

INTERNET GAMING DISORDER AND PROBLEMATIC INTERNET USE: THE LINKS BETWEEN CYBERBULLYING, AGGRESSION, LONELINESS AND PSYCHIATRIC COMORBIDITIES

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Summary:

Aims: To compare adolescents clinically diagnosed with Internet Gaming Disorder (IGD) and problematic internet use (PIU) in terms of cyberbullying, aggression, and loneliness.

Methods: Male adolescent patients ($N=124$, 14.3 ± 1.7 years) with Internet Addiction Scale (IAS) scores ≥ 50 were clinically interviewed for IGD in utilizing DSM-5 criteria. Patients without full IGD criteria were included as PIU comparisons. Clinical variables were assessed using the second version of the Revised Cyber Bullying Inventory, short-form of the UCLA Loneliness Scale, Buss Perry Aggression Questionnaire, Child Depression Inventory, and Screen for Child Anxiety Related Emotional Disorders.

Results: Compared to individuals with PIU, those with IGD were significantly more likely to have attention-deficit hyperactivity disorder, higher social phobia scores, higher cyberbullying scores, higher loneliness scores, been a cyberbully, and been a cyberbully victim.

Conclusion: Male adolescents with IGD have higher rates of psychiatric comorbidity, perceived loneliness, cyberbullying, and being a victim of cyberbullying than those with PIU. Future studies could evaluate these predictors of transition from PIU to IGD in large cohort samples.

Keywords: Internet Gaming Disorder, Problematic Internet Use, Loneliness, Aggression, Cyberbullying

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INTRODUCTION

Behavioral addictions have become a focus of increasing research interest, and have been defined as excessive problematic involvement in pleasurable activities (e.g., gambling, sex, shopping, internet gaming) that cause clinical impairment in individuals' lives (Griffiths 1996). Similar to substance use disorders, behavioral addictions have characteristic addiction-related physical and mental symptoms including a preoccupation with thoughts, mood lability, tolerance, withdrawal, and interpersonal conflicts (Griffiths 1996). Based on human-machine interaction generating reinforcing stimuli for the users, problematic internet use (PIU), and other "technological addictions" have been regarded as being part

of the cluster of behavioral addictions (Young 1998). In the extant literature, various terminologies, such as 'problematic internet use' (Davis et al., 2002), 'pathological internet use' (Davis 2001), and 'internet addiction' (Young 1998) have all been used to define internet use that causes clinical impairment.

The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) developed criteria for Internet Gaming Disorder (IGD) comprising the playing internet-based games repetitively, preoccupation with internet games, withdrawal symptoms, tolerance and loss of control, and clinical impairment of an individual's overall functioning due to internet gaming (American Psychiatric Association, 2013). The eleventh revision of the International Classification of Diseases (ICD-11) also

included gaming disorder defined “as a pattern of gaming behavior (digital-gaming or video-gaming) characterized by impaired control over gaming, increasing priority given to gaming over other activities to the extent that gaming takes precedence over other interests and daily activities and continuation or escalation of gaming despite the occurrence of negative consequences” (World Health Organization, 2018).

The prevalence of IGD in community settings has been found to be between 0.7-27.5% (Mihara & Higuichi 2017). Moreover, other psychiatric comorbidities are prevalent among patients with internet addiction (Ko et al. 2012) and studies have reported various comorbidity rates (ranging from 50-100%) among adolescents and young adults (Bozkurt et al. 2013), including major depressive disorder, attention-deficit hyperactivity disorder, and social anxiety disorder (Yen et al. 2007). Such risk factors are of crucial importance in predicting the development of IGD so that effective interventions for high-risk groups can be utilized to help prevent long-term negative and harmful consequences (Rho et al. 2017).

Cyberbullying, whereby individuals use communication technologies to deliberately harm others, is also common among adolescents (Agatston et al. 2007), and can result in depressive symptoms, difficulties in peer relationships, hostility, refusal to go to school, and a decline in academic functioning (Li 2007). Previous studies in the literature have reported an association between cyberbullying/cyberbullying victimization and PIU (Jung et al. 2014). More specifically, a lack of parental supervision for their children’s social media use was found to increase the risk of harmful behaviors to others (Young 2004). Loneliness can also be a risk factor for IGD, and studies have indicated clinical correlations between PIU, loneliness, and depressive disorders (Caplan 2002). Additionally, significantly increasing the time spent online in the first year of internet use may be related to elevated levels of depression and loneliness (Shields & Behrman 2000). Higher levels of aggression have been associated with IGD and have been widely investigated among the internet-addicted population (Yu & Cho 2016). Furthermore, aggression may also be a predictive marker in the at-risk group, as well as state- and trait-anxiety facilitating the development of IGD and PIU (Mehroof & Griffiths 2010).

None of the previous studies investigating the associations between internet addiction and cyberbullying (Rao et al. 2019), loneliness (Kök Eren & Örsal 2018), and aggression (Muller et al. 2015) among youth did not implement a clinical interview for the presence of full IGD and PIU diagnoses. To our knowledge, only a few interview-based studies have clinically assessed the IGD

diagnosis using the DSM-5 criteria (Martín-Fernández et al. 2016). Most studies compared differences between IGD and PIU groups by using self-report scales (Krossbakken et al. 2018, Muller et al. 2015, Yu & Cho 2016). Therefore, there is an unmet need to define the clinical differences between IGD and PIU subgroups to better understand and characterize help-seeking patients. Consequently, the present study evaluated aggression, social isolation, cyberbullying, and related psychiatric comorbidities among a clinical population with IGD diagnosis, and differentiated those with PIU from those with IGD to explore the distinctness of these two separate disorders.

The first aim of the present study is to observe the levels of social isolation would be higher among adolescent IGD patients than those with PIU. The second aim is to investigate the scores of aggression among patients with IGD than those with PIU. Thirdly, based on the association between cyberbullying and PIU in the previous literature (Jung et al. 2014), we hypothesized that cyberbullying victimization and cyberbullying would be more common among IGD patients than PIU. The present study also investigated the associations between IGD/PIU and psychiatric comorbidities including attention deficit hyperactivity disorder (ADHD), social anxiety disorder (SAD), and major depressive disorder (MDD).

SUBJECTS AND METHODS

Participants

The sample comprised help-seeking youth population aged 12-18 years, recruited from outpatient clinics of a tertiary-care psychiatry teaching hospital between October 2018 and January 2019. The Internet Addiction Scale (IAS) was implemented for the initial screening (Bayraktar 2001, Young 1996). Patients scoring above the screening threshold (≥ 50 out of 100 on the IAS (Bayraktar 2001, Young 1996)) were clinically assessed for IGD, which requires ≥ 5 out of nine gaming-related symptoms for at least one year. Individuals who did not endorse full IGD criteria but fulfilled the criteria for PIU were used as the comparison group. Given the higher prevalence of IGD among male populations (Muller et al. 2015, Yu & Cho 2016), the present study did not include female patients. Other exclusion criteria included (i) any history of psychotherapy, psychotropic medication and a chronic medical illness, (ii) inability to properly respond questions asked during the clinical interview, (iii) any existing full psychotic disorders, full bipolar disorders, autism

spectrum disorders were clinically assessed using DSM-5 criteria by an experienced child and adolescent psychiatrist, and (iv) IQ < 70.

Measures

Table 1 contains detailed information concerning the scales used in this study (see supplementary materials). Here, we briefly introduce the clinical assessments conducted in the study.

Internet Addiction Scale (IAS): The IAS is a 20-item Likert-type that assesses internet addiction (Bayraktar 2001, Young 1996). Scores less than 50 are considered as clinically unlikely to have internet use-related impairment in functioning screening (Bayraktar 2001, Young 1996).

Revised Cyber Bullying Inventory-II (RCBI-II): The RCBI-II comprises two parts investigating cyberbullying and cyberbullying victimization (Topcu & Erdur-Baker 2018). RCBI-II is scored between 10-40 and higher scores indicate severe cyberbullying or cyberbullying victimization.

Short-form of the UCLA Loneliness Scale (ULS-8): The short-form of the ULS-8 is a self report tool developed by Hays and DiMatteo (Hays & DiMatteo 1987).

Higher scores are associated with severe loneliness. The Turkish version of ULS-8 was translated and validated by Yıldız and Duy (Yıldız & Duy 2014).

Buss Perry Aggression Questionnaire (BPAQ): The BPAQ is a validated Turkish scale assessing four dimensions of aggressiveness including physical and verbal aggressiveness, anger, and hostility (Buss & Perry 1992, Can 2002, Demirtaş Madran et al. 2013).

Child Depression Inventory (CDI): The CDI was developed by Kovacs to evaluate the severity of childhood depression (Kovacs 1981, Öy et al. 1991). Scores >19 are considered to be clinically relevant for depressive symptomatology (Kovacs 1981, Öy et al. 1991).

Screen for Child Anxiety Related Emotional Disorders (SCARED): The SCARED comprises 41 items scored between 0-2 range to assess the severity of various anxiety disorders. The cutoff value >25 might indicate the presence of an anxiety disorder (Birmaher et al. 1997, Karaceylan Çakmakçı 2004).

Kiddie Schedule for Affective Disorders and Schizophrenia for School-Aged Children (K-SADS): The K-SADS is a semi-structured clinical interview to investigate a wide range of DSM disorders to determine research diagnoses. Both children and at least one caregiver were interviewed in this study (Gokler et al. 2004, Kaufman et al. 1997).

Figure 1: Study flow chart

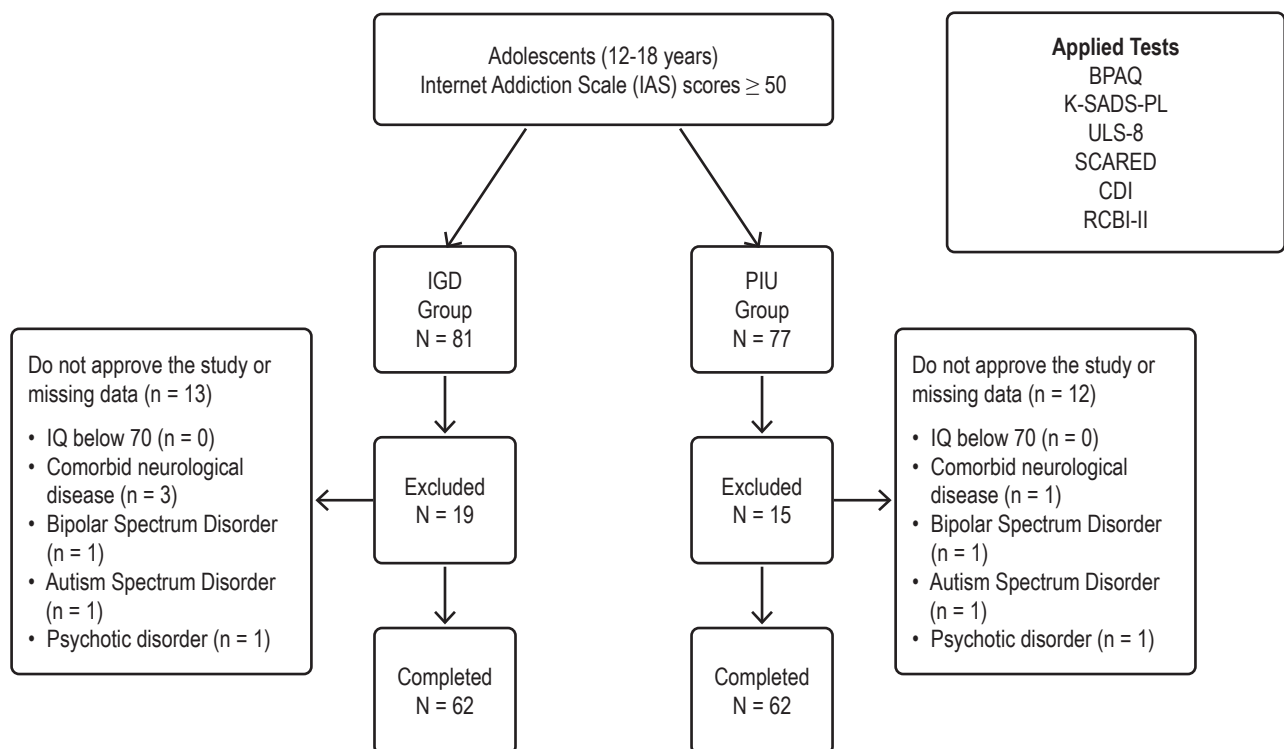


Table 1. Scales and the assessments used in the study

Scales	Original Study	Turkish validation	Assessment	Self-report (Y/N)	The number of items	Example item(s)	Ratings	Score range	Cut-off value(s)
IAS	(Young, 1996)	(Bayraktar, 2001)	Internet addiction	Y	20	“How often do you find that you stay online longer than you intended?”	1=Rarely, 2=Occasionally, 3=Frequently, 4=Often, 5=Always.	20-100	<49: average online user 50-79: occasional to frequent problems due to internet use >80: Internet use causing significant problems
RCBI-II	(Erdur Baker & Kavrut, 2007)	(Topcu & Erdur-Baker, 2018)	Cyberbullying victimization and cyberbullying in two parts	Y	10 items in each part	“I threatened someone via internet” “I was insulted online”	1=never, 2=once, 3=twice or three times, 4=more than three times.	10-40	Any item ≥ 2 is considered as being a cyberbullying victim or cyberbully in the related part.
ULS-8	(Hays & DiMatteo, 1987)	(Yildiz & Duy, 2014)	Loneliness	Y	7	“I am unhappy being so withdrawn.”	1= Never, 2= Rarely, 3= Sometimes, 4= Always.	7-28	N/A
BPAQ	(Buss & Perry, 1992)	(Demirtaş Madran, 2013)	Aggression	Y	29	“I tell my friends openly when I disagree with them.”	1= extremely uncharacteristic of me, 2= uncharacteristic of me, 3= neither characteristic nor uncharacteristic of me, 4= characteristic of me, 5= extremely characteristic of me.	29-145	N/A
CDI	(Kovacs, 1981)	(Öy, 1991)	Depression	Y	27	0=“I get sad from time to time.” 1=“I am sad many times.” 2=“I am sad all the time.”	Each item contains three alternate sentences scored between 0-2. Some items are reversed while counting.	0 – 54	≥ 19 : clinically significant depressive symptomatology.
SCARED	(Birmaher et al., 1997)	(Karacaylan Çakırakçı, 2004)	Anxiety	Y	41	“When I feel frightened it is hard to breathe.”	0= not true or hardly ever true, 1= somewhat true or sometimes true, 2= very true or often true.	0 – 82	≥ 25 : clinically significant anxiety-related symptoms.
K-SADS	(Kaufman et al., 1997)	(Gökler et al., 2004)	DSM diagnoses	N	N/A	N/A	N/A	N/A	N/A

Note: BPAQ= Buss Perry Aggression Questionnaire, CDI= Child Depression Inventory, IAS=Internet Addiction Scale, K-SADS= Turkish version of Kiddie Schedule for Affective Disorders and Schizophrenia for School-Aged Children, RCBI-II=The Revised Cyber Bullying Inventory-II, SCARED= Screen for Child Anxiety Related Emotional Disorders, ULS-8=Short-form of the UCLA Loneliness Scale

Procedure

An experienced child and adolescent psychiatrist (first author) clinically interviewed all participants for the eligibility criteria of the study. All patients were interviewed and clinically assessed for IGD severity using DSM-5 criteria. All psychiatric comorbidities were systematically assessed using the Turkish versions of the scales in the 'Measures' section.

Statistical analysis

A priori power analysis was conducted using Stata v16.0 (Stata Corp.) to test differences between two independent group means using a two-tailed test, a medium effect size ($d=.50$), and an alpha of 0.05 level. Results showed that a total sample of 94 participants with two equal-sized groups ($n=47$) was required to achieve a power of .95. We also implemented sensitivity power analysis for posthoc subgroups. Effect sizes were calculated for ADHD ($d=0.71$), SAD ($d=0.90$) and MDD ($d=1.0$) subgroups ($\alpha=0.05$, $\beta=0.2$ and confidence interval= $\%95$). Statistical analyses were performed using Statistical Package for Social Sciences (IBM Corporation®) version 18.0.0. Categorical variables were analyzed using the chi-square test and Fisher's Exact Test (when cell size ≤ 5). Normal distribution was tested using the Kolmogorov-Smirnov test, Shapiro-Wilk Test, skewness, kurtosis, and histogram. For parametric comparison, an independent sample t -test was used for normally distributed continuous variables and the Mann-Whitney U test was implemented when the normality assumption was not fulfilled. ANCOVA covariation analysis was performed for significant results (adjusted for age). The significance

level was set at 0.05 two-tailed. Bonferroni correction was implemented for multiple comparisons ($p<0.0012$ for each comparison). Cohen's d and r values were calculated for the effect size estimations. To determine adjusted odds ratios for the significant psychiatric comorbidities, binary logistic regression was conducted. Finally, explorative post hoc subgroup analysis was undertaken to compare both study groups for the relevant psychiatric comorbidities such as ADHD, SAD, and MDD.

RESULTS

Sociodemographic variables are shown in Table 2. A total of 124 help-seeking male youth aged 14.3 years ($SD\pm 1.7$) were included and the study groups differed in ages (for IGD group: 14.6 years [$SD\pm 1.7$] vs. PIU group: 13.9 years [$SD\pm 1.6$], $p=0.026$).

Table 3 summarizes the characteristics of the participants. The IGD and PIU groups did not differ regarding the IAS score implemented for the screening (for IGD median \pm IQR =52.0 [$SD\pm 4.0$] vs. PIU median \pm IQR=52.0 [$SD\pm 2.0$], $p=0.241$). There was a statistically significant difference between study groups for the average time spent on the internet during a day (6.7 hours [$SD\pm 2.0$] vs. 3.6 hours [$SD\pm 0.7$], $p<0.001$). There was no difference between study groups for the age at when they first started using the internet and computers. MDD and SAD were more common among those with IGD (41.9% vs. 19.4%; $p=0.006$) than those with PIU (45.2% vs. 25.8%; $p=0.024$). However, these results became non-significant after Bonferroni correction. ADHD and oppositional defiant disorder (ODD) were significantly more prevalent among IGD participants in comparison to

Table 2. Sociodemographic characteristics of 124 male youth with a diagnosis of IGD and PIU.

Characteristics	IGD, n=62	PIU, n=62	Total Sample, n=124	t / Z / X ²	p-value
Age, years, median \pm SD	14.6 \pm 1.7	13.9 \pm 1.6	14.3 \pm 1.7	2.3	0.026
Monthly income, TL/month, median \pm IQR	2750.0 \pm 2625.0	3000.0 \pm 1500.0	3000.0 \pm 1500.0	-0.3	0.789
Psychiatric disorder in mother	21 (33.9)	10 (16.1)	31 (25.0)	5.2	0.023
Psychiatric disorder in father	24 (38.7)	13 (21.0)	37 (29.8)	4.7	0.031
Having a computer at home, n (%)	55 (88.7)	51 (82.3)	106 (85.5)	1.0	0.308
Having a computer at the child's room, n (%)	41 (66.1)	25 (40.3)	66 (53.2)	8.3	<0.001 ^a
Having a separate computer belonging to the child, n (%)	34 (54.8)	25 (40.3)	59 (47.6)	2.6	0.106

Note: IGD=internet gaming disorder, IQR=interquartile range, PIU=problematic internet use, SD=standart deviation, TL=Turkish lira, ^asurvived from FDR adjustment $p<0.0012$

those with PIU (72.6% vs. 40.3%; $p < 0.001$). The differences between study groups for MDD, SAD, and ODD diagnoses did not remain significant after correcting for multiple comparisons.

The total scores of depressive complaints, anxiety, perceived loneliness, aggression, cyberbullying, and cyberbullying victimization scales are shown in Table 4. IGD Patients had higher total scores on the CDI, SCARED, and total social phobia subscale than those with PIU (CDI median=14.0 [SD± 24.0] vs. 4.0 [± 4.0]; $p < 0.001$; SCARED mean=22.1 [SD± 1.9] vs. 11.7 [SD± 10.8]; $p < 0.001$; social phobia subscale median= 6.0 [SD±11.0] vs. 2.0 [SD± 9.0]; $p < 0.001$). Higher total scores on the BPAQ and ULS-8 were found in IGD group (89.7 [SD±25.8] vs. 42.6 [SD±10.5]; $p < 0.001$) than those with PIU (18.5 [SD± 6.5] vs. 9.2 [SD±1.7]; $p < 0.001$). Additionally, both cyberbullying and cyberbullying victimization scores were also greater in the IGD group

(median=17.5 [SD±11.0] vs. 10.0 [± 0.0]; $p < 0.001$) compared to the PIU group (median=17.0 [SD±11.0] vs. 10.0 [± 0.0] $p < 0.001$).

Table 5 summarizes the outcomes of logistic regression analysis. ADHD, MDD, and SAD remained significant in the logistic regression analysis (Exp [B]=30.6 95%CI: 5.8–160.6 for ADHD, Exp [B]=24.9 95%CI: 4.9-127.2 for MDD, Exp [B]: 22.4 95%CI: 4.5-112.1 for SAD). However, ODD was not found statistically significant in the model ($p=0.129$). Nagelkerke's R^2 value was 0.494. Post-hoc subgroup analyses showed significant differences between IGD and PIU comparisons including patients with ADHD (n=70), SAD (n=45), and MDD (n=38) regarding total ULS-8 scores and BPAQ scores (Table 6). Cyberbullying and cyberbullying victimization were also more commonly reported among IGD patients than PIU patients in ADHD and SAD subgroups.

Table 3. Characteristics of 124 male youth with a diagnosis of IGD and PIU.

Characteristics	IGD, n=62	PIU, n=62	Total Sample, n=124	t / X ²	p-value
History of involving in a forensic case, n (%)	11 (17.7)	2 (3.2)	13 (10.5)	7,0	0.008
The total duration of computer use, years, mean ± SD	6.4 ± 2.5	5.7 ± 2.2	6.0 ± 2.4	1.6	0.107
The age-onset of internet use, mean± SD	8.6 ± 2.3	8.7 ± 2.1	8.6 ± 2.2	0.3	0.744
The average duration of internet use, hours/day, mean ± SD	6.7 ± 2.0	3.6 ± 0.7	5.1 ± 2.1	12.0	<0.001 ^a
Age at the first symptom of IGD/PIU, mean ± SD	12.2 ± 1.9	12.0 ± 1.7	12.1 ± 1.8	0.6	0.522
Attempt to stop using the internet, n (%)	9 (14.5)	14 (22.6)	23 (18.5)	1.3	0.248
Motivation to reduce internet use, n (%)	7 (11.3)	28 (45.2)	35 (28.2)	17.6	<0.001 ^a
Psychiatric Comorbidities, n (%)					
MDD	26 (41.9)	12 (19.4)	38 (30.6)	7.4	0.006
SAD	28 (45.2)	16 (25.8)	44 (35.5)	5.1	0.024
ADHD	45 (72.6)	25 (40.3)	70 (56.5)	13.1	<0.001 ^a
ODD	16 (25.8)	3 (4.8)	19 (15.3)	10.5	0.001
CD	3 (4.8)	1 (1.6)	4 (3.2)	FE	0.619
Panic Disorder	2 (3.2)	1 (1.6)	3 (2.4)	FE	1.0
GAD	4 (6.5)	3 (4.8)	7 (5.6)	FE	1.0
Specific phobia	5 (8.1)	6 (9.7)	11 (8.9)	0.1	0.752
OCD	2 (3.2)	1 (1.6)	3 (2.4)	FE	1.0
Separation anxiety disorder	2 (3.2)	2 (3.2)	4 (3.2)	FE	1.0
Any tic disorder	3 (4.8)	2 (3.2)	5 (4.0)	FE	1.0

Note: ADHD=attention-deficit hyperactivity disorder, CD=conduct disorder, FE=Fisher's exact test, GAD=generalized anxiety disorder, IGD=internet gaming disorder, MDD=major depressive disorder, OCD=obsessive-compulsive disorder, ODD=oppositional-defiant disorder, PIU=problematic internet use, SAD=social anxiety disorder.

^asurvived from FDR adjustment $p < 0.0012$

Table 4. Aggression, perceived loneliness, cyberbullying, and cyberbullying victimization levels of 124 male youth with a diagnosis of IGD and PIU.

Characteristics	IGD, n=62	PIU, n=62	Total Sample, n=124	t / Z / X ²	p-value	ES ^{a,c}
The total score of IAS, mean ± IQR	52.0 ± 4.0	52.0 ± 2.0	52.0 ± 4.0	-1.2	0.241	r= 0.1 ^a
The total score of CDI, median ± IQR	14.0 ± 24.0	4.0 ± 4.0	9.0 ± 17.0	-7.2	<0.001 ^b	r= 0.6 ^a
The total score of SCARED, mean ± SD	22.1 ± 11.9	11.7 ± 10.8	16.9 ± 12.4	-5.1	<0.001 ^b	d= 0.9 ^c
The total score of school phobia subscale, mean ± SD	1.0 ± 1.1	0.9 ± 0.9	0.9 ± 1.0	-0.6	0.521	d= 0.1 ^c
The total scores of somatic/panic subscale, median ± IQR	4.0 ± 4.0	0.5 ± 3.0	3.0 ± 5.0	-6.5	<0.001 ^b	r= 0.6 ^a
The total score of generalized anxiety subscale, median ± IQR	6.0 ± 5.0	1.0 ± 4.0	4.0 ± 6.0	-5.4	<0.001 ^b	r= 0.5 ^a
The total score of separation anxiety subscale, median ± IQR	3.0 ± 2.0	1.0 ± 2.0	2.0 ± 2.0	-3.8	<0.001 ^b	r= 0.3 ^a
The total score of social phobia subscale, median ± IQR	6.0 ± 11.0	2.0 ± 9.0	3.0 ± 10.0	-4.0	<0.001 ^b	r= 0.4 ^a
The total score of BPAQ, mean± SD	89.7 ± 25.8	42.6 ± 10.5	66.1 ± 30.7	-13.3	<0.001 ^d	d= 2.4 ^c
The total score of physical aggression subscale, mean ± SD	25.9 ± 8.0	11.4 ± 2.8	18.7 ± 9.4	-13.6	<0.001 ^b	d= 2.4 ^c
The total score of verbal aggression subscale, mean ± SD	19.1 ± 4.8	10.9 ± 3.6	15.0 ± 5.9	-10.8	<0.001 ^b	d= 1.9 ^c
The total score of hostility subscale, mean ± SD	22.0 ± 7.6	10.4 ± 2.3	16.2 ± 8.1	-11.6	<0.001 ^b	d= 2.1 ^c
The total score of anger subscale, mean ± SD	22.7 ± 7.2	10.0 ± 2.3	16.3 ± 8.3	-13.2	<0.001 ^b	d= 2.4 ^c
The total score of ULS-8, mean ± SD	18.5 ± 6.5	9.2 ± 1.7	13.9 ± 6.6	-10.9	<0.001 ^d	d= 2.0 ^c
Any type of cyberbullying, n (%)	40 (64.5)	14 (22.6)	54 (43.5)	22.1	<0.001 ^b	-
Any type of cyberbullying victimization, n (%)	44 (71.0)	14 (22.6)	58 (46.8)	29.2	<0.001 ^b	-
The total score Cyberbullying Section, median ± IQR	17.5 ± 11.0	10.0 ± 0.0	10.0 ± 8.0	-5.9	<0.001 ^d	r= 0.5 ^a
The total score of Cyberbullying victimization Section, median ± IQR	17.0 ± 11.0	10.0 ± 0.0	10.0 ± 7.0	-6.6	<0.001 ^d	r= 0.6 ^a

Note: BPAQ=Buss Perry Aggression Questionnaire, CDI=Child Depression Inventory, GAD=generalized anxiety disorder, IGD=internet gaming disorder, IQR=interquartile range, RCBI-II=Revised Cyber Bullying Inventory-II, SCARED= Screen for Child Anxiety Related Emotional Disorders, PIU=problematic internet use, SD=standart deviation, ULS8=short-form of the UCLA Loneliness Scale, IAS=Young's Internet Addiction Scale.

^a r, 0.1=small effect, 0.3=medium effect, 0.5=large effect (Fritz et al., 2012)

^b survived from FDR adjustment $p < 0.0012$

^c Cohen's d, 0.2=small effect, 0.5=medium effect, 0.8=large effect

^d remained significant ($p < 0.001$) and survived from FDR adjustment $p < 0.0012$ after ANCOVA covariation analysis implemented for age

Table 5. Logistic regression analysis including psychiatric comorbidities of PIU/IGD characteristics.

Characteristics	B	SE	Wald	p-value	Exp (B)	95% CI
ADHD	3.4	0.8	16.4	<0.001	30.6	5.8 – 160.6
ODD	1.2	0.8	2.3	0.129	3.3	0.7 – 15.1
MDD	3.2	0.8	14.9	<0.001	24.9	4.9 – 127.2
SAD	3.1	0.8	14.4	< 0.001	22.4	4.5 – 112.1

Note: ADHD=attention-deficit hyperactivity disorder, CI=confidence interval, IGD=internet gaming disorder, MDD=major depressive disorder, PIU=problematic internet use, SAD=social anxiety disorder, Nagelkerke R²=0.494.

Table 6. Post-hoc subgroup analysis of 124 male youth with a diagnosis of IGD and PIU.

Variables	ADHD, n=70			SAD, n=45			MDD, n=38		
	IGD, n=45	PIU, n=25	p-value	IOOB, n=28	PIK, n=16	p-value	IOOB, n=26	PIK, n=12	p-value
Total ULS-8 score, mean± SD	17.6 ± 6.7	8.2 ± 1.0	<0.001 ^a	22.0 ± 2.3	9.7 ± 1.6	<0.001 ^a	23.5 ± 1.7	11.0 ± 1.4	<0.001 ^a
Any type of cyber bullying, n (%)	32 (71.1%)	7 (28.0%)	<0.001 ^a	20 (71.4%)	3 (17.6%)	<0.001 ^a	16 (61.5)	1 (8.3)	0.002
Any type of cyberbullying victimization, n (%)	34 (75.6%)	6 (24.0%)	<0.001 ^a	23 (82.1%)	5 (29.4%)	<0.001 ^a	18 (69.2)	2 (16.7)	0.003
Total BPAQ score, mean± SD	103.3 ± 13.4	53.2 ± 7.7	<0.001 ^a	86.4 ± 28.3	33.8 ± 2.1	<0.001*	87.2 ± 27.3	36.4 ± 4.6	<0.001 ^a
Variables	non-ADHD, n=54			non-SAD, n=79			non-MDD, n=86		
	IGD, n=17	PIU, n=37	p-value	IOOB, n=34	PIK, n=45	p-value	IOOB, n=36	PIK, n=50	p-value
Total ULS-8 score, mean± SD	20.8 ± 5.3	9.9 ± 1.7	<0.001 ^a	15.6 ± 7.3	9.0 ± 1.7	<0.001 ^a	14.9 ± 6.2	8.8 ± 1.5	<0.001 ^a
Any type of cyber bullying, n (%)	8 (47.1%)	7 (18.9%)	0.050	20 (58.8%)	11 (24.4%)	0.002	24 (66.7)	13 (26.0)	<0.001 ^a
Any type of cyberbullying victimization, n (%)	10 (58.8%)	8 (21.6%)	0.007	21 (61.8%)	9 (20.0%)	<0.001 ^a	26 (72.2)	12 (24.0)	<0.001 ^a
Total BPAQ score, mean± SD	53.4 ± 11.2	35.4 ± 4.1	<0.001 ^a	92.3 ± 23.6	45.9 ± 10.5	<0.001 ^a	91.4 ± 24.9	44.1 ± 11.0	<0.001 ^a

Note: ADHD=attention-deficit hyperactivity disorder, BPAQ=Buss Perry Aggression Questionnaire, MDD=major depressive disorder, SAD= social anxiety disorder, ULS-8=short-form of the UCLA Loneliness Scale.

^ap<0.0012

DISCUSSION

The results suggest that compared problematic internet use (PIU) patients, Internet Gaming Disorder (IGD) patients have (i) elevated levels of perceived, aggression, loneliness, cyberbullying victimization, and cyberbullying than patients with PIU; (ii) a higher prevalence of ADHD; and (iii) more severe depression and social anxiety-related symptoms. Compatible with the hypotheses, ADHD, MDD, and SAD were found statistically significant predictors of IGD after performing a logistic regression analysis (although ODD was not). To our knowledge, this study is the first to demonstrate clinical differences between IGD and PIU groups, involving participants based on DSM-5-defined diagnoses utilizing clinical interviews.

The results of the study confirmed previous theoretical and empirical studies by demonstrating that IGD and PIU are not the same construct. Researchers have previously argued that IGD and PIU are different constructs (Kiraly et al. 2014). A previous nationally representative largescale study among adolescents (Kiraly et al. 2014) showed that IGD and PIU were two different constructs but the study sample did not use a clinical sample.

Therefore, the present study attempted to confirm these previous theoretical and empirical studies by utilizing a clinical sample of treatment-seeking individuals.

In line with previous literature indicating a correlation between IGD and aggressiveness (Torres-Rodriguez et al. 2018), the results here suggest patients with IGD reported elevated aggression scores, nearly twice as high as compared to those with PIU. In a previous study, patients scoring ≥5 IGD criteria had elevated levels of attention problems, oppositional behaviors, aggressiveness, and externalizing problems compared to those endorsing 2-4 IGD criteria (Muller et al. 2015). Another study, including two participant groups differentiated into addicts and non-addicts by using the Internet Gaming Addiction Scale, reported BPAQ scores were significantly greater in the IGD group than “the possible Internet gaming disorder” group (Yu & Cho 2016). Unsurprisingly, the results of the present study also indicated a higher frequency of ADHD comorbid with IGD (72.6%) than with PIU (40.3%) groups, considering the epidemiological prevalence of ADHD (Polanczyk et al. 2014). The impulsive, novelty-seeking, and impatient traits of ADHD might increase the susceptibility for developing IGD during adolescence (Li et al. 2020).

Loneliness and CDI scores differed between the two study groups, consistent with research reporting the relationship between loneliness and IGD (Sarda et al. 2016). Müller and colleagues also compared internalizing symptoms, anxiety, depression, and social introversion scores of IGD with a subthreshold PIU group endorsing 2-4 IGD symptoms, and indicated greater impairment among the IGD population (Muller et al. 2015). In parallel with the previous literature, the results here found elevated depression scores for youth with a full IGD diagnosis (median=14.0 vs. 4.0). Moreover, syndromal MDD was more than twice as common among those with IGD (41.9%) compared to those with PIU (19.4%). MDD is associated with unwillingness, lack of energy, and a loss of interest in social activities and might also lead to social isolation, and a decrease in regular activities. In addition, it also might increase online gaming behavior and other less relatively challenging online activities such as online shopping or social networking. However, in the present study, only patients with an online gaming disorder were included rather than other problematic/addictive online behaviors that are also frequently observed among adolescent and adult age groups (Villegla et al. 2011).

Loneliness might also co-occur with depressive mood episodes and many adolescents and young adults with MDD/SAD might experience unsupportive peer relationships, ranging from friendlessness to bullying in school settings. Therefore, isolated youngsters might need to find a coping mechanism to socialize. Gradually increasing the number of online hours spent online might also cause young people to shape their regular habits according to online activities. Given that MDD is a risk factor for future IGD development, social isolation and perceived loneliness might also have an augmenting effect on the risk of IGD. Also, IGD accompanying depression might act as a catalyst and increase social withdrawal. Additionally, the current literature has evidenced a clinical relationship between IGD and SAD (Kowalski & Limber 2013). The results of the present study showed nearly half of patients with IGD (45.2%) and a quarter of patients with PIU (25.8%) were diagnosed with SAD. Van Rooij et al. also found that addicted online gamers had greater loneliness, social anxiety, and low self-esteem scores than other non-addicted online gamers (Van Rooij et al. 2011).

Many studies investigating social anxiety and loneliness have found an association between IGD and social anxiety symptoms, as well as loneliness (Van Rooij et al. 2011). Krossbakken and colleagues proposed that aggression was the antecedent of IGD development and that anxiety might be a consequence based on their longitudinal data (Krossbakken et al. 2018). They also concluded

that depression and loneliness had a reciprocal interaction with IGD. In a recent longitudinal study, loneliness was a significant predictor of future IGD. However, the study suggested anxiety may be a consequence of IGD development (Finseras et al. 2019). It could be argued that individuals with SAD might avoid close social contact by having online friendships and using the internet rather than having real-world experiences in social settings because they are perceived as fearful contact.

In previous literature, cyberbullying has been shown associated with both IGD and PIU (Rao et al. 2019). In the present sample, cyberbullying history among those with IGD (64.5%) was significantly more prevalent in comparison to those with PIU (22.6%). In line with results here, previous research has found that adolescents who spend more time on the internet and playing online games were found to be at-risk of cyberbullying and cyberbullying victimization (Jung et al. 2014). A study performed in school settings also suggested adolescents frequently reported cyberbullying (28.0%) and cyberbullying victimization (44.5%) (Rao et al. 2019). Furthermore, it might be argued that higher rates of male patients with a lower level of functioning might increase the risk of cyberbullying or cyberbullying victimization. Also, the present study found a higher prevalence of ADHD (56.5% for both groups) characterized by reward-seeking and impulsiveness, increasing the risk for cyberbullying and cyberbullying victimization (Dawson et al. 2019).

Patients with ADHD might suffer from poor impulsive control and unstable peer relationships, which may also contribute to the risk of cyberbullying and cyberbullying victimization (Patros et al. 2016). As well as ADHD, SAD might have detrimental effects on IGD by worsening social relationships. The SAD diagnosis was also prevalent in the present study's sample, and nearly one-third of the participants and various cross-sectional studies have reported elevated social anxiety scores (Muller et al. 2015, Yu & Cho 2016). It could be that the difference between the study groups here in terms of SAD diagnosis and loneliness might represent different phases of the long-term IGD course. Because the present study was cross-sectional, more prospective studies are needed to determine the future risk of IGD for the PIU group with SAD comorbidity in order to investigate moderator and mediator variables affecting long-term outcomes.

Higher rates of comorbidities, elevated levels of aggression, and behavioral disturbances might be conceptualized as the combined risk factors for IGD. In addition to externalizing symptoms, depressive and avoidant individuals might use gaming activities as self-medication to alleviate their discomfort and stress. In this context, ADHD could play a key role in the development of

gaming disorder among high-risk individuals. In the present sample, MDD, SAD, and ADHD may explain some of the total variance in the binary logistic regression model (Nagelkerke $R^2=49.4$). On the other hand, ODD did not remain significant in the model together with ADHD. It could be argued that ADHD, SAD, and MDD differed between study groups. However, the statistical power might not have been sufficient to discriminate ODD diagnosis in the present sample. Finally, posthoc comparisons showed similar significant differences between the two study groups.

Several limitations should be acknowledged when interpreting the results. First, the exclusion of female patients from the study limits the generalizability of the results. Considering the higher rates of IGD in the male population, the present study opted to avoid potential heterogeneity that could have been arisen from much lower numbers of female participants. Second, the modest sample size recruited from a single center might limit the generalizability of the results, as well as diminishing the statistical power in the post hoc analyses. However, as a tertiary-care psychiatry-teaching clinic in the most populated part of the country, the treatment center is the main referral clinic, accepting a high number of patients from even remote areas across the country. Third, IAS screening might not have strong face validity of scores >50 for the IGD diagnosis (Cho et al. 2014). Nevertheless, the IAS was only implemented for regular screening and the IAS scores do not indicate an IGD or a PIU diagnosis. Accordingly, all diagnoses including IGD and PIU were confirmed by an experienced clinician covering varied psychiatric disorders in accord with DSM-5 criteria. Fourth, the cross-sectional design restricts the conclusions that can be made. Despite all these limitations including the limited sample size (necessarily small because it utilizes a clinical sample), the results suggest robust statistical significance for the clinical parameters, supporting the notion that IGD is associated with much higher levels of depression, anxiety, loneliness, aggression, and cyberbullying among individuals recruited in clinical settings. The study also included patients scoring

five or more of the nine IGD-related symptoms based on proposed criteria in the DSM-5 among a help-seeking PIU group, in order to compare both distinct entities, and showing a major categorical differentiation which could be helpful for clinicians. The last limitation of the study was associated with lack of healthy control group. In terms of the applicability of the results of the study in the community sample, it is important to plan future studies in this design.

CONCLUSIONS

As a novel DSM-5 disorder, IGD has distinct clinical features and increased levels of psychopathology compared to more general PIU. Psychiatric disturbances among the IGD group in the clinical population were more evident compared to patients with PIU. Future studies with interview-based IGD diagnoses in the clinical help-seeking population could guide clinicians to focus on a functionally impaired population. Prospective studies investigating subthreshold PIU are still needed to assess the moderators and mediators of the those developing IGD.

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