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Internet gaming disorder: Its prevalence and associated gaming behavior, anxiety, and depression among high school male students, Dammam, Saudi Arabia

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Abstract:

BACKGROUND: Video games have become popular in the last few decades, resulting in an increase in reported negative consequences. This study aimed to assess the prevalence of internet gaming disorder (IGD), its association with gaming behavior, depression, and anxiety in male high school students.

MATERIALS AND METHODS: This cross-sectional study involved male high school students in Dammam. Schools were selected using stratified random sampling, and data were collected using a self-administered questionnaire. Data analyzed using SPSS v23.0; the initial analysis included descriptive statistics. Continuous and ordinal variables were compared using *t*-test or Mann–Whitney U test, and ANOVA or Kruskal–Wallis test, as appropriate; Chi-square test was used for categorical variables. Spearman correlation coefficient was calculated to determine the correlation between IGD score and depression and anxiety scores.

RESULTS: A total of 726 high school gamers were involved, 87% of whom were Saudi, with a mean age of 16.92 years and 45% were from public schools. The mean IGD score was 18.12, and the prevalence of IGD was 21.85%. Students who spent ≥ 4 h/day on weekdays or ≥ 6 h/day at weekends on videogames and gamers who spent ≥ 200 Saudi Riyals per month on gaming had significantly higher mean IGD scores ($P < 0.001$). Gamers who used PC/laptop for gaming had significantly higher IGD scores compared to those who used other devices ($P = 0.002$). Action, fight, open-world games, and games with violence were associated with significantly higher IGD scores. Among students with IGD, 21.7% had moderately severe/severe depression and 11.4% had severe anxiety.

CONCLUSION: IGD is a concerning psychiatric disorder in male high school students. It is associated with certain gaming behavior and other mental problems. We recommend future larger-scale research that includes females as well.

Keywords:

Addiction, anxiety, depression, internet gaming disorder, online games, videogames

Introduction

The advancement of internet technologies has brought diverse changes to our lives and increased the number of internet

users dramatically. For instance, in 2021, approximately 95% of Saudi Arabia's population of 35.08 million had an active internet connection, indicating a growth rate of 4.2% from 2020.^[1]

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Internet addiction in Saudi Arabia was estimated at one-third of the population.^[2] With the advancement of the internet came the more sophisticated mobiles, video game consoles, and dedicated personal computers for gaming at affordable prices. This increase in the popularity of video games among the youths in the past two decades has resulted in an increase in reported negative impact on mental, physical, and social well-being of the gamers.^[3,4] A study conducted in 2018–2019 in Al-Khobar, reported that 98% of secondary school students used electronic devices.^[5]

Studies report that internet gaming disorder (IGD) is associated with depression (10.7%, odds ratio [OR] 4.69), anxiety disorders (8.7%, OR 4.32), and alcohol consumption (5.5%, OR 1.21) in adolescents.^[3,4] They suggest that about 64% of the US population aged 13 years old or older are gamers compared to around 54% of the European Union population of gamers aged from 6 to 64 years old. Besides, time spent playing video games on average in the US was 5.1 h/week compared to 8.7/week in the EU.^[6-8]

The American Psychiatric Association (APA) included IGD in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) diagnostic manual in May 2013 in section III under conditions which warrant additional research.^[9] The World Health Organization also recognized problematic gaming as a disorder in the 11th Revision of the International Classification of Diseases.^[10]

IGD has recently drawn the interest of researchers across the world with variable prevalence rates ranging from 2.5% to 10.8%.^[4,11] Many psychological comorbidities such as attention deficit hyperactivity disorder, aggression, sleeping problems, low self-esteem, and impulsivity have been reported as associated with IGD.^[12,13]

Videogames give the player the ability to make choices, and in addiction theory, this choice is critical. In individuals with IGD, the choice to play games seems intentional and rational. To them there is no such thing as a “gaming disorder;” being isolated is their choice and they believe they have full control over their gaming behavior.^[14]

Generally speaking, patients with mood and or anxiety disorders are at higher risk of engaging in addictive behaviors.^[9,15] Likewise, behavioral addiction may be associated with a number of mental problems such as anxiety and depressive disorders. Interestingly, comorbid mood disorders are associated with more distress and poorer treatment outcomes.^[9,15] Similarly, the presence of other comorbid mental problems with mood disorders is associated with poor prognosis.^[9,15]

Many researchers have documented a direct association between IGD and mood disorders.^[16,17] A study of secondary school students in Al-Hasa Region showed that 76.2% had depression and 49.9% had anxiety.^[18]

Researchers have investigated such risk factors for developing IGD as money spent on games, extreme time spent playing during weekdays, gaming club membership, anxiety, impulsiveness, low self-esteem, using gaming personal computers, early age at which children start to play video games, and large amounts of money spent on games.^[13,19] On the other hand, high self-esteem, social competence, integration, and teachers' support have been reported as protective.^[12]

Although the use of electronic devices and internet games are very common among Saudi adolescents, data on IGD in adolescents in Saudi Arabia is scarce. Therefore, our study aimed to assess the prevalence and determinants of IGD and its association with depression as well as anxiety, in a sample of male high school students from Dammam city in Saudi Arabia.

Materials and Methods

This cross-sectional study was conducted among male high school students in Dammam, Saudi Arabia, in February–March 2022. The city of Dammam is divided into five administrative districts. The list of schools in Dammam obtained from the Ministry of Education website shows 58 high schools for boys in Dammam with a total of 16,846 students. Eight high schools were randomly selected based on the number of schools in each district: one each from North and East districts, two each from South and West, and three from the central district. From every school chosen, all students in the 10th, 11th, and 12th grades were included in the study, giving a sample size of 798.

Data were collected using a self-administered questionnaire in Arabic in six sections as follows: Part (A) had sociodemographic characteristics (age, nationality, marital status, father and mother education and occupation, family income, school attendance and performance, monthly allowance, and leisure time activities); Part (B) comprised game-related behavior including the type of game, the device used, age at which play began, most games played, time spent playing, and money spent on video games; Part (C) had IGDS9-SF scale^[20] translated in Arabic and validated by two faculty members of the psychiatry department and one family medicine faculty; Part (D) was the Arabic version of the Patient Health Questionnaire – 9; a short screening tool to assess the severity of depression; and Part (E) was Generalized Anxiety Disorder-7 Arabic version; a short screening tool to assess the severity of anxiety.^[21]

According to the APA's DSM-5, the diagnosis of IGD requires assent to at least half of the criteria (five or more criteria out of 9 criteria).^[8] Owing to the lack of diagnostic information, researchers used different cutoff points to define the endorsement of a criterion. For instance, some researchers labeled participants who give a response of 5 (very often) to at least five items as having IGD.^[11,22] We call it IGD 5. According to another definition in some studies, a person who gives a response of 4 or 5 (often or very often) to at least 5 items was labeled IGD;^[23,24] we call it IGD 4.

In research by Hongsik Yu and Jaehee Cho, the IGD was divided into three categories: IGD group comprises gamers who endorsed at least 5 of the 9 criteria, and possible internet disorder group consists of gamers who endorsed 3 or 4 of the 9 criteria. The regular gamer group (not having IGD) is gamers who endorsed less than 3 of the 9 criteria. Endorsement means the participant's response is at the mid-point of the 5-point scale 3 (sometimes), 4 (often), or 5 (very often).^[25] In this study, all three definitions were used to compare the prevalence of IGD. We used the third definition (IGD 3) to test associations.

Depression variable was categorized on the basis of depression score: no/minimal depression (score 0–4), mild/moderate depression (score 5–9), and moderately severe/severe depression (score 10–14/14–20). Anxiety variable was created using anxiety score: no anxiety (score 0–5), mild anxiety (score 6–10), moderate anxiety (score 11–14), and severe anxiety (score 15–21).

Ethical approval was obtained from the Institutional Review Board (IRB) at Imam Abdulrahman Bin Faisal University (IAU) vide Letter No. IRB-2022-01-087 dated 20/02/2022, informed written consent was taken from the parents of all participants, and permission obtained from the administration offices of each selected school. This was an anonymous survey and participation was voluntary. The questionnaire was administered by the researchers during school time in class, and researchers explained the purpose of the study and what was required of the students. The questionnaire was completed by all students in 15–20 min and submitted to the researchers. All the data were strictly kept confidential.

Data were coded and entered into Microsoft Excel and analyzed in SPSS v21.0 (SPSS Inc., Chicago, IL, USA). The initial analysis included descriptive statistics such as mean, standard deviation, and median for continuous variables and frequencies and proportions for categorical variables. To compare continuous and ordinal variables, *t*-test or Mann–Whitney U-test, and ANOVA or Kruskal–Wallis test were used as appropriate. Spearman correlation coefficient was calculated to determine the

correlation between IGD score and depression and anxiety scores. For categorical variables, the Chi-square test was used to test for statistical significance. All tests were performed at a 5% level of significance.

Results

A total of 798 students completed the survey. Seventy-two students who responded “No” to the question: “Have you played any video games in the past 12 months?” were considered nongamers and were excluded from the analysis. The final sample size was 726.

The sociodemographic characteristics of the study participants, the IGD scores, and the IGD status by sociodemographic characteristics are shown in Table 1.

About 87% of students were Saudi and most (97.5%) were single. The mean age was 16.92 years (standard deviation [SD] = 0.9 years) and 45% were from public schools; 37.7% were in 10th grade and 35.4% were in 11th grade.

The grades for the majority of students were either excellent (52.1%) or very good (31.3%). Thirty-four percent of students reported that they had been absent from school at least once a week, and 7.4% of students had to repeat the grade. The majority of mothers (68.8%) and fathers (72%) of the students had high school or higher education, and about two-thirds of mothers (65.4%) were homemakers. About 22% reported a monthly household income of <10,000 Saudi Riyals (SAR), 34% reported monthly household income of >10,000 SAR, and 44.2% did not mention their monthly household income. About 61% of students received a monthly allowance of >200 SAR [Table 1].

About 74% of the students spent <4 h/day on videogames on weekdays and 71.5% spent <6 h/day on videogames at weekends [Table 2]. About 84.7% spent <200 SAR per month on games; 70.6% reported playing outdoor sports. The majority of students started playing electronic games before the age of 10 years (61.4%), 72.2% played with a partner, 87.3% played games online and 69.5% played games containing violence. The most common device used to play videogames was the phone/tablet (47.5%) followed by a console (32.5%) and PC/laptop (20.0%); 49.9% reported that they used more than one device [Table 2].

The mean IGD score was 18.12 (SD = 6.67) and the median was 17 [Table 1]. No significant differences in mean IGD scores were observed by nationality, school type, year of study, absence from school, school performance (grades), grade repetition, mother and father's education, monthly household income, and students' monthly

Table 1: Internet gaming disorder scores among male high school gamers by sociodemographic characteristics

	Overall (%)	IGD score			IGD 3 categories			
		Mean±SD	Median	P-value	IGD (%)	Probable IGD (%)	RG (%)	P-value
All gamers (n=726)		18.12±6.67	17.0	-	21.8	27.0	51.2	-
Nationality								
Saudi	86.6	18.18±6.72	17.0	0.544	21.0	27.7	51.4	0.351
Non-Saudi	13.4	17.68±6.41	16.0		26.8	22.7	50.5	
Age (years)								
Mean	16.92	-	-	-	16.91	16.9	16.94	0.84
Median	17.0	-	-		17.0	17.0	17.0	
SD	0.899	-	-		0.894	0.90	0.903	
School type								
Governmental	44.9	18.04±6.3	17.0	0.88	23.3	24.8	51.8	0.426
Private	55.1	18.18±7.0	17.0		20.5	28.7	50.8	
Year of education								
10 th	37.7	18.28±6.5	17.0	0.649	21.5	30.3	48.2	0.59
11 th	35.4	18.18±7.03	17.0		22.2	24.1	53.7	
12 th	26.9	17.81±6.67	17.0		21.5	26.2	52.3	
Average absences days								
Attends regularly	66.0	17.79±6.51	17.0	0.089	21.1	25.9	53.0	0.403
Once/week or higher	34.0	18.76±6.96	17.0		23.1	29.1	47.8	
School performance grade								
Excellent	52.1	17.89±6.22	17.0	0.42	20.1	28.3	51.6	0.41
Very good	31.3	17.84±6.86	17.0		21.1	26.0	53.0	
Good	12.5	19.52±7.44	18.0		29.6	26.3	44.0	
Acceptable	3.2	18.22±7.54	16.0		17.4	26.1	56.5	
Poor	1.0	21.0±7.07	15.0		42.9	0.0	57.1	
Grade repetition								
Yes	7.4	19.02±7.04	7.0	0.35	22.2	33.3	44.5	0.675
No	92.6	18.05±6.65	17.0		21.8	26.5	51.7	
Marital status								
Single	97.5	18.06±6.61	17.0	0.54	21.5	27.1	51.4	0.366
Married	1.7	19.75±9.76	19.0		25.0	33.3	41.7	
Widowed	0.8	21.0±7.07	21.0		50.0	0.0	50.0	
Part time job								
Yes	9.5	17.41±6.56	17.0	0.388	21.7	24.6	53.6	0.903
No	90.5	18.2±6.6	17.0		21.8	27.3	50.9	
Father's education level								
Less than high school	28.0	18.69±7.03	17.0	0.343	22.7	30.0	47.3	0.521
High school/diploma	31.0	17.59±6.18	17.0		19.1	27.1	53.8	
University	41.0	18.12±6.77	17.0		23.2	24.8	52.0	
Mother's education level								
Less than high school	31.0	18.42±7.03	17.0	0.305	23.1	28.0	48.9	0.907
High school/diploma	28.8	17.97±6.13	17.0		20.6	27.8	51.7	
University	40.0	17.99±6.79	17.0		21.6	25.7	52.7	
Family's monthly income (SAR)								
≤10,000	21.5	18.4±6.84	17.0	0.85	23.7	26.9	49.4	0.964
>10,000	34.3	18.01±6.8	17.0		21.4	26.2	52.4	
Don't know	44.2	18.05±6.51	17.0		21.3	27.5	51.3	
Participant's monthly allowance (SAR)								
≤200	36.9	17.84±6.1	17.0	0.707	21.0	26.6	52.4	0.876
>200	63.1	18.28±7.0	17.0		22.2	27.2	50.5	
Outdoors sporting activities								
Yes	70.6	17.73±6.35	17.0	0.07	20.1	27.5	52.3	0.251
No	29.4	19.04±7.33	18.0		25.7	25.7	48.6	
Mother's occupation								
Working	34.6	18.63±6.5	17.0	0.055	22.3	30.7	47.0	0.191
House-wife	65.4	17.85±6.75	18.0		21.5	25.0	53.5	

IGD=Internet gaming disorder, RG=Regular gamer, SD=Standard deviation, SAR=Saudi Riyal

Table 2: Internet gaming disorder scores among high school gamers by gaming behavior

	Total (%)	IGD score			IGD (%)	Probable IGD (%)	RG (%)	P-value
		Mean±SD	Median	P-value				
Hours spent in videogames/day in week days								
<4	74.2	17.22±6.27	16.0	<0.001	17.5	26.4	56.1	<0.001
4 or more	25.8	20.71±7.15	20.0		34.2	28.9	36.9	
Hours spent in videogames/day in weekend days								
6 or less	71.5	17.06±6.19	16.0	<0.001	17.3	24.7	58.0	<0.001
>6	28.5	20.76±6.67	19.5		32.9	32.9	34.3	
Video games expenses (SAR)/month								
<200	84.7	17.66±6.42	17.0	<0.001	20.3	25.7	54.0	<0.001
≥200	15.3	20.69±7.49	21.0		29.7	34.2	36.0	
Device type								
Console	32.5	18.23±6.39	17.0	<0.001	20.4	29.8	49.8	0.018
PC/laptop	2.8	20.45±6.64	19.0		30.0	35.0	35.0	
Phone/tablet	14.9	15.62±6.49	14.0		13.0	20.3	66.7	
More than one type	49.9	18.59±6.74	17.0		24.4	26.9	48.8	
Type of most played game								
RPG	31.0	17.74±6.49	17.0	0.390	18.8	29.9	51.3	0.324
Action	54.0	18.81±6.69	18.0	0.001	25.4	28.5	46.2	0.006
Adventure	31.2	18.47±6.31	18.0	0.130	25.7	26.5	47.8	0.214
Sports	31.9	16.98±5.94	16.0	0.004	15.5	26.2	58.4	0.008
Fight	27.4	18.8±6.45	18.0	0.036	26.4	30.2	43.7	0.04
Open world	26.9	18.93±6.66	18.0	0.027	24.0	29.1	46.9	0.367
Horror	9.2	18.39±6.62	17.0	0.676	22.1	32.4	45.6	0.404
Age started playing electronic games (years)								
<7	24.0	18.92±6.42	18.0	0.070	21.3	33.9	44.8	0.145
7-10	37.4	17.93±6.01	17.0		20.7	27.7	51.7	
11-15	31.6	18.0±7.0	16.0		23.6	23.1	53.3	
>15	7.0	16.56±7.06	14.0		19.6	17.6	62.7	
Gaming partner								
Play alone	27.8	17.4±6.44	16.0	0.065	20.8	23.8	56.4	0.178
Play with partner	72.2	18.39±6.75	17.0		22.1	28.6	49.2	
Connectivity to internet								
On-line	87.3	18.22±6.69	17.0	0.24	22.2	27.4	50.4	0.642
Off-line	12.7	17.2±6.39	16.0		18.5	23.9	57.6	
Game contains violence								
Yes	69.5	18.76±6.83	18.0	0.008	25.1	28.8	46.1	0.007
No	30.5	17.24±6.11	16.0		16.4	24.9	58.7	

IGD=Internet gaming disorder, RG=Regular gamer, SD=Standard deviation, RPG=Role-playing games, SAR=Saudi Riyal

allowance [Table 1]. Only the students whose mothers were homemakers, or the students who did not play outdoor sports or were absent from school at least once a week had higher IGD scores that were statistically significant at $\alpha = 0.1$.

Table 2 shows that the IGD scores of students, who spent 4 or more h/day on weekdays or 6 or more h/day at weekends on videogames, were significantly higher ($P < 0.001$). Gamers who spent more than 200 SAR per month on gaming had significantly higher IGD scores ($P < 0.001$). High school gamers, who used PC/laptop for gaming, had significantly higher IGD scores (20.45 ± 6.64) compared to those who used consoles or phones/tablets ($P = 0.002$). The IGD scores were higher for students who reported that most games

played were action or fight or open-world ($P < 0.05$) whereas for students who played mostly sports games had lower IGD scores ($P = 0.004$). Those who reported playing games with violence had higher IGD scores ($P = 0.008$). No other significant differences in IGD scores were observed [Table 2].

On considering answers to 3 out of 5 or more on the Likert scale (sometimes, often, and very often) as an endorsement of a criterion, the prevalence of IGD was 21.9%; 27% had probable IGD, and 51.2% did not have IGD [Table 1]. The prevalence was lower when answers to 4 out of 5 or more (often and very often) or 5 out of 5 (very often) were adopted as an endorsement of a criterion, 5.6%, and 1.4%, respectively [Table 3]. No significant differences in IGD prevalence by sociodemographic variables were observed.

Table 3: Responses of gamers to IGD diagnostic criteria according to diagnostic and statistical manual of mental disorders V (DSM-5) and Prevalence of IGD among male high school gamers in Dammam

Question number	Criteria	Response categories in all gamers		
		Very often %	Often or very often %	Sometimes or more %
1	Preoccupation	3.6	9.8	39.7
2	Withdrawal	4.0	9.9	26.3
3	Tolerance	5.9	14.3	37.5
4	Unsuccessful control	3.3	9.6	23.8
5	Loss of interest	7.4	14.5	25.8
6	Continued excessive use despite problems	9.9	20.0	35.5
7	Deceiving	8.0	12.0	20.4
8	Escape	19.8	31.1	57.0
9	Functional impairment	4.3	10.3	19.6
		IGD 5	IGD 4	IGD 3
The prevalence of IGD (endorsed 5 of 9 question)		1.4	5.6	21.8

IGD=Internet gaming disorder

Gamers who spent 4 or more h/day on weekdays or 6 or more h/day at weekends on video games, spent >200 SAR per month on games, played games on PC/laptop, or played games containing violence, had significantly higher IGD prevalence. No other differences were detected [Table 2].

Table 3 shows the prevalence of DSM 5 IGD diagnostic criteria among gamers according to three responses. Higher proportion of gamers endorsed escape (57.0%), preoccupation (39.7%), tolerance (37.5%), and continued excessive use despite problems (35.5%).

The mean depression and anxiety scores increased by IGD status, from no IGD to probable IGD and IGD [Figure 1]. Half of the gamers had mild/moderate depression, 38.8% had minimal or no depression, whereas 10.5% had moderately severe/severe depression [Table 4]. IGD scores were significantly higher for students with severe/moderately severe depression (23.24 ± 8.81) and students with moderate depression (19.46 ± 6.35) compared to students with minimal or no depression (15.0 ± 4.93) ($P < 0.001$). The prevalence of IGD was highest in students with moderately severe/severe depression followed by those with mild/moderate depression and minimal/no depression ($P < 0.001$).

About 54% of students had no anxiety, 28.0% had mild anxiety, 12.7% had moderate anxiety, and 5.0% had severe anxiety. Those who had moderate or severe anxiety had higher IGD scores than those with mild or no anxiety ($P < 0.001$). The prevalence of IGD was highest among students with severe anxiety followed by those with moderate, mild, and no anxiety ($P < 0.001$). Moderate correlation ($r = 0.473$, $P < 0.001$) was observed between IGD score and depression score [Figure 2], and between IGD score and anxiety score ($r = 0.385$, $P < 0.001$) [Figure 3].

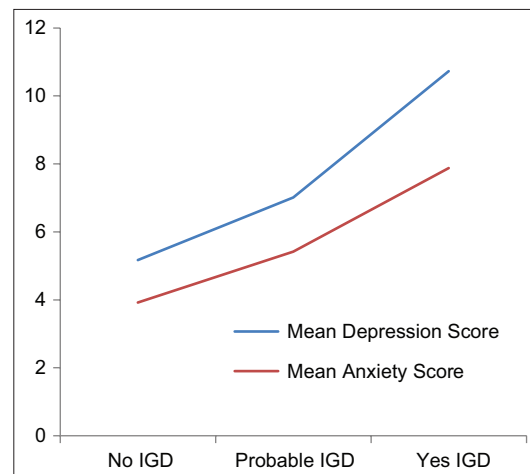


Figure 1: Linear trends of depression and anxiety scores among 3 gamer groups

The results of the logistic regression analysis final model for the association between IGD and various sociodemographic and gaming behavior variables are shown in Table 5. Playing for more than 4 h a day on weekdays (OR = 1.894), playing for more than 6 h a day at weekends (OR = 1.643), and playing adventure games (OR = 1.456) were associated with increased risk for IGD. Playing RPG (OR = 0.568) and sports videogames were associated with a lower risk of having IGD.

Discussion

The current study revealed an estimated prevalence of 21.8% IGD in high school male students in Dammam, Eastern region in Saudi Arabia. In the study done in South Korea that defined IGD in the same way as the present study, the prevalence of IGD for males was 11.5%.^[25] Compared to other studies in Saudi Arabia that used the IGD 9-Item Short Scale, the IGD prevalence in our study was high (21.8%) than previous results: 10.1% in male medical students at King Saud University in

Table 4: Mean internet gaming disorder score and subtypes according to depression and anxiety mean scores and categories

	All gamers (%)	IGD score			IGD categories			P-value
		Mean±SD	Median	P-value	IGD (%)	Probable IGD (%)	RG (%)	
Depression (PHQ-9)								
Mean±SD	7.0124±5.47	-	-	-	10.73±5.69	7.53±4.82	5.17±5.47	<0.001
No/minimal	38.8	15.0±4.93	14.0	<0.001	14.6	28.1	55.0	<0.001
Mild/moderate	50.6	19.46±6.25	19.0		63.7	63.3	38.3	
Moderately severe/severe	10.5	23.24±8.81	22.0		21.7	8.7	6.7	
Anxiety (GAD-7)								
Mean±SD	5.18±4.81	-	-	-	7.88±5.19	5.42±4.79	3.92±4.13	<0.001
No	54.3	19.16±6.31	15.0	<0.001	32.3	48.7	66.7	<0.001
Mild	28.0	18.12±6.67	19.0		31.6	34.9	22.8	
Moderate	12.7	22.17±7.24	21.0		24.7	13.8	7.3	
Severe	5.0	23.42±8.71	22.0		11.4	3.1	3.2	

IGD=Internet gaming disorder, RG=Regular gamer, SD=Standard deviation, PHQ-9=Patient health questionnaire-9, GAD-7=Generalized anxiety disorder-7

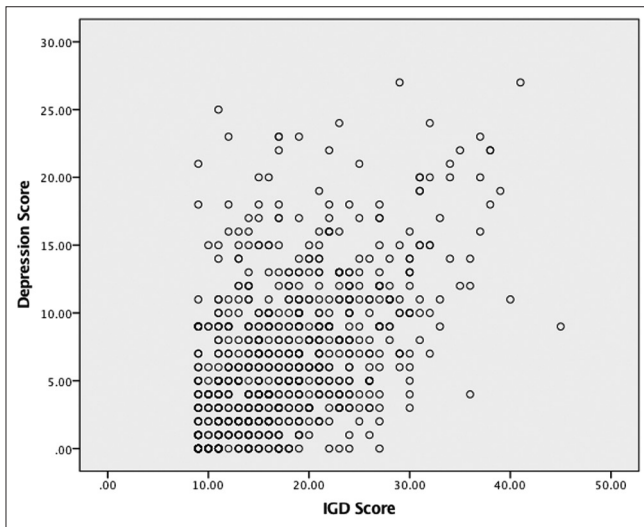


Figure 2: Correlation between IGD score and depression score among high school gamers. Pearson correlation coefficient = 0.473 ($P \leq 0.001$). IGD: Internet gaming disorder

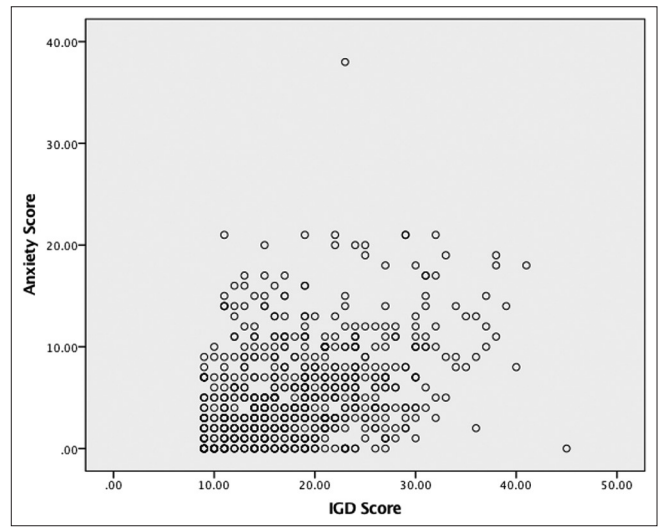


Figure 3: Correlation between IGD score and anxiety score among high school gamers. Pearson correlation coefficient = 0.385 ($P \leq 0.001$). IGD: Internet gaming disorder

Riyadh using the IGD 9-Item Short Scale, and around 16% in non-Saudi high school students in Buraidah, Al-Qassim using another assessment tool.^[26,27] The differing IGD prevalence with other studies could be explained by the different scales used, social and cultural differences, the target demography, and sample size.

A study found that adolescents with IGD showed higher levels of depression.^[25] We found in our study that 14.6% of IGD gamers had minimal or no depression, 63.7% of IGD gamers had mild or moderate depression, and 21.7% of IGD gamers had moderately severe or severe depression. All these findings are statistically significant. A study found that depression is a common comorbidity of IGD.^[4] Another study showed that having depression can lead to IGD.^[28] In addition, a study found that adolescents with IGD showed higher levels of anxiety.^[25] Our findings showed that 32.3% of

IGD gamers had anxiety, 31.6% of IGD gamers had mild anxiety, 24.7% of IGD gamers had moderate anxiety, and 11.4% of IGD gamers had severe anxiety. All these findings are statistically significant.

Limitations of the study include the relatively small sample size (726). Schools in Saudi Arabia are strictly segregated for males and females. Data could not be collected from female schools. Only male high school students were included in the study since the present study was a research project for male students. Furthermore, data were collected from one city only in the eastern province of Saudi Arabia and thus may not represent the whole adolescent age group in the Eastern province. We recommend further studies with a better representative sample of Eastern Province that includes both genders of varying age groups for a better understanding of IGD.

Table 5: Logistic regression analysis final model: Correlates of internet gaming disorder among male high school students in Dammam

Factor	OR	P-value	95% CI for OR
Plays >4 h a day on weekdays	1.894	0.006	1.197-2.996
Plays >6 h a day at weekends	1.643	0.029	1.051-2.566
Plays RPG video games	0.568	0.011	0.367-0.878
Plays adventure video games	1.456	0.065	0.976-2.170
Plays sports video games	0.549	0.008	0.352-0.855

OR=Odds ratio, CI=Confidence interval, RPG=Role-playing games

We recommend that schools and families of gamers educate their students by helping them maintain a schedule that does not interfere with their responsibilities. Alternative activities should be found for them, and stress management and self-control techniques taught to them. Teaching them to record their gaming sessions may be beneficial in curbing their impulsive decisions and giving them time for reflection. We also advise practitioners to address gaming behavior whether it is a coping mechanism or the cause of their patients' comorbidities of depression and anxiety.

Conclusion

IGD is a concerning psychiatric disorder in male high school students. It is associated with certain gaming behaviors and other mental problems. Our findings lend support to the idea that IGD is a real psychiatric disorder. We recommend future larger-scale research conducted in person of both male and female adults with qualified psychiatrists.

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Conflicts of interest

There are no conflicts of interest.

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