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Internet gaming disorder and its correlates among university students, Saudi Arabia

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Abstract:

BACKGROUND: Over-indulgence in online/offline video games could result in the development of internet gaming disorder (IGD). Knowledge of the prevalence and correlates of IGD may help to understand its etiology. The aim of the present study was to estimate IGD and its psychological/game-related correlates in Saudi university students.

MATERIALS AND METHODS: For this cross-sectional study, 843 students registered in a university in Saudi Arabia filled an online survey comprising diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), hospital anxiety and depression scale, Rosenberg self-esteem scale, social phobia inventory scale, satisfaction with life scale, and subjective happiness (SH) scale. For data analysis, an independent sample *t*-test, Pearson correlation coefficient/Chi-square test, and multiple linear regression followed by hierarchical regressions were used.

RESULTS: The frequency of IGD was 21.5%. Total game time/day, years of playing games, and social phobia were significantly higher in subjects with IGD ($P = 0.001$, <0.001 , and <0.001 , respectively), whereas SH was significantly lower ($P < 0.001$). Tendency to IGD had a significant positive correlation with social phobia, total game time/day, and years of playing games and a negative correlation with SH. Total game time/day, years of playing games, and social phobia were significant positive predictors of tendency to IGD, whereas SH was a negative predictor. The rest of all variables were insignificant predictors.

CONCLUSION: The frequency of IGD in Saudi university students identified by DSM-5 criteria was relatively high (21.5%). The prediction of the severity of IGD could be based on social phobia, total game time/day, number of years of playing games, and SH.

Keywords:

Internet gaming disorder, social phobia, video games

Introduction

Playing online games is the most widespread leisure interest of the youth of today. Internet Gaming Disorder (IGD) is present in Diagnostic and Statistical Manual of Mental Disorders (DSM-5), published by American Psychiatric Association (APA).^[1] In 2013, at the time of publication of DSM-5, APA added IGD to the section recommending conditions for future study. The World

Health Organization also recognized game addiction as a serious public health problem and labeled it "Gaming disorder" (GD).^[2]

According to the DSM-5, "IGD is a recurring and persistent use of video games (both online and/or offline), frequently with other players, as reflected by the endorsement of at least five out of nine clinical criteria in the last 12 months."^[1] Since the inclusion of IGD in DSM-5, numerous studies have been conducted worldwide on gaming behavior.^[3,4] IGD has been linked with co-morbidities such as anxiety, depression, stress, and less satisfaction with

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life (SWL).^[5,6] IGD exhibits neurobiological changes that are typical for other addictions, such as: (i) activation of dopamine-mediated reward mechanisms; (ii) reduced activity in impulse control areas and impaired decision making; and (iii) reduced functional connectivity in brain pathways involved in cognitive control, executive function, motivation, and reward. Studies have even found abnormal structures and patterns in the brain of individuals with IGD,^[7] not directly involved in other forms of addiction. Mohammadi *et al.*, reported significantly decreased gray and white matter in violent videogame players compared to age-matched controls. The density of gray matter was negatively correlated with the total length of playing in years.^[8] Seok and Sohn (2018) reported a negative association between IGD severity and functional connectivity in the areas which facilitate reward and cognitive control.^[9] Takeuchi *et al.*, reported a correlation of video game playing with delayed brain development and low intelligence.^[10] However, the inconsistent and nonstandardized diagnostic approaches to identifying IGD weaken inferences drawn from these studies.

In Saudi Arabia, two local studies,^[11,12] explored IGD prevalence, correlates, and risk factors but none of them used the DSM-5 criteria to diagnose IGD. The participants in these studies were adolescents (intermediate and high school students). Hence, their results cannot be generalized to other age groups like university students. Another local study^[13] restricted to a relative small sample of 281 students, identified IGD by using IGD 9-Item Short Scale and found an association of IGD with age, gender, sleep, academic achievement, and accommodation. That study was limited to medical students only, but our study involved all the disciplines/colleges in Saudi Arabia. One more local study^[14] involved a relatively bigger sample size (798 participants) but was restricted to male high school students only. They also used IGD 9-Item Short Scale. Therefore, the present study was conducted to explore IGD in Saudi university students using DSM-5 criteria to compare psychological health variables (anxiety, depression, social phobia, self-esteem, SWL, and subjective happiness [SH]) and game-related variables between students with and without IGD. The correlation and predictive value of these psychological variables for the tendency to IGD in this demographic group was also explored.

Materials and Methods

Students were recruited by nonprobability convenience sampling and snowball sampling for this cross-sectional study. The sample size was calculated through an online free statistical program OpenEpi.^[15] Considering the total number of Saudi students registered in Saudi universities as 1.7 million^[16] and an expected prevalence

of IGD in Saudi university students as 8.8%,^[13] the calculated sample size was 771 at 2% absolute precision and 95% confidence level. The survey was created with Google forms. The survey link was shared with the group leaders of each class by social media, requesting that they share the link not only with their whole class but also with friends/relatives currently registered in a Saudi university, regardless of the city. Data were collected from January to March 2020. Ethical approval was obtained from the Institutional Review Board (IRB) vide Letter No. IRB 2019-01-403 dated 22/12/2019 and informed written consent was taken from all participants.

The game-related variables included an estimate of gaming time (minutes) on a typical working day, an estimate of gaming time (minutes) on a typical weekend, and the number of years since online/offline play of video games began. Average game time/day was calculated subsequently by the following formula: Average game time/day = $([\text{working day game time} \times 5] + [\text{weekend day game time} \times 2])/7$.

DSM-5 criteria were used to identify IGD tendency/severity. This criterion consists of 9 items reflecting on (a) preoccupation, (b) withdrawal, (c) tolerance, (d) Reduce/stop, (e) continue despite problems, (f) give up other activities, (g) escape adverse moods, (h) deceive/cover-up, and (i) Risk/lose. Although these items can have either dichotomous (yes/no) or polytomous (likert-type or frequency-based) response options, we chose dichotomous response options because Lemmens *et al.*, declared the dichotomous 9-item IGD scale as the more practical scale for diagnostic purposes compared with polytomous scale.^[17] Subjects had to answer each item with either “yes” or “no.” Subjects were identified as cases of IGD if they endorsed ≥ 5 items.^[18] The number of criteria endorsed by a participant reflected IGD tendency/severity. Cronbach’s alpha of this scale was 0.75.

Anxiety and depression were assessed by the Hospital Anxiety and Depression Scale.^[19] Cronbach’s alpha was 0.79.

Self-esteem was assessed by the Rosenberg Self-Esteem Scale and higher scores suggested greater self-esteem.^[20] Cronbach’s alpha was 0.72.

Social phobia was assessed by Social Phobia Inventory and higher scores indicated more social anxiety/phobia.^[21] Cronbach’s alpha was 0.74.

SWL was measured by the SWL Scale and higher scores indicated greater satisfaction.^[22] Cronbach’s alpha was 0.77.

SH was measured by the SH Scale. And higher scores reflected greater happiness.^[23] Cronbach’s alpha was 0.73.

For the translation of these questionnaires into participants’ native language “Arabic,” reverse-translation technique was used. English versions were translated first into Arabic, and then into English by two different expert translators.

Descriptive statistics, independent sample *t*-test, Pearson correlation coefficient/Chi-square test, and multiple linear regression followed by hierarchical/sequential regressions were conducted using the Statistical Package for the Social Sciences (IBM SPSS, Chicago, IL, USA), version 27. Multiple linear regression was applied to explore the prognostic value of psychological predictors (independent variables) in IGD tendency/severity (dependent variable). The order in which various predictors was entered hierarchically are shown in Figure 1. The threshold for significance was set at <0.05 in all tests.

Results

In total, 843 respondents (men: 382 [45.3%]; women: 461 [54.7%]) completed the survey online. 181 out of 843 subjects (21.5%) were identified as cases of IGD as they endorsed ≥ 5 items of DSM-5 (men: 81 [44.8%]; women:

100 [55.2%]) [Table 1]. Social phobia, total game time/day, and the number of years of playing online/offline video games were significantly higher in subjects with IGD ($P = 0.001$, <0.001 , and <0.001 , respectively). SH was significantly less in subjects belonging to the IGD group ($P < 0.001$) [Table 2]. Pearson correlation revealed a significant positive correlation of IGD tendency with social phobia, total game time/day, and the number of years of playing online/offline games. The correlation was significant and negative with SH [Table 3].

In linear regression analysis, the value of R (multiple correlational coefficients) was 0.564, showing a good level of prediction of tendency to IGD (dependent variable) with the predictors. R^2 value was 0.32 ($F [11, 819] = 34.671$, $P < .0001$). Predictor relationship of “total game time/day” and “years of playing online/offline video games” with IGD was also significant and positive ($\beta 1.016$, $P < 0.001$ and $\beta 0.179$, $P < 0.001$, respectively). The rest of the variables (age, anxiety, depression, self-esteem, and SWL) were insignificant predictors [Table 4].

Sequential/hierarchical regression analysis [Figure 1 and Table 5] revealed that social phobia alone caused 3% variation. Adding SH to social phobia caused an additional variation of 2.2%. Next, adding total game time/day accounted for an additional variation of 12%, and adding years of playing online/offline games caused an additional 1.8% variation.

In summary, IGD tendency had a significant positive correlation with social phobia, total game time/day, and

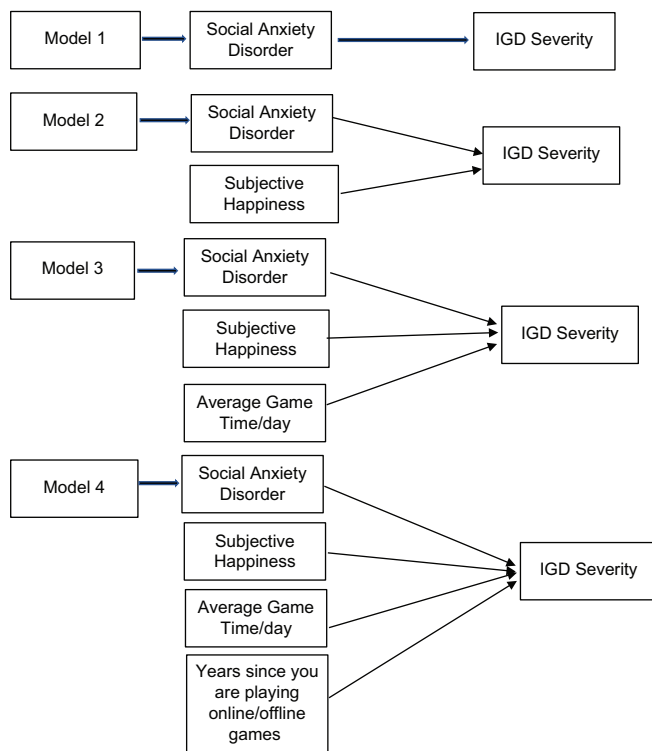


Figure 1: The input order of the Hierarchical Regression Analysis showing the outcome/dependent variable (IGD severity) and the predictors. IGD: Internet gaming disorder

Table 1: Demographics, psychological, and game-related variables among study participants

Parameters	Mean±SD
Age (years)	20.68±1.55
Gender, N (%)	
Men	382 (45.3)
Women	461 (54.7)
Anxiety scores	7.92±4.5
Depression scores	6.48±3.68
Self-esteem scores	28.35±4.39
Social phobia scores	22.52±14.25
Satisfaction with life scores	25.58±7.01
Subjective happiness scores	4.44±1.17
IGD, N (%)	
Yes	181 (21.5)
No	662 (78.5)
Estimated game time/working day (min)	103±152.5
Estimated game time/weekend (min)	274.99±387.82
Total game time/day ^a (min)	151±215.11
Number of years of playing online/offline video games	5.35±5.77

^aTotal game time/day=Working day×5 + weekend day×2/7. IGD=Internet gaming disorder, SD=Standard deviation

Table 2: Comparison of psychological and game-related variables between study participants with and without internet gaming disorder

Parameters	Subjects with IGD (n=181) Mean±SD	Subjects without IGD (n=662) Mean±SD	P-value
Age (years)	20.51±1.50	20.72±1.56	0.09
Gender, N (%)			
Men	81 (44.8)	301 (45.5)	-
Women	100 (55.2)	361 (54.5)	
Anxiety scores	8.21±4.33	7.84±4.56	0.33
Depression scores	6.59±3.46	6.45±3.73	0.65
Self-esteem scores	27.66±3.83	28.53±4.51	0.02
Social phobia scores	25.77±15.06	21.64±13.90	0.001
Satisfaction with life scores	25.32±6.89	25.66±7.05	0.57
Subjective happiness scores	4.07±1.29	4.54±1.11	<0.001
Estimated game time/working day (min)	199.42±224.63	76.64±112.46	<0.001
Estimated game time/weekend (min)	398.84±449.26	240.51±361.81	<0.001
Total game time/day ^a (min)	256.36±288.84	122.20±179.87	<0.001
Number of years of playing online/offline video games	7.30±5.92	4.82±5.62	<0.001

^aTotal game time/day=Working day×5 + weekend day×2/7. IGD=Internet gaming disorder

Table 3: Correlation of internet gaming disorder tendency/severity with psychological and game-related variables

Parameters	Pearson correlation coefficient	P-value
Age (years)	-0.047	0.18
Gender	0.029	0.864
Anxiety scores	0.02	0.56
Depression scores	-0.001	0.97
Self-esteem scores	-0.056	0.11
Social phobia scores	0.19	<0.001
Satisfaction with life scores	-0.04	0.23
Subjective happiness scores	-0.18	<0.001
Estimated game time/working day (min)	0.41	<0.001
Estimated game time/weekend (min)	0.27	<0.001
Total game time/day ^a (min)	0.35	<0.001
Number of years of playing online/offline video games	0.29	<0.001

^aTotal game time/day=Working day×5 + weekend day×2/7

years of playing games, and a negative correlation with SH. Total game time/day, years of playing games, and social phobia were significant positive predictors of IGD tendency, whereas SH was a negative predictor.

Discussion

The present study aimed to find out the frequency of IGD in Saudi university students by the DSM-5 criteria. We found IGD frequency as 21.5% (44.8% men: 55.2% women). Two previous studies conducted locally in the Eastern province of Saudi Arabia^[11,12] reported prevalence rates of 5% and 16%. Study participants in both these studies were adolescents (mean ages 16.1 ± 1.6 and 15.3 ± 1.25 years, respectively), and that data were collected 7 years ago. The cause of higher frequency in our study as compared to these studies

could be an actual rise in IGD with time owing to increased affordability and accessibility of internet games, or use of different instruments/diagnostic approaches to identify IGD as all the instruments may not be equally sensitive, or variability in participants' characteristics such as variations in age. Recently, two local studies^[13,14] identified IGD in the same way as the present study and reported the prevalence of IGD as 8.8% and 21.85%, respectively. One of those studies was limited to medical students.^[13] Medical students might have a lower prevalence because of their arduous studies and the significant demands their profession makes of them. The other study that reported IGD prevalence of 21.85% was limited to male high school students.^[14]

We found the “total game time/day” and the “number of years of playing online/offline games” as significant positive predictors of IGD tendency/severity, in line with previous studies.^[24-27] The experience of playing video games is considered “rewarding” by the players because it triggers the release of dopamine in the brain.^[28] Dopamine has been reported to play a role in addictive behavior.^[29] We found social phobia a strong positive predictor of IGD tendency, parallel with studies on other populations.^[30,31] Karaca *et al.*,^[32] reported social anxiety as a significant risk factor of online game addiction. Subjects suffering from social phobias have unnecessary fears related to social interactions. However, they perceive virtual interactions as “safe.”^[33] Hence, socially anxious individuals have a greater propensity to developing internet addiction.

Our study showed that subjects with IGD were significantly less happy than subjects without IGD. SH was a significant negative predictor of IGD tendency in our study population, meaning that happiness may

Table 4: Linear regression model for predictors of internet gaming disorder tendency/severity

Parameters	Effect on slope		95% CI		P-value
	Estimate	SE	Lower limit	Upper limit	
Gender	-0.006	0.162	-0.353	0.289	0.844
Age (years)	-0.030	0.05	-0.151	0.047	0.302
Anxiety scores	-0.010	0.20	-0.045	0.034	0.777
Depression scores	-0.011	0.26	-0.059	0.043	0.770
Self-esteem scores	-0.38	0.20	-0.063	0.017	0.261
Social phobia scores	0.138	0.006	0.014	0.037	<0.001
Satisfaction with life scores	0.064	0.013	-0.001	0.049	0.057
Subjective happiness scores	-0.167	0.072	-0.521	-0.237	<0.001
Total game time/day ^a (min)	1.016	0.001	0.015	0.020	<0.001
Number of years of playing online/offline games	0.179	0.015	0.053	0.112	<0.001

^aTotal game time/day=Working day×5 + weekend day×2/7. Linear regression model: $F=34.671$, $R=0.564$, $R^2=0.318$, Adjusted $R^2=0.309$, $P<0.001$. Dependent variable: IGD tendency/severity. Predictors: Gender, age, anxiety, depression, social phobia, satisfaction with life, subjective happiness, total game time/day, number of years since you are playing online/offline games. SE=Standard error, CI=Confidence interval, IGD=Internet gaming disorder

Table 5: Sequential/hierarchical multiple regression analysis for predictors of internet gaming disorder tendency/severity

Model sequence	Unstandardized coefficients		Standardized coefficients (β)	P-value	R ²	R ² change
	β	SE (β)				
Model 1						
Social phobia	0.034	0.006	0.185	<0.001	0.034	0.034
Model 2						
Social phobia	0.028	0.006	0.153	<0.001	0.056	0.022
Subjective happiness	-0.343	0.078	-0.152	<0.001		
Model 3						
Social phobia	0.026	0.006	0.138	<0.001	0.179	0.123
Subjective happiness	-0.377	0.072	-0.167	<0.001		
Total game time/day	0.004	0.000	0.351	<0.001		
Model 4						
Social phobia	0.023	0.006	0.125	<0.001	0.197	0.018
Subjective happiness	-0.381	0.072	-0.169	<0.001		
Total game time/day	0.003	0.000	0.285	<0.001		
Years you have been playing online/offline games	0.069	0.016	0.151	<0.001		

protect an individual from developing IGD tendency/severity. Conversely, the lack of happiness may make a person more susceptible to developing IGD. The protective role of happiness in addictive behaviors has been reported earlier as well.^[34,35]

Conclusion

Our results revealed that social phobia, SH, total game time/day, and “years of online/offline games” were significantly related to IGD, and they predicted IGD significantly. On the other hand, age, gender, anxiety, depression, self-esteem, and SWL were not related to or predict IGD. Therefore, policy-makers, mental health educators, and practitioners should be aware of this relationship and try to identify young adults who suffer from social phobias and spend a lot of time on internet games. Families of such individuals should encourage alternative activities for them and provide them with social support. If such gamers are identified at an earlier

stage, and corrective measures are taken, the tendency to IGD can be avoided.

We relied on self-report instruments. Since this was a cross-sectional study, a causal link could not be established. Experimental or longitudinal studies should be planned in the future to determine causal links. Convenience sampling technique was used, so our results cannot be generalized to similar populations. Despite the limitations, our study has examined the frequency of IGD using DSM-5 criteria in a large sample of young university students.

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Conflicts of interest

There are no conflicts of interest.

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