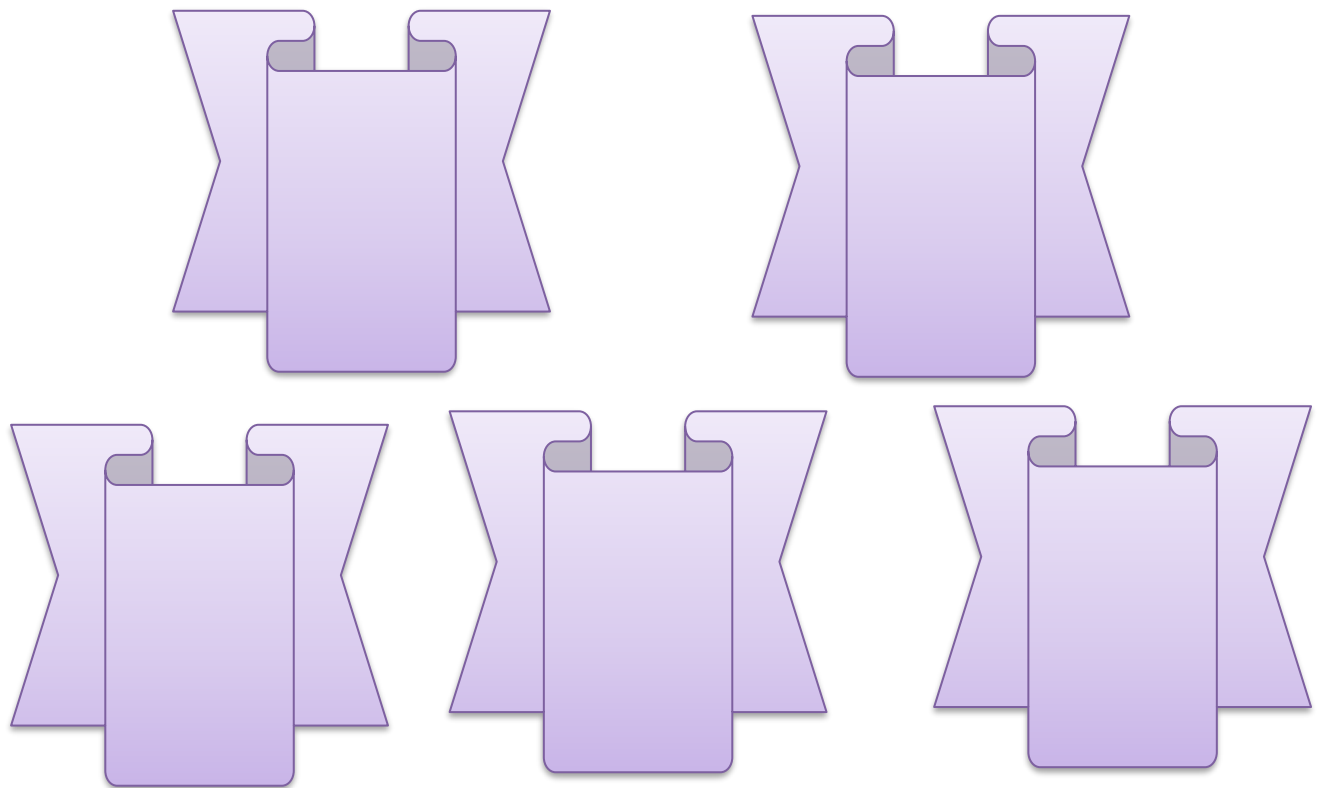


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## Original Article

# Association between Internet Gaming Disorder and Adult Attention Deficit and Hyperactivity Disorder among A Sample of Medical Students of Al-Azhar University, Damietta

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## ABSTRACT

### Article information

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**Background:** When it interferes with their ability to perform in social, professional, familial, educational, and psychological ways, gaming can become pathological for some players. This strong link was observed to be more significant for ADHD symptoms in young adults than juvenile ADHD, and recent research has confirmed these findings. IGD and ADHD have a reliable relationship as both conditions are associated with opposition and impulsivity. The actual correlation between both conditions is not fully explored.

**Aim of the work:** To estimate the prevalence of gaming disorder among medical college students of Al-Azhar University, Damietta and to assess the association between gaming disorder and attention deficit hyperactivity disorder among medical college students of Al-Azhar University, Damietta.

**Patients and Methods:** The present study was conducted on sample of medical college students of Al-Azhar University, Damietta on 300 patients. Diagnosis of IGD was based on DSM-5 criteria. Conners adult ADHD diagnostic interview for DSM-IV [CAADID] to confirm diagnosis of ADHD.

**Results:** Most patients had symptoms of ADHD and they are normal gamers. Online gaming, disordered gaming and internet gaming scale score were statistically significant higher in ADHD than non-ADHD students. Students with internet gaming disorder are statistically more likely to be men. Students with ADHD and internet gaming disorder statistically seem to be more masculine. Internet gaming scale score has statistically significant negative correlation with age and grade and statistically significant positive correlation with internet time/day and game time/day.

**Conclusion:** This investigation showed a significant link between adult ADHD and IGD. Students with ADHD and internet gaming disorder statistically seem to be more masculine. Further large-scale studies are needed.

**Keywords:** Internet; Gaming; Attention; Hyperactivity; ADHD.



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## INTRODUCTION

Maladaptive Internet use has certain negative effects, including psychological issues, especially in young individuals [1].

Internet addiction [IA], which is described as an excessive, uncontrolled, and hazardous use of the Internet, is a term that has been often used to describe this type of unproductive Internet use [2].

Clinicians and researchers focused their attention mostly on gaming among the many activities people engage in online, such as chatting, shopping, blogging, gambling, and other pastimes. Although playing video games is not considered to be inherently pathological or harmful, for certain players it can become pathological when it starts to negatively impact their social, occupational, familial, educational, and psychological functioning [3].

Internet gaming disorder [IGD], which the American Psychiatric Association [APA] determined in 2013 needs more research and data gathering, is now included in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, section III [4].

Since 2014, the World Health Organization [WHO] has acknowledged game addiction as a significant public health issue [5]. The term gaming disorder [GD], which was developed to describe game addiction, is characterised by certain diagnostic criteria [6].

The 11th and final iteration of the International Classification of Diseases [ICD-11] was issued in June 2018, which added GD [7]. A pattern of repetitive or persistent gaming behaviour was cited as a defining characteristic of GD in both the DSM-5 and the ICD-11. Typically, the gaming behaviour and the traits necessary for diagnosis become apparent after at least a year [4, 7].

Addictive behaviour in adults, such as substance abuse and dependence, low academic performance, poor mental health, unemployment, and life impairment are all highly connected with adult ADHD [8, 9].

The association between adult ADHD and IGD has not been adequately investigated yet. Therefore, the current study was conducted to determine the prevalence of gaming disorder among medical college students at Al-Azhar

University in Damietta was the goal of our study. To evaluate the relationship between gaming disorder and attention deficit hyperactivity disorder among Al-Azhar University medical college students, Damietta.

## PATIENTS AND METHODS

The present study was conducted on sample of medical college students of Al-Azhar University, Damietta. This is a cross sectional study for 6-month period during the academic year 2021-2022 over the period from October 2021 to April 2022.

### Inclusion criteria

Medical college students of Al-Azhar University, Damietta male and female from first year to sixth year aged from 18 to 24 years.

### Exclusion criteria

Students who was previously diagnosed by any psychological disorder like [anxiety disorders, depression].

### Sample size

To estimate the sample size, we used the OpenEPI program version 3 [online engine] and according to following: The worldwide prevalence of gaming disorder was 3.05% [10] [primary endpoint]; and the total number of the faculty students around 3600 student and to provide 99.99% confidence level, assuming alpha error is 5%. Sample size should be at least 169 students.

The study was applied on a sample of medical college students of Al-Azhar University with stratified random sampling; those who will be diagnosed with gaming disorder will be compared with control group of the same population to assess ADHD in the two groups.

### Study tools

A structured questionnaire will be used to collect data through self-reported questionnaire consisting of:

1. A diagnostic criteria of internet gaming disorder [of DSM-5]. In the DSM-5, five of the nine diagnostic criteria [preoccupation, withdrawal, tolerance, unsuccessful attempts to control, loss of other interests, continued

excessive use despite psychosocial problems, deception regarding internet gaming activities, escape, and functional impairment] must be met within a year to be diagnosed as IGD [4].

2. Adult ADHD Self Report Scales [ASRS] 19. The ASRS is an 18-item scale that measures ADHD symptoms based on DSM Fourth Edition [DSM-IV-TR] criteria [11].

3. Structured psychiatric interview: Conners adult ADHD diagnostic interview for DSM-IV [CAADID] to confirm diagnosis of ADHD [12].

### Statistical analysis design

Collected data were reviewed and coded manually. These numerical codes were fed to the computer where statistical analysis was done using the Statistic Package for Social Science Version 22 [SPSS 22] for windows. Quantitative data were presented as mean and standard deviation [mean  $\pm$  SD]. Qualitative data were expressed as numbers and percentage. Chi square-test [ $X^2$ ] was used to compare groups while comparing qualitative data. Student's "t" test is used to compare quantitative data from two independent samples of data that are regularly distributed. For comparing quantitative data from two independent samples of non-normally distributed data, use the Mann Whitney test. Kruskal-Wallis Test for comparing non-normally distributed quantitative data from more than two independent samples. Using the "Pearson correlation" correlation coefficient, the link between the variables was studied. 95% of the coefficient interval was chosen. The significance level was determined using the following probability [P] values. Statistics were judged significant at  $P < 0.05$ .

## RESULTS

The current study included 300 medical students; their age ranged between 18 – 24 years with mean value of  $20.497 \pm 1.796$ . Regarding

sex, 55% were male and 45% were females [table 1].

Among our studied medical students, 4.3% were ADHD; 46.1% were mixed type while 38.5% were inattention subscale and 15.4% were hyperactive / impulsive. The application of Adult ADHD self-reporting scale showed that 14% of ADHD students reported fidgeting, difficulty unwinding and relaxing, 11% r talk too much in social situations and has difficulty waiting one's turn, 22% finish the sentences of others, and 21% interrupt others when they are busy [table 2].

Among our studied medical students, 36% play online games daily. Most of them 81% were normal gamers, while 11% were risky gamers and 8% were disordered gamers. The internet use time/day ranged between 1-8 hours with mean value of  $3.279 \pm 1.244$  hours/day while gaming time ranged between 0-6 hours/day [table 3].

Regarding internet gaming disorder, 62.5% were male. Their mean age was  $20.174 \pm 0.972$  years. 25% of them were ADHD half of them were inattention and half were mixed ADHD subscale [table 4].

There is no statistically significant difference in age and sex between ADHD and non-ADHD students [table 5].

Online gaming, disordered gaming and internet gaming scale score were statistically significant higher in ADHD than non-ADHD students. Furthermore, internet use time/day, gaming time/day were statistically significant longer in ADHD than non-ADHD students. Among ADHD student 6 of 13 ADHD students have internet gaming disorder [46.2%] [table 6].

Internet gaming scale score has statistically significant negative correlation with age and grade and statistically significant positive correlation with internet time/day and game time/day [table 7].

**Table [1]:** The age and sex of the studied population

		No.= 300
Sex	Male	165 [55%]
	Female	135 [45%]
Age [years]	Range	18 – 24
	Mean $\pm$ SD	$20.591 \pm 1.743$

**Table [2]:** ADHD characteristics of the studied population

		No. = 300	
		No.	%
<b>ADHD</b>	Yes	13	4.3%
	No	287	95.7%
<b>ADHD subscale</b>	Inattention	5/13	38.5%
	Mixed	6/13	46.1%
	Hyperactive/Impulsive	2/13	15.4%
<b>Other symptoms of ADHD</b>	Fidgeting	42	14%
	Difficulty unwinding and relaxing	42	14%
	Talking too much in social situations	33	11%
	Finishing the sentences of others	66	22%
	Difficulty waiting one's turn	33	11%
	Interrupting others when they are busy	63	21%

**Table [3]:** Internet and gaming in the studied population

		No. = 300	
		No.	%
<b>Online gaming</b>	Daily	108	36%
	Occasional	192	64%
<b>Internet gaming subscale</b>	Normal gamers	243	81%
	Risky gamers	33	11%
	Disordered gamers	24	8%
<b>Internet use time/day</b>	Range	1 – 8	
	Mean ± SD	3.279 ± 1.244	
<b>Gaming time/day</b>	Range	0 – 6	
	Mean ± SD	0.833 ± 1.021	
<b>Internet gaming scale score</b>	Range	0 – 8	
	Mean ± SD	1.143 ± 1.867	

**Table [4]:** Characteristics of the studied population with internet gaming disorder

		No.= 24
<b>Sex</b>	Male	19 [79.2%]
	Female	5 [20.8%]
<b>Age [years]</b>	Range	18 – 22
	Mean ± SD	20.174 ± 0.972
<b>ADHD</b>	Yes	6 [25%]
	No	18 [75%]
<b>ADHD subscale</b>	Inattention	3 [50%]
	Mixed	3 [50%]
	Hyperactive/Impulsive	0 [0%]
<b>Academic year</b>	1 <sup>st</sup> year	5 [20.8%]
	2 <sup>nd</sup> year	8 [33.3%]
	3 <sup>rd</sup> year	7 [29.2%]
	4 <sup>th</sup> year	3 [12.6%]
	5 <sup>th</sup> year	1 [4.2%]
	6 <sup>th</sup> year	0 [0%]

**Table [5]:** comparison of age and sex between ADHD and non-ADHD students

		ADHD	No ADHD	Independent student t test/ chi square test	
		No.= 13	No.=287	t/x2	P-value
<b>Sex</b>	Male	9 [66.7%]	156 [54.4%]	1.112	0.292
	Female	4 [33.3%]	131 [45.6%]		
<b>Age [years]</b>	Range	18 – 23	18 – 24	-1.661	0.120
	Mean ± SD	19.846 ± 1.650	20.625 ± 1.743		

**Table [6]:** Comparison internet use and gaming between ADHD and non-ADHD students

		ADHD		No ADHD		Test	
		No.= 13		No.=287		z/x <sup>2</sup>	P-value
		No.	%	No.	%		
<b>Online gaming</b>	Yes	9	69.2%	99	34.5%	6.513	<b>0.011</b>
	No	4	30.8%	188	65.5%		
<b>Internet gaming subscale</b>	Normal gamers	4	30.8%	240	83.6%	32.32 8	<b>&lt;0.001</b>
	Risky gamers	3	23.1%	30	10.5%		
	Disordered gamers	6	46.2%	17	5.9%		
<b>Internet use time/day</b>	Range	2 – 8		1 – 8		5.106	<b>&lt;0.001</b>
	Mean ± SD	6.154 ± 1.772		3.296 ± 1.064			
<b>Gaming time/day</b>	Range	0 – 6		0 – 6		4.221	<b>&lt;0.001</b>
	Mean ± SD	3.115 ± 2.152		0.730 ± 0.805			
<b>Internet gaming scale score</b>	Range	0 – 8		0 – 7		3.340	<b>0.001</b>
	Mean ± SD	4.154 ± 3.211		1.007 ± 1.668			

**Table [7]:** Correlation of Internet gaming scale score to student characteristics

	Internet gaming scale score	
	r	p-value
<b>Age</b>	- 0.217**	<b>&lt;0.0001</b>
<b>Grade</b>	- 0.219**	<b>&lt;0.0001</b>
<b>Internet time/day</b>	0.347**	<b>&lt;0.0001</b>
<b>Game time/day</b>	0.824**	<b>&lt;0.0001</b>

## DISCUSSION

In the past ten years, the increasing prevalence of internet use among young people has led to a high rate of potentially addictive behaviours, which have detrimental effects on the social and psychological functioning as well as academic performance. The addiction model put forth by **Griffiths** [13] served as the basis for the diagnostic standards recommended by the American Psychiatric Association, which included salience, mood modification, tolerance, withdrawal, conflict, and relapse.

The current study included 300 medical students; their age ranged between 18-24 years with mean value of  $20.497 \pm 1.796$ . 55% were male and 45% were females. The selected students were distributed over six different academic years. Most of the students were in the 1st grade [28.7%] while the percentage of students in other graders ranged between 8.3% from 6th grade and 17.7% from the 4th grade. In this study, men were more frequently affected than women, which is consistent to other researches [14-16].

Our findings were consistent with the findings of **Cabelguen et al.** [17] which found that 91 [94%] of the 97 patients included in the study were men. The median age was 23 years old. On the other hand, in the study by **Aggarwal and**

**Pandian** [18], 400 students took part in the study. There were 265 [66.2%] women and 135 [33.7%] men. The average age was  $20.2 + 9$  years. A total of 314 [78.5%] students were enrolled in the undergraduate medical programme [MBBS], while 86 [21.5%] were enrolled in the undergraduate dental programme [BDS].

The present study showed that among our studied medical students, 4.3% were ADHD; 46.1% were mixed type while 38.5% were inattention subscale and 15.4% were hyperactive/ impulsive. The application of Adult ADHD self-reporting scale showed that 14% of ADHD students reported fidgeting, difficulty unwinding and relaxing, 11% talk too much in social situations and has difficulty waiting one's turn, 22% finish the sentences of others, and 21% interrupt others when they are busy.

This prevalence is lower than that reported by **Tufail et al.** [19] who found that 72% of student is not having ADHD, while 28 % are having ADHD. Also, in the study of **Chen et al.** [20] the prevalence of having ADHD symptoms was 12%. In addition, **Concerto et al.** [21] showed that there were 5 signs of ADHD on average [IQR 2 to 7]. The percentage of subjects in the entire sample who scored more than four symptoms on the Adult ADHD Self-Report Scale [ASRS] "Part A" subscale was 19.27%. Furthermore, **Osagiator et al.** [22] found that 29 [8.6%] of the

students using the self-report ADHD scale had probable ADHD.

The current study showed that among our studied medical students, 36% play online games daily. Most of them [81%] were normal gamers, while 11% were risky gamers and 8% were disordered gamers. The internet use time/day ranged between 1-8 hours with mean value of  $3.279 \pm 1.244$  hours/day while gaming time ranged between 0-6 hours/day.

While in the study of **Aggarwal and Pandian** [18], IGD was shown to be prevalent at a rate of 9%, which was greater than the rates of 5.9% recorded in Korean teenagers [23] and 5.7% in German people aged 12 to 25 [24]. In comparison to the prevalence reported in two other studies [16.9% and 13.8%], our study's prevalence was higher [15, 25].

In this study, those with IGD played for an average of 2 hours, but **King and Delfabbro** [26] indicated that they played for 3 hours on average. IGD group members were more inclined to play video games in class and even skip lessons to keep up with their gaming. Candy Rush, Temple Run or Subway Surfer, and Mini Militia were the most played games. One of the most well-liked games in the world, Candy Crush is enjoyed by people of all ages. Our results were supported by study of **Lai and Kwan** [27] who found that 67.5% are normal gamers, 72 students [18%] are risky gamers and 58 students [14.5%] are disordered gamers.

In the study in our hands, regarding internet gaming disorder, 62.5% were male. Their mean age was  $20.174 \pm 0.972$  years. 25% of them were ADHD; half of them were inattention and half were mixed ADHD subscale.

There is no statistically significant difference in age, sex and academic grading between ADHD and non-ADHD students. ADHD subscales have no statistically significant association with age, sex and academic grading. Our results were supported by study of **Lee et al.** [28] because they claimed that the baseline demographic and clinical traits of the pure-IGD and ADHD-IGD groups were similar. Despite the fact that there was a substantial difference in mean age between the groups, the age-group distribution did not change between them significantly. The groups had no gender differences. The present study showed that online gaming, disordered gaming and internet gaming

scale score were statistically significant higher in ADHD than non-ADHD students. Furthermore, internet use time/day, gaming time/day were statistically significant longer in ADHD than non-ADHD students. Among ADHD student, 6 of 13 ADHD students have internet gaming disorder [46.2%]. ADHD subscales have no statistically significant association with the online gaming and internet use time/day, gaming time/day and internet gaming scale score.

**Chen et al.** [20] demonstrated that symptoms of ADHD were common in college students and were strongly associated with the appearance of IGD symptoms. Moreover, **Osagiator al.** [22] reported that whereas ADHD prevalence was 9%, Internet Gaming Addiction [IGA] prevalence was 51%. Gaming disorder significantly influenced ADHD [ $r^2 = 0.122$ ,  $p = 0.001$ ], indicating that it accounts for 12.2% of the diversity in how ADHD symptoms appear.

Even after taking into account the impact of personality traits, sadness, and anxiety symptoms, **Kim et al.** [29] and **Kitazawa et al.** [30] revealed a robust link between the severity of ADHD symptoms and the severity of IA symptoms.

In another meta-analysis carried out by **Dullur et al.** [31], a total of 1028 papers were found, and 29 studies [ $n = 56650$  people] were included for the systematic review. The majority of these studies were observational in nature and of moderate quality, with weaknesses in the generalizability and confounding areas in particular. Purposive samples from community surveys [ $n = 18$ ] predominated, with fewer clinic-based samples [ $n = 11$ ].

Our findings indicated that students with computer gaming disorder are statistically much more likely to be men. In statistically significant numbers, students with internet gaming disorder and ADHD are predominantly male. The Internet Gaming Scale Score exhibits a statistically significant positive association with Internet Time/Day and Game Time/Day and a statistically significant negative correlation with Age and Grade. One of numerous limitations that must be taken into account when interpreting our findings is the self-report questionnaires utilised to identify internet and gaming addiction. Additionally, we did not examine how stimulant pharmaceutical therapy would alter the incidence, severity, and course of IGD.



## Conclusion

This cross-sectional investigation using diagnostic interviews showed a significant association between adult ADHD and IGD. There is statistically significant male predominance in students with ADHD and internet gaming disorder. Internet gaming scale score has statistically significant negative correlation with age and grade and statistically significant positive correlation with internet time/day and game time/day. Strong attention should be paid for early grade students for early diagnosis of these conditions and guiding them for controlling their symptoms so as to get better academic achievement.

**Conflict of Interest and Financial Disclosure:** None.

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