

## The influence of game genre on Internet gaming disorder

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*Background and aims:* Although Internet gaming disorder (IGD) has been investigated in detail, minimal research has been conducted regarding the influence of different game genres on IGD. The aim of this study is to compare the characteristics of members of game genre-specific groups with IGD and to identify factors associated with IGD status in each group in a large sample of adults. *Methods:* Internet games were categorized into four genres: real-time strategy games, massive multiplayer online role-playing games (MMORPG), sport games, and first-person shooter (FPS) games. Participants ( $n = 2,923$ ) who usually played one of these games completed an anonymous online survey that collected sociodemographic, game usage pattern, and psychopathological assessment data. *Results:* MMORPG and FPS game players more frequently met the criteria for IGD than participants in the other two groups. Differences between the IGD-suspected gamers within the genre-specific groups were observed for a few items, such as average game-playing time and the subscales of the behavioral activation system; however, the factors that contributed to the development of IGD within each game genre-specific group were found to be considerably different. *Discussion and conclusions:* The findings of this study suggest that IGD is a stable psychiatric diagnosis encompassing users of a broad range of game genres. In addition, the development of strategies for the prevention of and early intervention on individuals at high risk for developing IGD may require consideration of the distinct characteristics identified as effective predictors of IGD in users of each game genre.

**Keywords:** Internet gaming disorder, game genre, anxiety, impulsivity, self-control, behavioral addiction

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### INTRODUCTION

Internet gaming disorder (IGD), previously considered as an addictive behavior in *Diagnostic and statistical manual of mental disorders, fifth edition* (DSM-5), has recently been the focus of clinical attention in the field of mental health (American Psychiatric Association, 2013). To prevent the negative consequences of this disorder, such as interference with daily functioning and health morbidities, a great deal of investigations related to the theoretical understanding and practical management of IGD has been conducted (Eichenbaum, Kattner, Bradford, Gentile, & Choo, 2015). Indeed, some authors have noted that the body of evidence, to date, has indicated that numerous factors are associated with IGD, ranging from sociodemographic factors to psychological features (Lin, Ko, & Wu, 2011; Wu, Lee, Liao, & Chang, 2015).

Although the vast majority of studies have described the epidemiological characteristics of IGD, comparably little research has been conducted regarding the implication of game genre as a specific factor influencing IGD. Most previous studies have reported that the genre of game was associated with specific psychopathological profiles in individuals suspected of IGD, thus suggesting that the

identification of the preferred game type in IGD-suspected gamers may be important in developing an understanding of their clinical characteristics (Eichenbaum, Kattner, Bradford, Gentile, & Green, 2015; Elliott, Golub, Ream, & Dunlap, 2012; Lemmens & Hendriks, 2016; Metcalf & Pammer, 2014; Müller et al., 2015; Nagygyörgy et al., 2013; Park, Han, Kim, Cheong, & Lee, 2016). In other words, the results of previous studies, especially studies comparing game genres, have demonstrated that certain types of problematic Internet game players exhibit unique features in association with IGD, finding that a group containing problematic massive multiplayer online role-playing game (MMORPG) users demonstrated high levels of social anxiety, and that a group containing first-person

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shooter (FPS) game players with IBD demonstrated significantly higher levels of impulsivity than controls (Metcalf & Pammer, 2014; Park et al., 2016). Moreover, it has been proposed that specific game genres may serve as risk factors for IGD, including MMORPGs, FPS games, and real-time strategy (RTS) games (Lemmens & Hendriks, 2016), with some authors suggesting that the eminently immersive nature of these games and their associated potential for online-based social activities may contribute to high rates of IGD (Lemmens & Hendriks, 2016; Metcalf & Pammer, 2014; Park et al., 2016). Although preliminary evidence has indicated the importance of game genre in IGD, studies that have previously been conducted have included only a small sample size or particular groups, such as adolescents or students (Eichenbaum, Choo, et al., 2015; Eichenbaum, Green, et al., 2015; Müller et al., 2015; Park et al., 2016). In addition, some prior studies have narrowly focused on the impact of certain game genres on IGD and have not compared critical features between different genre-specific IGDs (Berle, Starcevic, Porter, & Fenech, 2015; Hsu, Wen, & Wu, 2009; Hussain, Griffiths, & Baguley, 2012; Kirby, Jones, & Copello, 2014; Metcalf & Pammer, 2014). Given the broad range and rapid expanding nature of the Internet gaming industry, increasing the body of knowledge regarding the effect of Internet game genres within under-represented groups could help inform the successful treatment of IGD.

To address these issues, this study investigated the influence of each game genre in association with IGD status in a large sample size of adults. This study aimed to compare game genre-specific IGD-suspected gamers by assessing their Internet game usage patterns and psychopathological characteristics. In addition, this study identified critical factors associated with the development of IGD in each user group according to their preferred genre of games.

## METHODS

### *Participants*

A total of 5,003 persons aged 20–49 years from South Korea completed an anonymous web-based survey conducted by a professional polling company (Hankook Research, Inc., Seoul, South Korea). All participants provided written informed consent prior to responding to the survey. Among the participants, all Internet gaming users who reported playing RTS games, MMORPG, sports games, or FPS games were included in this study except for individuals with a psychopathological history; the 2013 White Paper on Korean Games, a comprehensive summary of worldwide publications related to online games, was used to sort the responses regarding the titles of online games into four distinct genres (Korea Creative Content Agency, 2013). The final sample included 2,923 adults (837 females); of the participants, 30.7% ( $n = 896$ ) were RTS game users, 30.0% ( $n = 876$ ) were MMORPG game users, 23.3% ( $n = 680$ ) were sports game users, and 16% ( $n = 471$ ) were FPS game users.

### *Procedure*

IGD was determined by the endorsement more than five of the nine features included within the Section III of updated DSM-5 criteria, including preoccupation with Internet games, unsuccessful attempts to control gaming behavior, loss of interest in other activities, withdrawal, and tolerance (APA, 2013).

Internet game usage patterns were evaluated using questions related to participation in offline gaming-orientated communities, use of Internet cafes called PC Bangs (rooms), average amount of money spent on games, and average gaming time on weekdays and weekends.

The Dickman Impulsivity Inventory – Short Version (DII-short) is a 23-item self-report questionnaire evaluating functional and dysfunctional impulsivities (Dickman, 1990). In this study, 12 items from the DII-short questionnaire were adapted to assess dysfunctional impulsivity, which is the tendency to act with less forethought, leading to maladaptive performance and negative consequences (Zhang, Lamis, & Yuanyuan, 2012).

The Brief Self-Control Scale (BSCS; Korean validation by Hong, Kim, Kim, & Kim, 2012) was administered to measure dispositional self-control pertaining to thought control, emotion control, impulse control, performance regulation, and habit breaking. The 13 items that constitute this assessment tool are scored on a Likert scale (ranging from 1: strongly disagree to 5: strongly agree) with higher total scores representing lower self-control.

The Symptom Checklist-90-Revised (SCL-90-R; Korean validation by Kim, Kim, & Won, 1984) was designed to assess a broad range of psychopathological symptoms including somatization, obsession–compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. In this study, 23 items from the SCL-90-R were adapted to evaluate depression (13 items) and anxiety (10 items).

The behavioral inhibition system (BIS)/Behavioral Approach System Scale (Korean validation by Kim & Kim, 2001) includes 20 items divided into four subscales: BIS, behavioral activation system reward responsiveness (BAS-RR), drive (BAS-Drive), and fun-seeking (BAS-Fun) (Carver & White, 1994). Each subscale measures motivational systems underlying typical reactions to certain situations. The BIS assesses sensitivity to anticipated punishment, the BAS-RR assesses positive responses to rewards, the BAS-Drive assesses pursuit of goal-achievement, and the BAS-Fun assesses desires for new rewards during potentially novel experiences (Gray, 1981, 1982).

### *Statistical analysis*

The analyses consisted of two parts. First,  $\chi^2$  tests were conducted to compare the categorical variables between genre groups, and analysis of variance tests were performed to compare the distribution of continuous variables. The Bonferroni correction was used for post hoc analysis. Second, multivariate logistic regression analyses were conducted to determine the magnitude of the influence of predictive variables within each of the four game genre groups. All statistical analyses were performed using R

software, version 3.2.4 (R foundation for statistical computing, Vienna, Austria).

Ethics

The study procedures were carried out in accordance with the guidelines of Declaration of Helsinki. This study was approved by the Institutional Review Board of Seoul St. Mary's Hospital (IRB number: KC15EISI0103).

RESULTS

Sociodemographic data

Of the 2,923 participants, 494 met the IGD criteria (16.9%), of which a higher proportion were male ( $n = 358$ ; 72.5%) than female ( $n = 136$ ; 27.5%). (Table 1) Among the participants with problematic Internet game use, 32.2% ( $n = 159$ ) were categorized as MMORPG users, 28.1% ( $n = 139$ ) were categorized as RTS game users, 19.8% ( $n = 98$ ) were categorized as FPS game users, and 19.8% ( $n = 94$ ) were categorized as sports game users. The results of the  $\chi^2$  test indicated the presence of a significant difference in the IGD status distribution of the four genre-specific groups ( $\chi^2 = 10.32$ ,  $p = .016$ ), with the highest proportion of the IGD group identified in the FPS game group, followed by the MMORPG group, the RTS game group, and the sports game group. No difference was observed between the groups in unemployment status ( $\chi^2 = 3.03$ ,  $p = .387$ ). IGD-suspected gamers in the MMORPG (18.6% and 24.1%) and FPS game (21.1% and 22.4%) groups reported higher rates of smoking ( $\chi^2 = 8.49$ ,  $p = .037$ ) and drinking ( $\chi^2 = 12.69$ ,  $p = .005$ ) than participants in the other groups.

Between-group comparisons of gaming patterns and clinical characteristics

Considerable differences were identified between the game genre-specific groups regarding their overall gaming patterns and clinical characteristics, including their DII-short, BSCS, depression subdomain of SCL-90-R, BAS-RR, and BAS-Fun scores (Table 2). The post hoc analyses revealed that the average amount of gaming time on weekdays and the BAS-RR scores of participants in the MMORPG group were significantly higher than those of participants in the sports game group. Furthermore, the MMORPG group had higher scores on the DII-short and BSCS than the RTS game group. The sports game group significantly spent less money on buying games or progressing in games than the other groups; in addition, the sports game group participants had lower BAS-Fun scores than members of the other groups.

Meanwhile, when comparing these variables between only the members of the groups with IGD, differences in the temporal patterns of Internet game usage and scores on the subscales of the BAS were identified; however, no significant differences were observed in the amount of money spent gaming and other clinical characteristics

Table 1. Sociodemographic data

	RTS (N = 896)				MMORPG (N = 876)				Sports (N = 680)				FPS (N = 471)				$\chi^2$
	IGD		Non-IGD		IGD		Non-IGD		IGD		Non-IGD		IGD		Non-IGD		
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	
Gender	139	(15.5%)	757	(84.5%)	159	(18.2%)	717	(81.8%)	98	(14.4%)	582	(85.6%)	98	(20.8%)	373	(79.2%)	10.32*
Male	107	(77.0%)	605	(79.9%)	94	(59.1%)	401	(55.9%)	79	(14.6%)	464	(79.7%)	78	(79.6%)	258	(69.2%)	14.07**
Female	32	(23.0%)	152	(20.1%)	65	(40.9%)	316	(44.1%)	19	(13.9%)	118	(20.3%)	20	(20.4%)	115	(30.8%)	0.913
Age (years)																	
20-29	63	(45.3%)	350	(46.2%)	37	(23.3%)	238	(33.2%)	40	(40.8%)	212	(36.4%)	40	(40.8%)	167	(44.8%)	3.95
30-39	56	(40.3%)	280	(37.0%)	83	(52.2%)	333	(46.4%)	41	(41.8%)	252	(43.3%)	42	(42.9%)	146	(39.1%)	6.27
40-49	20	(14.4%)	127	(16.8%)	39	(24.5%)	146	(20.4%)	17	(17.4%)	118	(20.3%)	16	(16.3%)	60	(16.1%)	7.01
Unemployment	10	(7.2%)	47	(6.2%)	17	(10.7%)	79	(11.0%)	6	(6.1%)	42	(7.2%)	10	(10.2%)	27	(7.2%)	3.03
Substance use																	
Smoking	46	(33.1%)	209	(27.6%)	57	(35.8%)	180	(25.1%)	28	(28.6%)	175	(30.1%)	34	(34.7%)	118	(31.6%)	8.49*
Alcohol use	98	(70.5%)	594	(78.5%)	122	(76.7%)	533	(74.3%)	73	(74.5%)	446	(76.6%)	78	(79.6%)	292	(78.3%)	12.69***

Note. RTS: real-time strategy; MMORPG: massive multiplayer online role-playing games; FPS: first-person shooter; IGD: Internet gaming disorder.

\* $p < .05$ . \*\* $p < .01$ .

Table 2. Between-group comparisons of gaming patterns and clinical characteristics

	RTS <sup>a</sup>		MMORPG <sup>b</sup>		Sports <sup>c</sup>		FPS <sup>d</sup>		Statistics			
	(N = 896)		(N = 876)		(N = 680)		(N = 471)		F			
	Total	IGD	Total	IGD	Total	IGD	Total	IGD	Total	IGD	Total	IGD
<i>Gaming patterns</i>												
Gaming time on weekdays (hr)	2.28 ± 2.17	3.58 ± 3.21	2.36 ± 2.19	2.93 ± 2.72	2.01 ± 2.02	2.80 ± 3.01	2.15 ± 1.62	2.59 ± 1.66	4.13***	2.93**	b>c	a>d
Gaming time on weekends (hr)	3.51 ± 3.38	5.08 ± 4.10	3.55 ± 3.23	3.69 ± 2.25	2.95 ± 3.12	3.69 ± 2.37	3.43 ± 3.20	4.19 ± 3.57	5.34***	5.78***	a,b>c	a>b,c
Amount of money spent gaming (USD)	19.57 ± 34.92	39.03 ± 59.24	21.42 ± 41.53	35.30 ± 56.73	13.50 ± 22.29	24.35 ± 31.13	18.68 ± 29.94	34.62 ± 47.56	7.4***	1.62	a,b,d>c	
<i>Clinical characteristics</i>												
DII-short	3.77 ± 2.85	6.01 ± 2.69	4.17 ± 2.95	5.81 ± 2.84	3.98 ± 2.82	5.64 ± 2.70	4.18 ± 2.85	6.01 ± 2.76	3.51**	0.45	b>a	
BSCS	35.98 ± 6.45	40.27 ± 6.48	36.61 ± 6.85	40.86 ± 6.16	36.00 ± 6.27	39.34 ± 5.85	36.79 ± 6.25	40.40 ± 5.38	2.79**	1.3		
SCL depression	13.23 ± 10.31	21.58 ± 11.31	14.65 ± 10.73	22.62 ± 11.49	13.40 ± 9.98	21.91 ± 11.28	14.51 ± 10.27	21.50 ± 9.10	3.85***	0.3	b>a	
SCL anxiety	8.43 ± 8.13	15.45 ± 9.39	9.26 ± 8.26	16.62 ± 8.98	8.79 ± 7.71	15.90 ± 8.86	9.41 ± 8.08	15.70 ± 7.31	2.28	0.49		
BIS	18.48 ± 3.32	19.00 ± 3.26	18.72 ± 3.32	19.42 ± 3.16	18.35 ± 3.07	18.50 ± 2.96	18.55 ± 3.19	18.94 ± 2.89	1.82	1.83		
BAS-RR	13.08 ± 2.95	13.66 ± 3.30	13.43 ± 2.84	14.37 ± 2.77	12.82 ± 2.94	13.30 ± 3.25	13.21 ± 2.93	14.16 ± 2.54	5.73***	3.2**	b>c	
BAS-Drive	9.38 ± 2.23	9.99 ± 2.56	9.55 ± 2.15	10.46 ± 2.27	9.27 ± 2.13	9.91 ± 2.48	9.49 ± 2.17	10.46 ± 2.11	2.4	1.86		
BAS-Fun seeking	9.99 ± 2.28	10.50 ± 2.63	10.18 ± 2.20	10.84 ± 2.19	9.68 ± 2.20	10.06 ± 2.49	10.15 ± 2.31	11.02 ± 2.09	7.24***	3.36**	a,b,d>c	d>c

Note. RTS: real-time strategy; MMORPG: massive multiplayer online role-playing game; FPS: first-person shooter; IGD: Internet gaming disorder; DII-short: Dickman Impulsivity Inventory – Short Version; BSCS: Brief Self-Control Scale; SCL: Symptom Checklist; BIS: behavioral inhibition system; BAS: behavioral activation system; BAS-RR: BAS-reward responsiveness; USD: United States dollar (\$). \*\**p* < .05. \*\*\**p* < .01.

between the groups. The post hoc tests suggested that RTS game group participants with IGD spent more time playing games on weekdays than members of the FPS-IGD subgroup and on weekends than members of the MMORPG-IGD and the sports game-IGD subgroups. The participants in the sports game-IGD subgroup had lower BAS-RR scores than MMORPG-IGD group participants and lower BAS-Fun seeking scores than FPS-IGD group members. In addition, the IGD and non-IGD subgroups within each game genre-related group notably differed in their reported gaming patterns and almost all clinical measures ( $p < .05$ ) except for BIS scores in the sports ( $p = .591$ ) and the FPS game groups ( $p = .149$ ).

### *Identifying predictors of IGD by game genre*

The multivariate logistic regression analyses conducted to identify factors associated with IGD within each genre-specific subgroup revealed diverse results (Table 3). First, more gaming time on weekdays [odds ratio (OR) = 1.22; 95% CI: 1.096–1.358;  $p < .001$ ], a larger amount of money spent gaming (OR = 1.007; 95% CI: 1.002–1.012;  $p = .007$ ), higher DII-short scores (OR = 1.232; 95% CI: 1.131–1.343;  $p < .001$ ), higher BSCS scores (OR = 1.055; 95% CI: 1.006–1.107;  $p = .028$ ), and higher scores on the anxiety subdomain of the SCL-90-R (OR = 1.061; 95% CI: 1.001–1.125;  $p = .046$ ) were associated with IGD among RTS game users. Second, participating in game-related offline communities (OR = 2.133; 95% CI: 1.317–3.540;  $p = .002$ ), more gaming time on weekdays (OR = 1.175; 95% CI: 1.065–1.297;  $p = .001$ ), less gaming time on weekends (OR = 0.895; 95% CI: 0.816–0.982;  $p = .020$ ), higher BSCS scores (OR = 1.073; 95% CI: 1.027–1.121;  $p = .002$ ), and higher scores on the anxiety subdomain of the SCL-90-R (OR = 1.148; 95% CI: 1.048–1.216;  $p < .001$ ) were identified as factors associated with IGD among MMORPG players. Third, using PC rooms for playing games (OR = 1.951; 95% CI: 1.118–3.405;  $p = .019$ ), more gaming time on weekdays (OR = 1.152; 95% CI: 1.028–1.290;  $p = .015$ ), higher DII-short scores (OR = 1.131; 95% CI: 1.026–1.246;  $p = .013$ ), and higher scores on the anxiety subdomain of the SCL-90-R (OR = 1.093; 95% CI: 1.018–1.173;  $p = .014$ ) were associated with IGD among sports game-playing participants. Finally, participating in game-related offline communities (OR = 1.947; 95% CI: 1.027–3.692;  $p = .041$ ), higher DII-short scores (OR = 1.190; 95% CI: 1.062–1.333;  $p = .002$ ) and higher scores on the anxiety subdomain of the SCL-90-R (OR = 1.100; 95% CI: 1.025–1.181;  $p = .011$ ) were identified as factors associated with IGD among FPS game users.

## DISCUSSION

To our knowledge, this is the first study not only to compare members of game genre-specific groups with IGD but also identify factors associated with IGD within each game genre group in a large sample of adults. The results indicated that within the genre-specific groups, individuals suspected of IGD demonstrated slight differences in the average number

of hours spent gaming per day and some of the evaluated clinical scales. In addition, different predictors, including gaming patterns and psychopathological factors, were identified to be associated with the development of IGD within each specific game-playing group.

In this study, the total IGD rate (16.9%) was higher than that previously reported in the general population of South Korea (13.8%) (Kim et al., 2016). IGD was more common in young adults and males than their respective counterparts, both of which are characteristics that have been identified as associated with high risk for behavioral addictions. This result is in accordance with previously published findings regarding problematic Internet use (Bakken, Wenzel, Götestam, Johansson, & Øren, 2009; Grant, Potenza, Weinstein, & Gorelick, 2010). However, gamers with IGD who are in their 40s or female also may be cause for concern in the clinical setting.

A greater proportion of MMORPG and FPS game players met the criteria for IGD than members of the other two game groups. This finding supports previous results suggesting that IGD might be more prevalent in users of specific genres of Internet games, especially online role-playing and FPS games (Elliott, Ream, McGinsky, & Dunlap, 2012; Kim et al., 2010). Moreover, within the MMORPG-IGD and FPS game groups, the participants with IGD more frequently reported using substances, such as alcohol and tobacco, than when compared with the members of the other genre-related IGD groups. Given the adverse effects of substance use observed in patients with other psychiatric disorders, the results of this study suggest that assessing of the presence of substance use in users of genres of Internet games with IGD could be associated with a substantial reduction in mental health burden (Vogeli et al., 2007).

A noteworthy finding was that differences between the members of genre-specific groups with IGD were identified for a few items, whereas differences were observed between the overall genre-specific groups (including both IGD and non-IGD game users) were identified for most characteristics. Subjects with IGD in the RTS game group spent substantial amounts of time playing games; specifically, the amount of time spent gaming on weekdays was identified as significantly greater in members of the RTS game group with IGD than members of the RTS game group without IGD. This finding supports the hypothesis that gaming time management for high risk of IGD gamers who play RTS games might be important in alleviating their symptoms (Eichenbaum, Green, et al., 2015). Meanwhile, differences in a small number of clinical features were observed between the IGD groups. Given that the groups exhibited similar severity levels for almost all characteristics, IGD appears to be a stable diagnostic disorder within the DSM-5, encompassing users of a variety of genres in the gaming industry (APA, 2013). The only difference observed was the presence of high BAS scores in the MMORPG-specific and the FPS game-specific IGD groups, which could imply that cognitive behavioral therapy and the interpersonal therapy targeting BAS-relevant events might be beneficial in the treatment of IGD in individuals who play these games (Alloy & Abramson, 2010).

Table 3. Multiple logistic regression analyses of factors predicting IGD in game genre-specific groups

Variables	RTS		MMORPG		Sports		FPS	
	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
Gender (male/female)	0.837 (0.491–1.427)	.514	1.008 (0.627–1.621)	.972	1.255 (0.643–2.451)	.506	1.956 (0.979–3.909)	.058
Age (years)	1.188 (0.873–1.616)	.273	1.270 (0.936–1.724)	.125	1.157 (0.807–1.659)	.426	0.933 (0.629–1.384)	.730
<i>Substance use</i>								
Smoking (yes/no)	1.186 (0.722–1.947)	.501	1.332 (0.816–2.173)	.252	0.665 (0.376–1.176)	.161	0.737 (0.398–1.363)	.331
Alcohol use (yes/no)	0.797 (0.484–1.313)	.373	0.701 (0.427–1.150)	.160	0.932 (0.509–1.705)	.819	1.335(0.625–2.849)	.770
<i>Gaming patterns</i>								
Offline community for gaming (yes/no)	1.245 (0.767–2.021)	.375	2.133 (1.317–3.540)	.002	1.485 (0.846–2.606)	.168	1.947 (1.027–3.692)	.041
Using PC rooms (yes/no)	1.33 (0.818–2.162)	.251	1.434 (0.905–2.271)	.124	1.951 (1.118–3.405)	.019	1.131 (0.604–2.116)	.700
Gaming time on weekdays (hr)	1.22 (1.096–1.358)	<.001	1.175 (1.065–1.297)	.001	1.152 (1.028–1.290)	.015	1.103 (0.948–1.284)	.203
Gaming time on weekends (hr)	0.994 (0.927–1.066)	.875	0.895 (0.816–0.982)	.020	0.978 (0.896–1.068)	.623	1.017 (0.939–1.101)	.682
Amount of money spent gaming (USD)	1.007 (1.002–1.012)	.007	1.003 (0.999–1.007)	.198	1.008 (0.999–1.017)	.087	1.008 (0.999–1.017)	.089
<i>Clinical characteristics</i>								
DII-short	1.232 (1.131–1.343)	<.001	1.072 (0.990–1.161)	.085	1.131 (1.026–1.246)	.013	1.190 (1.062–1.333)	.002
BSCS	1.055 (1.006–1.107)	.028	1.073 (1.027–1.121)	.002	1.031 (0.971–1.095)	.317	1.059 (0.990–1.133)	.088
SCL depression	1.013 (0.964–1.064)	.619	0.969 (0.925–1.015)	.185	1.015 (0.957–1.076)	.625	0.998 (0.941–1.058)	.966
SCL anxiety	1.061 (1.001–1.125)	.046	1.148 (1.048–1.216)	<.001	1.093 (1.018–1.173)	.014	1.100 (1.025–1.181)	.011
BIS	0.972 (0.883–1.071)	.570	0.922 (0.842–1.009)	.076	0.932 (0.825–1.053)	.259	0.899 (0.790–1.023)	.153
BAS-RR	1.029 (0.888–1.193)	.701	1.114 (0.966–1.284)	.138	1.069 (0.894–1.280)	.463	1.023 (0.833–1.257)	.762
BAS-Drive	1.019 (0.873–1.189)	.814	1.159 (0.995–1.349)	.059	1.146 (0.944–1.391)	.169	1.238 (1.022–1.530)	.069
BAS-Fun seeking	0.909 (0.767–1.076)	.266	0.868 (0.744–1.013)	.072	0.836 (0.681–1.024)	.084	1.058 (0.864–1.295)	.672

Note. RTS: real-time strategy; MMORPG: massive multiplayer online role-playing game; FPS: first-person shooter; DII-short: Dickman Impulsivity Inventory – Short Version; BSCS: Brief Self-Control Scale; SCL: Symptom Checklist; BIS: behavioral inhibition system; BAS: behavioral activation system; BAS-RR: BAS-reward responsiveness; USD: United States dollar (\$).

Several factors were identified as contributing significantly to the development of IGD within each game genre-specific group; however, demographic factors, such as age and gender, were not observed in association with IGD in any of the groups. As stated above, this result suggests that further clinical attention to the risk of IGD in previously understudied population groups, such as females and middle-aged individuals, is warranted, although the results of other studies have demonstrated that male gender and young adulthood were risk factors for Internet addiction (Lin et al., 2011; Wu et al., 2015). In addition, distinct gaming patterns were identified as effective predictors of IGD within each group, including the amount of money spent gaming and time spent playing games on weekdays for RTS group members, participating in game-related offline clubs and the amount of time spent gaming for MMORPG group members, and using PC rooms for sports games, and joining game-related offline clubs for FPS game group members. For example, FPS game users who tend to extend their social interactions in the cyber world to the real world might be more preoccupied with Internet games, which may be associated with increased negative consequences related to this addictive behavior (Park et al., 2016). Hence, the assessment of gaming patterns among Internet game players who want to manage their gaming behaviors could be useful in predicting the risk of problematic consequences and targeting behavioral modifications (Hussain et al., 2012). Finally, anxiety was positively associated with IGD in each of the genre-specific groups, in which impulsivity was a predictor of RTS, sports game, and FPS game-related IGD, and poor self-control was found to be associated with RTS and MMORPG-related IGD. Regarding the hypothesis that Internet gaming may serve as a coping strategy for anxiety reduction, this study supports that specific management of anxiety for individuals at high risk for developing IGD may be efficacious (Mehroof & Griffiths, 2010). In addition, previous studies have underscored the importance of both impulsivity and self-control in the clinical management of problematic Internet use (Dong & Potenza, 2014; Zhou, Zhu, Li, & Wang, 2014). Future research regarding the strategies that facilitated acquisition of skills for dealing with impulsivity and self-control among players of each genre of game may contribute to the development of programs for the prevention of and the early intervention on this disorder.

This study has a number of limitations. First, self-report data could be biased in the direction of both overreporting and underreporting. Second, the results of this study have limited generalizability, and causality could not be definitively established due to the non-representative sample included in and cross-sectional nature of the study. Third, the Internet gaming industry has rapidly been launching new products, such as mobile-based games and virtual reality games; these categories of games could not be investigated in this study. Future research is required to advance the understanding of genre-related IGD and its clinical features using a longitudinal perspective and to define precise treatment strategies for individuals at high risk for developing IGD.

## CONCLUSIONS

These limitations notwithstanding, the findings of this study suggest that IGD is a stable psychiatric diagnosis encompassing users of a wide range of gaming genres. Furthermore, individuals with IGD within each game genre exhibited distinct characteristics, comprising their gaming patterns, and clinical characteristics that may be for predicting IGD development. The implementation of strategies for the prevention and early treatment of IGD in community mental health services may require consideration of gaming genres.

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