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Internet Gaming Disorder and its Association with Cognitive Function: A Comparison Between Gamers and Non-Gamers

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ABSTRACT

Objectives: To determine the prevalence of Internet Gaming Disorder and the association between IGD and cognitive functions.

Study Design: Analytical cross-sectional study.

Place and Duration of Study: Different universities of Twin cities from Jun to Sep 2022.

Methodology: A total of 367 participants of 18-26 year-age, belonging to either gender and currently enrolled in a university and excluding someone with priorly diagnosed mental illness were included. Data was collected by questionnaires via Google forms, filled voluntarily after informed consent. Participants filled the Internet Gaming Disorder Scale Short Form to assess gaming addiction and the cognitive failures questionnaire for cognitive function (CFQ). Mean scores were calculated for questionnaires to assess frequency of gamers based on cut-off score of 32 and association of gaming with demographics and cognitive functions was found out by applying Chi-square test.

Results: Out of total 367, 193(52%) males and 174(48%) females participated, with 248 gamers 158(64%) males and 90(36%) females) and 119 non-gamers 25(29%) males and 94(71%) females. Out of these gamers 19(7.6%) individuals -15(79%) males and 4(21%) females- scored as disordered. Association between CFQ and IGD scores was statistically insignificant (p-value =0.062) however the mean scores of different domains of CFQ were relatively higher for disordered as compared to other categories of gamers.

Conclusion: Males were significantly more likely to play games. Overall prevalence of IGD was low. No significant association was found between IGD and cognitive failures of gamers and non-gamers.

Keywords: Cognitive Function, Distractibility, False triggers, Internet Gaming Disorder, Memory.

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INTRODUCTION

Internet Gaming Disorder (IGD) is broadly defined as the inability to resist the temptation of obsessive online gaming which leads to behavioral, social, financial, and occupational difficulties.[1,2] IGD is recognized by the American Psychiatric Association as a potential mental illness and has been included in the latest edition of the Diagnostic and Statistical Manual 5 published in May 2013,[1] as well as by the World Health Organization (WHO) in the latest revision of the International Classification of Disease (ICD-11).[3] IGD is diagnosed upon the inclusion of five or more conditions of the 9-item diagnostic criteria.[1,3,4]

Studies state that prevalence of IGD varies from 0.7% to 27.5% worldwide,[5] and it is found to be fairly more prevalent in Asian countries notably South Korea. Demographic factors, such as gender and age, are also linked to IGD - young males being a vulnerable group.[5,6] Studies performed on Korean, Indonesian, Chinese, and Jordanian populations found that IGD and high-risk individuals tend to demonstrate lower cognitive function indices, especially working memory and verbal ability.[4,5] Individuals with IGD are also reported to have difficulty retaining information in cognitive assessment studies.[7] It is difficult for addicted individuals to inhibit the urge of playing games, similar to substance use disorder (SUD).[7,8] A study in Pakistan found the frequency of IGD was only 5.4% (n=315) in Pakistani students.[9]

As IGD is newly established, there is a gap in the information available about the prevalence of the disorder especially in our setting. Its relationship with individual factors is not known but is being studied worldwide to establish an association. There are few studies performed in Pakistan, but the associated investigation is mainly of related risk factors. So, this study was aimed to determine the frequency of IGD and high-risk individuals and to determine the association between IGD and cognitive functions, allowing exploration of a different aspect.

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METHODOLOGY

An analytical cross-sectional study was conducted on 367 students attending universities in the twin cities, over a period of 4 months; from June 2022 to September 2022. Sample size was calculated using Rao soft sample size calculator, keeping the margin of error as 5% and confidence interval of 95% and estimated population size of 10000. Data was collected by non-probability convenience sampling technique.

Inclusion Criteria: Undergraduate students belonging to both genders, enrolled in universities in Islamabad or Rawalpindi aged 18-26 years with majors in medicine, engineering, social sciences, arts, and business.

Exclusion Criteria: Students with priorly diagnosed psychiatric disorders such as anxiety or depression were excluded.

Ethical approval was taken from Institutional review board of Army Medical college to conduct the study(ERC/ID/209). The questionnaire, made on a Google form and distributed via social media, was a self-reporting online form based on 2 validated scales - the Internet Gaming Disorder Scale Short Form (IGDS9-SF)[10] and the Cognitive Failures Questionnaire (CFQ) filled voluntarily after informed consent. Participants were directed to the internet gaming disorder scale only if they answered yes to the question: "Do you use the internet to play games?". Participants who responded with no were directed to the cognitive failures questionnaire because there was no need for them to fill the Internet Gaming Disorder Scale. The first part of the questionnaire was the IGDS9-SF which comprises of nine items, mapping directly onto the nine DSM-5 criteria for IGD, with answers being scored on a Likert scale. The sum produces a final score between 9 to 45, and the cut-off score to distinguish between non-disordered (non-gamers) and disordered (gamers) individuals was 32 according to the study published in the International Journal of Psychiatry.[11] Scores ranging from 1-19 were categorized as normal gamers, from 20-31 as high-risk gamers and from 32-45 as disordered.

The Cognitive Failures Questionnaire (CFQ) is used to measure failures in cognition, particularly an individual's perception, motor function, and memory, by evaluating the different errors made in daily life as a result of inattentiveness or forgetfulness.[12] There are 24 questions - eight assessing false triggering such as 'Do you bump into people' eight assessing distractibility with questions such as 'Do you lose your temper and regret it', and eight assessing forgetfulness such as 'Do you fail to notice signposts on the road' - their answers were also scored on a five-point Likert scale .A higher score suggests a greater likelihood to have cognitive failure. The CFQ was chosen for its ability to test multiple factors of cognitive function simultaneously, and for the reason that it could easily provide answers with zero direct contact with participants amid a pandemic.

The statistical software Statistical Package for the social sciences (SPSS) version 25:00 was used for analysis. Frequencies and percentages of the categorical variables were calculated, and the Chi-Square test was applied to find the associations between them. The mean scores were calculated for continuous variables and compared for gamers and non-gamers.

RESULTS

A total of 367 responses were collected via an online questionnaire. Mean age of the participants was 20.50+2.0 years. Almost half were males (52.6%) and most of them (58.9%) were medical students. Their demographic characteristics are tabulated in Table-I.

Table-I: Demographics of Participants (n=367)

Demographic characteristic	Non-gamers n(%)	Normal gamers n(%)	High risk n(%)	Disordered n(%)	*p*-value
Age (years)					
18-20	54(14.75%)	64(17.43%)	44(12%)	7(1.90%)	0.852
21-23	49(13.33%)	59(16.07%)	31(8.44%)	7(1.90%)	
24-26	16(4.35%)	17(4.632%)	14(3.81%)	5(1.36%)	
Gender					
Males	35(9.53%)	87(23.70%)	56(15.25%)	14(3.81%)	0.000
Females	84(22.88%)	53(14.44%)	33(8.99%)	5(1.36%)	
Field of Study					
Medicine	81(22.07%)	76(20.70%)	51(13.89%)	8(2.17%)	0.121
Engineering	16(4.35%)	40(10.89%)	23(6.26%)	7(1.90%)	
Social Sciences	22(5.99%)	24(6.53%)	15(4.08%)	4(1.08%)	

Out of these 367, there were 248(67.6%) gamers, the distribution of gamers was : disordered 19(5.22%), high-risk 89(24.3%), and normal 140(38.1%) according to their score. And 119(32.4%) were non-gamers.

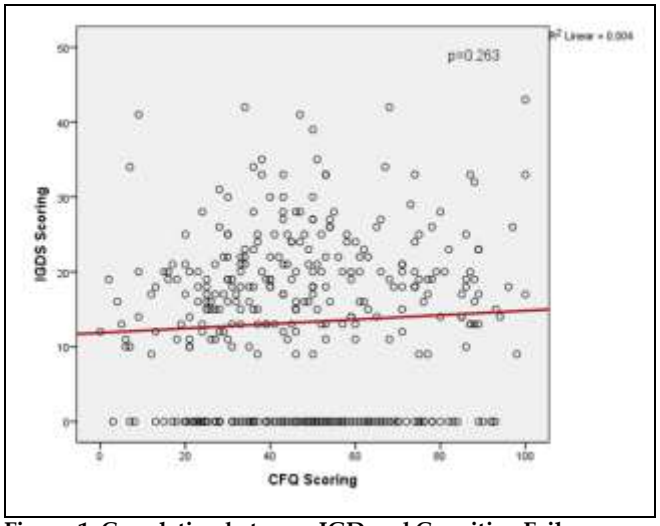

Figure-1: Correlation between IGD and Cognitive Failure

All the participants then answered the cognitive failures questionnaire which focuses on three aspects of cognitive failure - distractibility, forgetfulness, and false triggering. The mean scores of distractibility were 19.4+8.9 for disordered, 17.9+6.1for high risk, 16.1+7.6 for normal, and 16.6+6.8 for non-gamers. The mean scores of forgetfulness were 17.6+8.5 for disordered, 16+6.3 for high risk, 15.3+7.8 for normal, and 15.3+6.8 for non-gamers. The mean scores of false triggering were 15.9+9.4 for disordered, 13.9+6.3 for high risk, 13.72+8.5 for normal, and 13.29+7.6 for non-gamers. Correlation between CFQ scores and IGD scores came out to be statistically insignificant (p-value=0.263) however the mean scores of different domains of CFQ were relatively higher for disordered as compared to other categories of gamers shown in Table-II.

Table-II: Cognitive Functions Categories of Participants (n=367)

Cognitive functions	Non-Gamers n=119 (32.42%)	Normal gamers n=140 (38.14%)	High risk Gamers n=89 (24.25%)	Disordered n=19 (5.17%)	p-value
Distractibility					
Yes	39(32.77%)	42(30.0%)	26(29.21%)	9(47.3%)	0.447
No	80(67.22%)	98(70.0%)	63(70.7%)	10(52.7%)	
Forgetfulness					
Yes	27(22.62%)	38(27.14%)	25(28.08%)	6(31.57%)	0.736
No	92(77.38%)	102(72.85%)	64(71.91%)	13(68.42%)	
False Triggering					
Yes	22(18.48%)	32(22.85%)	20(22.47%)	6(31.57%)	0.583
No	97(81.51%)	108(77.14%)	69(77.52%)	13(68.42%)	

DISCUSSION

In this study, there were 367 participants out of which 119 (35 men and 84 women) said that they did not use the internet to play games. This divided the population into gamers, 67.6%, and non-gamers 32.4%. Out of the total gamers, there were only 19 individuals who scored high enough to be on the disordered spectrum. The gender distribution in the disordered group was 15 males and 4 females, making the total prevalence 7.66%. This is similar to another study done previously in Islamabad to find the prevalence of IGD in Pakistani students where the disordered were only 5.4% (n=315) while 35 individuals were found to be high-risk in the study.[9]

There was a significant association between gender and the diagnosis of IGD in this study which is supported by literature, as IGD is known to affect males more than females.[5] In a similar study conducted to assess the prevalence of IGD, it was found that 11.9% of males were diagnosed with IGD as compared to a mere 2.9% of females.[9] This can be additionally supported by the fact that the majority of non-gamers in our study were females - only 35 out of 193 males were non-gamers compared to 84 non-gamers out of 174 females. In another study done on the Turkish population, there was a significant association between gender and being diagnosed with IGD.[13] According to a Chinese study, which looked at the association between internet gaming disorder and cognition indices, there was no significant association between being diagnosed with IGD and sex.[14] A probable reason for this could be the widespread prevalence of gaming addiction in China, Korea, and Taiwan compared to other parts of the world.[15]

No association was found between age and IGD ($p \geq 0.05$). In this study, the age groups were divided into 3 groups; 18-20, 21-23, and 24-26 years with the frequency of IGD cases as 7, 8, and 4 respectively. This is supported by previous studies where there was no significant association found between age and IGD.[16] Similarly, there was no significant association between the field of study and IGD in this study. The reason for this assessment was to check whether there is a relation between the number of hours undergraduates are required to put in for their course study and IGD.

Upon observing the association between the scoring of the IGD scale and CFQ amongst gamers, the association was found to be statistically insignificant (p=0.062). In a Chinese study that assessed the association between internet gaming disorder and cognition, the disordered and high-risk groups scored lower on cognition function assessment than the normal group, and the IGD group scored significantly lower.[17] Similarly, in this study, the disordered and

high-risk group scored higher on cognitive function failure as compared to normal gamers in different subscales of CFQ. These results indicate that the individuals diagnosed with IGD have the greatest likelihood to develop cognitive failure, with high risk and normal gamers having a lesser risk respectively.

The cognitive function questionnaire evaluated the three components of cognitive functions failure – namely forgetfulness, false triggering, and distractibility among gamers and non gamers. Although no significant association was found between these three components and gaming categories the scores of these components were higher for gamers when compared with non gamers. In a similar study performed in China studying the correlation between internet use and IGD, it was found that gamers diagnosed with IGD had problems in the retention and manipulation of information, as well as a lower working memory capacity. There is sufficient evidence to state that Internet Gaming Disorder and Internet Addiction is significantly associated with increase in daily cognitive failures.[18] There are studies which have found that increased use of internet, specially the use of internet to play video games has led to individuals scoring more on the distractibility scale.[19] There are studies however which have proved in neurophysiological studies that individuals with IGD have poorer auditory processing because of cognitive dysfunction due to distraction.[20]

CONCLUSION

In conclusion it was observed that while there is a large number of gamers in the population, a very small proportion of the gamers are diagnosed as disordered, and males tend to have a greater propensity to develop IGD. Although no statistically significant association was found between cognitive functions of gamers and non gamers but gamers scored high on cognitive function failure questionnaire showing possibility of developing cognitive issues later on if gaming habit persists. So the interventions for prevention of IGD ought to concentrate on individuals who are at higher risk of having this condition.

LIMITATION OF STUDY

There are important limitations to the current investigation. These include the use of self-report tools, the relatively small sample size, and the recruiting strategy used, which produced an unrepresentative sample. Despite these possible drawbacks, our findings fill a study vacuum on IGD among Pakistani samples and give valuable epidemiological information that may be applied to cross-cultural comparisons in global research. Self-evaluation of errors was required for the cognitive failures questionnaire, which resulted in ill-defined categories. A clinical evaluation would have given standardization and allowed for a clearer identification of mistakes.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MAR & AH: Data acquisition, data analysis, critical review, approval of the final version to be published.

WK & AF: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

RHA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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