (4.05)	3.99 (0.001)
Skill Development	10.56 (4.98)	10.83* (5.13)	9.90 (4.45)	0.19 (0.025)	10.89 (4.78)	12.22 (5.78)	10.40 (5.0)	12.78* (4.83)	11.34 (5.25)	9.81 (4.55)	4.58 (<0.001)
Fantasy	8.64 (4.49)	9.03* (4.74)	7.54 (3.94)	0.34 (<0.001)	8.31 (3.26)	9.92* (5.33)	8.87 (4.55)	8.15 (4.44)	8.82 (4.99)	7.97 (4.19)	2.77 (0.017)
Recreation	17.08 (5.02)	17.64* (4.82)	15.47 (5.14)	0.43 (<0.001)	16.65 (4.57)	17.99 (4.54)	18.15* (4.56)	17.78 (5.0)	17.66 (5.16)	15.87 (5.18)	6.66 (<0.001)

*Highest values when there is a significant difference between the groups

^ F value based-on one-way ANOVA

MORPG: (massively) Multiplayer online role-playing games; MOFPS: Multiplayer online first-person shooter; MORTS: Multiplayer online real-time strategy; TBS: Turn-based strategy; MOBA: Multiplayer online battle arena. Note that 785 participants had sex and gaming motivations data, but 734 had data for predominant genre as well

Correlated Factors of BSI Score

Multivariate linear regression analysis for BSI score showed that gaming time ($\beta = -15.83$, $p = 0.021$ for >42 h/week in comparison to <7 h/week), using a PC as the gaming platform ($\beta = -9.5$, $p = 0.009$ in comparison to mobile), escape ($\beta = 2.61$, $p < 0.001$) and fantasy motives ($\beta = 1.16$, $p = 0.018$), and IGDT-10 score ($\beta = 6.10$, $p < 0.001$) were significantly correlated with BSI score. In this model, effect sizes (in terms of standardized regression coefficients) were higher for the escape motivation (0.27), IGDT-10 score (0.22), and the fantasy motivation (0.12) compared to other variables (Table 6).

Discussion

We used the IGDT-10 and the DSM-V-based cut-off threshold of 5 or more endorsed criteria for a positive screening result for IGD. Based on this definition, the prevalence estimate of IGD was 3.7% among gamers. Since the release of the DSM-5 and the development of the IGDT-10, this approach has been applied in other studies as well, and the prevalence estimates of IGD has been reported to be 1% to 9% among gamers in several studies (Király et al., 2015; Przybylski et al., 2017; Rehbein et al., 2015; Yu & Cho, 2016). Some studies have used multiple thresholds when screening participants for pathological gaming. For example, Demetrovics et al. assessed pathological online gaming using the Problematic Online Game Questionnaire (POGQ) and reported that 3.4% of the gamers were considered as high risk and another 15.2% were considered as "moderately problematic" (Demetrovics et al., 2012). In another study, "problematic gaming" was defined as having at least two criteria (out of the nine proposed research criteria by DSM-5) which had a prevalence of 11% in adolescents (Spilkova et al., 2017). These attempts to assess and screen for gaming patterns that are "problematic" (i.e., associated with a few symptoms of pathological gaming) but not "disordered" might reflect broader arguments that psychiatric conditions may be better conceptualized and approached as dimensional rather than categorical phenomena (Kotov et al., 2017; Yee et al., 2015). Indeed, it has recently been argued that a hybrid categorical and dimensional approach to the measurement of IGD might be optimal (Stavropoulos et al., 2021).

While we present data on the correlates of IGDT-10 score, a potentially dimensional measure of pathological gaming, we do not define any categories of players between those with a positive IGD screening result based on IGDT-10 and those with fewer than 5 endorsed criteria. This is because the diagnosis of IGD itself is still controversial (Ferguson et al., 2018; Van Rooij et al., 2018), and the IGDT-10 is merely a screening tool, not a diagnostic one, and applying

Table 4 Univariate and multivariate logistic regression of variables correlated with meeting the threshold for Internet Gaming Disorder (a rating of "often" on 5 or more IGDT-10 items) (n = 737 after removing participants with missing data)

		Internet Gaming Disorder (IGD)					
		Univariate for IGD [1]			Multivariate for IGD		
		OR	95% CI	P Value	OR	95% CI	P Value
Age		0.84	0.74–0.96	0.010	0.87	0.77–0.98	0.026
Sex							
Female		1.0			1.0		
Male		6.98	1.39–35.05	0.018	3.54	0.42–29.82	0.245
Gaming time							
<7 h/week (<1 h/day)		1.0			1.0		
7–14 h/week (1–2 h/day)		1.58	0.41–6.01	0.504	0.60	0.13–2.81	0.520
15–28 h/week (2–4 h/day)		4.42	1.37–14.29	0.013	1.99	0.48–8.25	0.341
29–42 h/week (4–6 h/day)		7.50	2.28–24.64	0.001	2.78	0.68–11.33	0.155
>42 h/week (>6 h/day)		20.17	7.21–56.40	<0.001	15.20	3.70–62.36	<0.001
Gaming platform							
Mobile		1.0			1.0		
PC		4.05	1.61–10.19	0.003	2.89	0.93–9.05	0.068
Console		2.10	0.29–15.48	0.465	0.72	0.06–8.15	0.794
> One platform		2.96	1.08–8.06	0.034	1.41	0.41–4.81	0.587
Predominant gaming genre							
Other		1.0					
MORTS		1.15	0.45–2.94	0.772			
MOFPS		2.34	0.81–6.77	0.118			
MOBA		1.60	0.48–5.34	0.445			
TBS		1.30	0.16–10.75	0.805			
MORPG		–	–	–			
Motives for Online Gaming Questionnaire							
Social	<=Q2	1.0			1.0		
	Q2 – Q3	1.43	0.45–4.53	0.544	0.71	0.17–2.87	0.625
	>Q3	4.51	1.99–10.20	<0.001	0.524	0.14–1.92	0.329
Escape	<=Q2	1.0			1.0		
	Q2 – Q3	1.31	0.38–4.46	0.667	0.51	0.11–2.35	0.391
	>Q3	7.82	3.18–19.21	<0.001	1.99	0.51–7.85	0.323
Competition	<=Q2	1.0			1.0		
	Q2 – Q3	2.33	0.77–7.05	0.135	2.26	0.54–9.41	0.264
	>Q3	6.96	2.80–17.33	<0.001	3.57	0.97–13.17	0.056
Coping	<=Q2	1.0			1.0		
	Q2 – Q3	1.94	0.63–5.99	0.248	1.18	0.28–5.06	0.821
	>Q3	5.51	2.31–13.15	<0.001	0.92	0.21–3.95	0.908
Skill development	<=Q2	1.0			1.0		
	Q2 – Q3	1.59	0.60–4.23	0.351	1.08	0.29–3.96	0.909
	>Q3	3.83	1.63–8.96	0.002	1.44	0.41–5.07	0.572
Fantasy	<=Q2	1.0			1.0		
	Q2 – Q3	1.81	0.55–6.03	0.331	0.81	0.18–3.66	0.788
	>Q3	6.18	2.61–14.62	<0.001	1.54	0.42–5.63	0.513
Recreation	<=Q2	1.0			1.0		
	>Q2	3.11	1.39–6.97	0.006	1.38	0.51–3.73	0.525
GSI > 1		3.93	1.80–8.61	0.001	2.73	0.96–7.81	0.061

BIS: Barratt impulsiveness scale; BSI: Brief symptoms inventory; CI: confidence interval; GSI: global severity index; IGD: Internet Gaming Disorder; MOBA: multiplayer online battle arena; MOFPS: multiplayer online first-person shooter; MORPG: (massively) multiplayer online role-playing games; MORTS: multiplayer online real-time strategy; OR: Odds Ratio; PC: personal computer; TBS: turn-based strategy

[1]Penalized

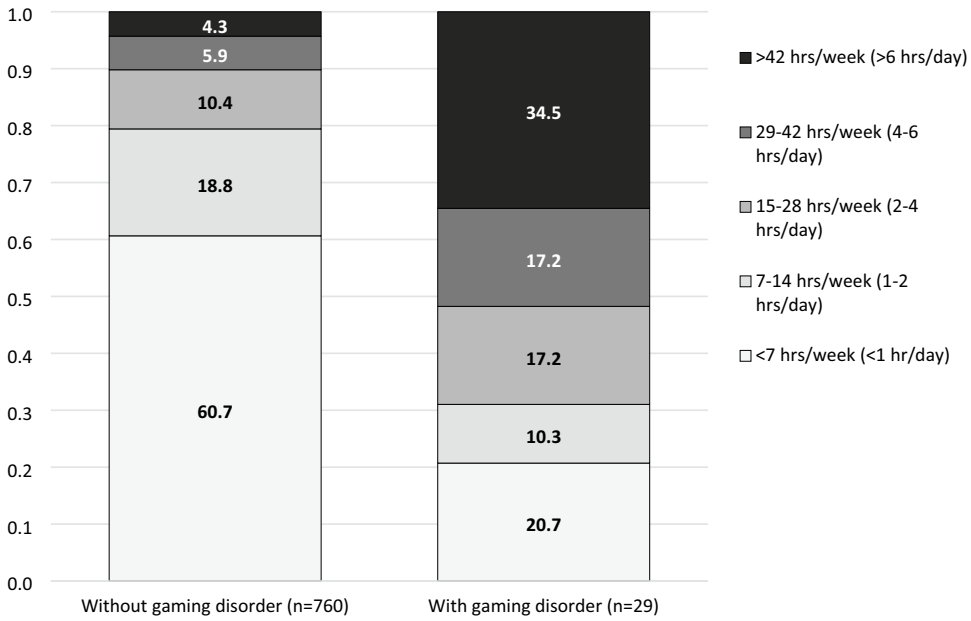

Fig. 3 Gaming time for participants who meet and do not meet the Internet Gaming Disorder threshold; percentage

such a label as "problematic gamer" to individuals without significant dysfunction may risk unjustified over-pathologization (Billieux et al., 2015). Based on the 5-criteria threshold, we found that higher gaming time and IGD were more prevalent in men than women. This is a consistent finding in studies from various cultural and national contexts across the world (S.-I. Chiu et al., 2004; Funk, 1993; Ko et al., 2005; Rehbein et al., 2015). Enjoying dominance, power, strength and violence while playing games may partly account for the higher interest of men/boys in gaming. It is important to note that psychological and behavioral differences between genders can be highly culturally contingent, and thus these comparisons between Iran and other countries can only be made tentatively until more nuanced data is available.

In the present study, higher gaming time was associated with IGD in general, inline with most prior research (Király et al., 2015; Ko et al., 2005; Kuss et al., 2012; Lemmens & Hendriks, 2016; Rho et al., 2016). It has been suggested that high gaming time can itself be a sign of pathological gaming and indicate loss of control (Tejeiro Salguero & Moran, 2002) and based on DSM-5 criteria, greater playing time might reflect "tolerance" (American Psychiatric Association, 2013). On the other hand, some studies suggest that gaming time is only moderately associated with IGD (Brunborg et al., 2014; Király et al., 2017a) and may reflect healthy player desires to achieve gaming-related objectives and rewards rather than a pathological gaming pattern (D. L. King et al., 2017). This likely suggests that gaming time per se is an unreliable predictor of pathological gaming (Király et al., 2017b).

Surprisingly, 20.7% of individuals with IGD (6 out of 29) played less than an hour per day, despite the overall relationship between gaming time and IGD. It has recently been argued that IGD criteria may fall under two broad categories: "symptom criteria" such as tolerance and the perception of playing for too long and loss of control over playing which do not nescessarily indicate objective harm; and "problem criteria" indicating the existence of objective familial, social or financial gaming-related problems (Carras & Kardefelt-Winther, 2018). Under this framework, Carras and Kardefelt-Winther have demonstrated that a large subgroup of players may fall in a "Concerned" class, not more likely to endorse IGD "symptom criteria" compared to normative players but more likely to endorse most IGD "problem criteria" (Carras & Kardefelt-Winther, 2018). The six participants in our study who reported at least 5 IGD criteria despite little gaming may fall under this class of "Concerned" players, but the limited sample size precludes further investigation.

We found "continuation" and "negative consequences" to be the most common criteria among all gamers and in those with IGD. While Király et al. have found similar results in Hungarian gamers, they reported that the two criteria were associated with a lower disorder severity (Király et al., 2017a). We also found that "withdrawal" and "tolerance" are less frequently seen in all gamers and those with IGD. Many studies have suggested that tolerance and withdrawal are key features of IGD (Király, Sleczka, et al., 2017; Rehbein et al., 2015), but there is no consensus on applying these concepts, primarily associated with physical dependence, to IGD. Some have noted that clinically-relevant pathological gaming may arise without associated tolerance and withdrawal symptoms and these symptoms might be infrequent (Király et al., 2017a; Rehbein et al.,

Table 5 Univariate and multivariate linear regression of variables correlated with Internet Gaming Disorder Test-10 score (n = 669 after removing participants with missing data)

	Univariate for IGDT-10				Multivariate for IGDT-10			
	β	Standardized Beta	95% CI for β	P Value	β	Standardized Beta	95% CI for β	P Value
Age	−0.03	−0.11	−0.05 to −0.01	0.0.002	−0.03	0.01	−0.05 to −0.01	0.015
Sex, male	0.44	0.13	0.21 to 0.68	<0.001	0.05	0.01	−0.19 to 0.23	0.689
Gaming time								
<7 h/week (<1 h/day)	1.0				1.0			
7–14 h/week (1–2 h/day)	0.42	0.11	0.17 to 0.67	0.001	−0.003	−0.001	−0.26 to 0.25	0.982
15–28 h/week (2–4 h/day)	0.87	0.18	0.56 to 1.18	<0.001	0.45	0.09	0.13 to 0.77	0.006
29–42 h/week (4–6 h/day)	1.34	0.22	0.94 to 1.73	<0.001	0.72	0.12	0.33 to 1.11	<0.001
>42 h/week (>6 h/day)	2.11	0.33	1.68 to 2.53	<0.001	1.55	0.23	1.09 to 2.0	<0.001
Gaming platform								
Mobile	1.0				1.0			
PC	0.42	0.12	0.17 to 0.67	0.001	0.39	0.11	0.14 to 0.64	0.002
Console	0.92	0.11	0.34 to 1.49	0.002	0.47	0.06	−0.08 to 1.01	0.094
> One platform	0.49	0.14	0.23 to 0.76	<0.001	0.23	0.06	−0.02 to 0.48	0.075
Predominant gaming genre								
Other	1.0				1.0			
MORTS	0.25	0.08	−0.003 to 0.5	0.053	−0.01	−0.005	−0.24 to 0.21	0.898
MOFPS	0.43	0.18	0.07 to 0.79	0.020	−0.07	−0.01	−0.39 to 0.26	0.693
MOBA	0.24	0.19	−0.12 to 0.61	0.196	−0.26	−0.05	−0.59 to 0.06	0.115
TBS	−0.20	0.31	−0.63 to 0.59	0.948	−0.22	−0.05	−0.78 to 0.34	0.448
MORPG	−0.20	0.30	−0.80 to 0.39	0.501	−0.29	−0.03	−0.83 to 0.25	0.293
Motives for Online Gaming Questionnaire								
Social	0.17	0.01	0.14 to 0.19	<0.001	0.005	0.01	−0.03 to 0.04	0.782
Escape	0.15	0.43	0.13 to 0.17	<0.001	0.06	0.17	0.02 to 0.09	0.001
Competition	0.10	0.01	0.08 to 0.12	<0.001	0.02	0.07	−0.004 to 0.05	0.096
Coping	0.14	0.38	0.12 to 0.16	<0.001	−0.005	−0.01	−0.04 to 0.03	0.789
Skill development	0.07	0.21	0.05 to 0.09	<0.001	−0.003	−0.01	−0.03 to 0.02	0.806
Fantasy	0.15	0.01	0.13 to 0.17	<0.001	0.05	0.14	0.02 to 0.08	0.004
Recreation	0.09	0.21	0.06 to 0.12	<0.001	0.01	0.02	−0.02 to 0.04	0.621
BSI-53	0.01	0.41	0.01 to 0.02	<0.001	0.01	0.20	0.005 to 0.01	<0.001

BSI: Brief symptoms inventory; CI: confidence interval; MOBA: multiplayer online battle arena; MOFPS: multiplayer online first-person shooter; MORPG: (massively) multiplayer online role-playing games; MORTS: multiplayer online real-time strategy; PC: personal computer; TBS: turn-based strategy

2015; Snodgrass et al., 2017). The 11th version of the International Classification of Diseases (ICD-11) has not included these two symptoms as essential features of IGD (World Health Organization, 2019).

Based on our findings, IGD was more prevalent in those who predominantly played "multiplayer online first-person shooter games" than others. Several other studies have also found that multiplayer online first-person shooters and role-playing games might contribute to higher gaming time and pathological gaming (Elliott et al., 2012; Kim et al., 2010; Laconi et al., 2017; Na et al., 2017), suggesting a possible role for specific genres in the psychopathology of the IGD.

Significant correlations were found between IGD and BSI scores in the multivariate linear regression model, with a standardized beta coefficient of 0.20. Correlations between psychopathology and IGD has been commonly reported, and the literature seems to suggest bi-directional relationship between the two phenomena: Most researchers believe that neuroticism and symptoms like anxiety, depression, and low self-esteem play an etiological role in the development of IGD, but these symptoms have been described as consequences of the disorder as well (Carli et al., 2013; Kuss & Griffiths, 2012; Weinstein et al., 2014). For a better understanding of this relationship, better controls, larger samples and longitudinal designs are needed. The relationship

Table 6 Univariate and multivariate linear regression of variables correlated with the brief symptom inventory (BSI) score (n = 669 after removing participants with missing data)

	Univariate for BSI				Multivariate for BSI			
	B	**Standardized Beta**	**95% CI for B**	**P Value**	**B**	**Standardized Beta**	**95% CI for B**	**P Value**
Age	−0.62	−0.07	−1.23 to −0.002	0.049	−0.57	−0.06	−1.16 to 0.03	0.061
Sex, male	−0.67	−0.01	−7.46 to 6.12	0.846	−5.94	−0.06	−12.77 to 0.90	0.089
Gaming time								
<7 h/week (<1 h/day)	1.0				1.0			
7–14 h/week (1–2 h/day)	15.19	0.14	7.50 to 22.88	<0.001	5.63	0.05	−1.76 to 13.01	0.135
15–28 h/week (2–4 h/day)	9.45	0.07	−0.15 to 19.06	0.054	−4.17	−0.03	−13.47 to 5.13	0.379
29–42 h/week (4–6 h/day)	27.18	0.16	15.11 to 39.25	<0.001	5.03	0.03	−6.24 to 16.29	0.381
>42 h/week (>6 h/day)	18.36	0.10	5.22 to 31.50	0.006	−15.83	−0.09	−29.25 to −2.41	0.021
Gaming platform								
Mobile	1.0				1.0			
PC	−5.61	−0.06	−13.01 to 1.79	0.137	−9.50	−0.10	−16.66 to −2.33	0.009
Console	13.80	0.06	−2.99 to 30.58	0.107	7.24	0.03	−8.43 to 22.91	0.365
> One platform	6.03	0.06	−1.63 to 13.68	0.122	−0.40	−0.004	−7.66 to 6.85	0.913
Predominant gaming genre								
Other	1.0				1.0			
MORTS	5.40	0.06	−1.82 to 12.63	0.142	0.58	0.01	−5.82 to 6.98	0.860
MOFPS	4.87	0.04	−5.44 to 15.57	0.354	−2.39	−0.02	−11.78 to 7.0	0.617
MOBA	5.69	0.04	−8.12 to 27.75	0.283	0.10	0.001	−9.24 to 9.45	0.983
TBS	9.82	0.04	−8.12 to 27.75	0.283	4.37	0.02	−11.75 to 20.50	0.595
MORPG	−3.0	−0.01	−20.57 to 14.57	0.738	−6.83	−0.03	−22.40 to 8.74	0.389
Motives for Online Gaming Questionnaire								
Social	3.64	0.30	2.81 to 4.47	<0.001	0.29	0.02	−0.80 to 1.38	0.600
Escape	4.42	0.46	3.81 to 5.04	<0.001	2.61	0.27	−0.80 to 1.38	<0.001
Competition	2.40	0.30	1.80 to 2.99	<0.001	0.67	0.08	−0.06 to 1.41	0.073
Coping	3.85	0.37	3.17 to 4.53	<0.001	0.60	0.06	−0.53 to 1.73	0.298
Skill development	1.46	0.16	0.81 to 2.11	<0.001	−0.71	−0.08	−1.50 to 0.07	0.076
Fantasy	3.92	0.39	3.27 to 4.58	<0.001	1.16	0.12	0.20 to 2.12	0.018
Recreation	1.12	0.09	0.26 to 1.98	0.011	−0.89	−0.07	−1.83 to 0.05	0.065
IGDT-10 score	11.29	0.41	9.47 to 13.12	<0.001	6.10	0.22	3.93 to 8.26	<0.001

BSI: Brief symptoms inventory; CI: confidence interval; MOBA: multiplayer online battle arena; MOFPS: multiplayer online first-person shooter; MORPG: (massively) multiplayer online role-playing games; MORTS: multiplayer online real-time strategy; PC: personal computer; TBS: turn-based strategy

between meeting the IGD threshold and the presence of severe psychiatric symptoms did not reach significance (p = 0.61) in the multivariate logistic regression model, though this may have been because of the small number of individuals who met the threshold.

Gaming motivations can also be associated with healthy or pathological online game play. In the total sample, we found "recreation" followed by "competition" and "skill development" as the most prominent motivation domains for gaming, while the "social" motivation domain was the least frequent. "Fantasy" and "competition" domains had a higher correlation with pathological gaming than others. Studies have reported a variety of gaming motivation profiles in different groups of gamers. In particular, escapism has been reported as a common gaming motivation in gamers with IGD (Billieux et al., 2011; Király et al., 2015; Kuss et al., 2012; Laconi et al., 2017; Sauter et al., 2020). "Coping" and "fantasy" motivations have also been associated with IGD in some studies (Király et al., 2015; Laconi et al., 2017). However, it is unclear whether these motivations result in pathological gaming or the motives change over time, with more time spent on gaming or when problems arise.

Limitations

This is the first study conducted in Iran that investigates different aspects of online gaming and was carried out in a relatively large sample of specifically online players. However, since data were collected via an online survey and on a non-representative sample, any generalization of these findings should be carried out with caution. The cross-sectional design of the study and the reliance on self-reports could be considered other limitations of our study. Some of the questions meant to assess gaming behavior also add to the limitations. For example, gaming time was assessed as an ordinal and not a continuous variable, and the specification of preferred gaming genres relied on participant familiarity with specific genre labels, which may have led to a high proportion of participants without a specified genre, even though an open question was included to avoid the issue. Future studies with random samples of online gamers, longitudinal follow-ups and more sophisticated designs, gathering information from significant others, including clinical samples and using more objective measures (such as applications for assessing screen time and gaming time) are necessary to mitigate these limitations.

Conclusion

This survey showed that problems associated with online gaming were common among Iranian gamers, and were more prevalent among younger individuals and those who play longer hours. Patterns of gaming, including game genres, gaming platform and motivations for gaming seem to be implicated in healthy and pathological gaming. It appears that the symptomatology and correlated factors of IGD vary across countries. More investigation is needed to understand the underlying nature of these variations and their relevance to IGD. Moreover, longitudinal studies are required to assess the course and outcomes of different patterns of gaming.

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Availability of Data and Material The dataset analyzed during the current study is not publicly available to maintain participant anonymity, but anonymized data are available from the corresponding author on reasonable request.

Author CRediT Statement Hosein Rafiemanesh: Methodology, Software, Formal analysis, Data Curation, Writing - Original Draft.

Rabert Farnam: Supervision, Conceptualization, Project administration.

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Declarations

Conflict of Interests None.

Ethics Approval The research protocol was approved by the Ethics Committee of Tehran University of Medical Sciences in Iran (No. IR.TUMS.VCR.REC.1395.800).

Consent to Participate All participants were informed regarding the purpose of the study and participant anonymity before choosing to participate in the online survey.

Ethics Approval Participants were informed that provided data would be used for the preparation of publicly available research.

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