

## ORIGINAL RESEARCH

# Psychiatric Correlates of Internet Gaming Disorder in Children

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## Main Points

- IGD scores were significantly correlated with the scores of anxiety, hyperactivity/impulsivity, and suicidal ideation
- It is important to evaluate the suicidal ideation of individuals with problematic gaming behavior.
- IGD scores were not significantly correlated with depression or family dysfunction
- Depression and family dysfunction may be other conditions that present with persisting IGD diagnosis.
- The mean time between the first internet gaming experience and the parents' recognition of the disorder was about two years.

## Abstract

The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) criteria has included internet gaming disorder (IGD) as a condition, but it needs further research. Little is known about who is at risk of developing IGD. Efforts at prevention and early intervention are very important in childhood and adolescence when the first signs of IGD appear, especially in susceptible groups. However, in the results of studies investigating the relationship between psychopathologies and IGD, there are contradictions that may be the result of heterogeneity in the evaluation processes. Therefore, it is critical to use DSM-5 criteria or questionnaires regarding IGD. Ninety-two children were included in this study, which is a cross-sectional study evaluating the correlation between IGD and other possible comorbid conditions (inattention, hyperactivity/impulsivity, oppositional defiant disorder, conduct disorder, anxiety, depression, suicidality, and family dysfunction). IGD scores were significantly correlated with the scores of anxiety, hyperactivity/impulsivity, and suicidal ideation. However, we did not find a significant correlation between IGD and depression or family dysfunction. The mean time between the first internet gaming experience and the parents' recognition of the disorder was about 2 years. Children suffering from anxiety or hyperactivity/impulsivity should be evaluated for their screen time. Children with problematic gaming behavior are at risk for developing suicidal tendencies.

**Keywords:** Problematic gaming, internet addiction, suicidal ideation, anxiety, attention deficit hyperactivity disorder

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## Introduction

The latest version of the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-5) included internet gaming disorder (IGD) as a condition that needs further research (American Psychological Association, 2013). Similarly,

the International Classification of Diseases (ICD-11) has confirmed the diagnosis of IGD (ICD). Studies have reported that the prevalence of IGD is between 1.2% and 5.9% among young people (King & Delfabro, 2016; Pontes et al, 2016; Wartberg et al., 2017). In addition, IGD was implied as separate from internet addiction (IA). However, there are questions such as

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whether IA has similar comorbid psychopathologies as IGD (Sugaya et al., 2019). Researchers who have conducted a systematic literature review on IGD emphasize that the studies have included IA or problematic internet use and their scales. There are limited number of studies focused on IGD, especially using DSM-5 criteria or DSM-5 criteria-based scales. These limitations in the evaluation processes may be the cause of the inconsistencies (González-Bueso et al., 2018).

It is essential to identify adolescents susceptible to IGD. Risk factors can be categorized into three main categories: psychiatric comorbidities, family and parental conditions, and other factors such as academic performance (Lam, 2014). Knowledge of underlying psychological and parental problems is important to develop preventive and therapeutic interventions. IGD was associated with hyperactivity/impulsivity, conduct disorder, depression, anxiety, and family dysfunction (King & Delfabbro, 2016; Strittmatter et al., 2015). Depression was the most common comorbidity in all age groups (González-Bueso et al., 2018). There are contradictory results about comorbidities of IGD and IA. There are some studies that did not detect any correlation between IGD and family functioning or psychiatric comorbidities (King & Delfabbro, 2017). Moreover, studies recommend exploring the relationship between IGD and comorbidities, which are possibly the cause or result of IGD (González-Bueso et al., 2018). IGD can cause impairments in the adolescent's relationship with family and peers, which may, in turn, lead to mental health problems. An important issue that is associated with IA is suicidal ideation. Suicidal ideation was detected to be more prevalent among children and adolescents. Suicidal ideation, planning suicide, or suicide attempts were reported to be significantly associated even after controlling for the comorbidity of depression (Cheng et al., 2018).

A systematic review evaluated the association between IGD and psychopathologies in the current literature to provide a direction for future studies (González-Bueso et al., 2018). The authors reported different levels of effect sizes regarding the associations of psychopathologies with IGD (large, moderate, small, and non-association). The strongest correlations were observed with anxiety, depression, and attention deficit hyperactivity disorder (ADHD). Most of the studies targeted the non-clinical adult population. In this study, the strongest associations between IGD and psychopathologies were found in the adult population, and age was reported to be one of the important factors related to psychiatric comorbidities. Authors hypothesized that children and adolescents are less affected by the long-term effects of IGD. However, there is a lack of studies investigating IGD in children and adolescents using DSM-5-based criteria or questionnaires specific to IGD. In addition, children and adolescents are expected to exhibit different kinds of associations, especially between family environment and IGD symptoms. Therefore, studying etiological factors related to IGD in children and adolescents requires a different perspective from studying etiological factors related to IGD in the adult population (Sugaya et al., 2019).

We aimed to evaluate both IA and IGD and the anxiety, depression, ADHD symptoms, and family functions with specific questionnaires using DSM-5 criteria-based scale for IGD in children. The main aim of this study was to investigate the association between IGD and other psychopathologies (inattention, hyperactivity/impulsivity, depression, anxiety, and suicidal ideation) and family functioning.

## Methods

### Participants

This study included 92 patients who were consecutively referred for evaluation and treatment by the outpatient clinic of the child and adolescent psychiatry department. Participants with a history of significant head injury, intellectual disability, seizure, and psychotic or neurological disorders were excluded from the study. Ethical approval was obtained from the ethics committee of Balikesir University (approval number: 2020/19, date: February 05, 2020).

The questionnaire based on DSM-5 criteria of IGD was the internet gaming disorder scale-short form (IGDS9-SF). Young's internet addiction test-short form (YIAT-SF) is a screening instrument used to identify IA. We used the screen for child anxiety-related emotional disorders (SCARED) to evaluate anxiety; children's depression inventory (CDI) to evaluate depression; Atilla Turgay DSM - IV-based child and adolescent disruptive behavioral disorders screening and rating scale (T-DSM-IV-S) to measure ADHD, oppositional defiant disorder (ODD), and conduct disorder (CD) symptoms; and McMaster family assessment device (FAD) to evaluate family functioning.

### Instruments

#### YIAT-SF

The YIAT-SF evaluates symptoms of IA and includes 12 items, which are measured on a 5-point scale, from (1) never to (5) very often. It was developed by Young (1998) and shortened by Pawlowski et al. (2013). The YIAT-SF has been translated and validated for the Turkish population with a good internal consistency of 0.88 (Kutlu et al., 2016).

#### IGDS9-SF

The IGDS9-SF has been developed to assess the symptoms and severity of IGD over a 12-month period (Pontes et al., 2016). Nine items of IGDS9-SF were defined by DSM-5 to evaluate withdrawal, preoccupation/salience, tolerance, deception, and daily activity impairment. It has a quick admission by nine items of 5-point Likert scale. These items are answered on a 5-point Likert scale ranging from (1) never to (5) very often, and higher scores on the scale imply a higher level of gaming disorder. It has been translated into different languages, including Turkish by Evren et al. (2018). The Turkish form of the scale was reported as reliable (Cronbach's alpha of 0.89) and showed adequate convergent and criterion-related validity with amateur or professional gamers (Evren et al., 2018).

#### McMaster FAD

The FAD is a 60-item self-report and Likert-type questionnaire determining family functioning (Epstein et al., 1983). It consists of 7 subscales (problem-solving, communication, roles, affective responsiveness, affective involvement, behavior control, and general functioning). It was translated into different languages, including Turkish (Bulut, 1990). The participants evaluate the status of the statements on a scale of 1 to 4, with 1 being strongly agree, 2 mostly agree, 3 rarely agree, and 4 never agree. Scores belonging to each scale are added up, and the score of the subscale is calculated by dividing it with the number of items in the subscale. One point indicates being "healthy" and four means being "unhealthy." The median value is 2 point.

### T-DSM-IV-S

This scale was developed by Atilla Turgay based on DSM-IV diagnostic criteria and adapted and translated into Turkish by Ercan (Ercan, 2001; Turgay, 1995) to screen and assess inattention (9 items), hyperactivity/impulsivity (9 items), ODD (8 items), and CD (15 items). The symptoms were scored by assigning a severity estimate for each symptom on a 4-point Likert-type scale (0=not at all, 1=just a little, 2=much, and 3=very much). This 4-point Likert-type scale is calculated by summing the scores in each subscale.

### CDI

The CDI was developed to measure the severity of depression symptoms and demonstrated good reliability and validity, especially distinguishing children aged 7 to 17 years (Kovacs, 1985). The CDI scale includes 27 items with rating from 0 to 2 points. It is a self-assessment scale that evaluates symptoms of depression in children. The participants are given a group of three sentences and asked to choose the one that best describes them in the past 2 weeks (negative mood, ineffectiveness, negative self-esteem, interpersonal problems, and anhedonia are evaluated). Symptoms of depression and suicidal ideation were evaluated using CDI in this study. Psychometric characteristics of the Turkish version were studied, and the reliability and validity of the Turkish form were reported (Oy, 1991).

### SCARED

SCARED consists of 41 items to evaluate anxiety symptoms of children aged 8-18 years (Birmaher et al., 1997). The reliability and validity of the Turkish form were studied (Çakmakçı, 2004). It is rated as follows: 0, not true or hardly ever true; 1, somewhat true or sometimes true; and 2, very true or often true. The minimum score is 0 points, and the maximum score is 82 points. Higher scores on the scale that has no cut-off values represent a higher level of anxiety.

### Statistical Analysis

Statistical analysis was performed using Statistical Package for Social Sciences for Windows version 20.0 (IBM SPSS Corp.; Armonk, NY, USA). Shapiro-Wilk test was used for the evaluation of the normality of data. For skewed data, Mann-Whitney U test was used to compare the two groups. Spearman correlation analysis was performed to evaluate associations among numerical variables.

### Results

Ninety-two children (20.7% female and 79.3% male) and their parents were included in this study. IGDS9-SF and YIAT-SF scores were higher in male participants ( $9.5 \pm 6.7$  and  $25.3 \pm 9.4$ , respectively) than in female participants ( $5.6 \pm 4.4$  and  $22.8 \pm 7.5$ , respectively). The mean age of the participants was  $11.08 \pm 2.06$  (range: 7-16) years. The mean age of the first internet gaming experience reported by parents was  $6.5 \pm 2.7$  years. In addition, the mean age of the children when their parents first identified the signs of IGD was  $8.1 \pm 2.3$  years. In addition, data about maternal education level, paternal education level, family history of any psychiatric diagnosis, and family history of any kind of addiction are shown in Table 1.

The IGDS9-SF scores had significantly positive correlations with hyperactivity/impulsivity scores and anxiety scores (Table 2). The YIAT-SF scores had significantly positive correlations with inattention scores, hyperactivity/impulsivity scores, and anxiety scores (Table 2). Participants who had suicidal ideation had higher IGDS9-SF and YIAT-SF scores compared to who had not

Table 1.  
*Sociodemographic Characteristics of the Sample*

Sociodemographic characteristics	n(%)
Maternal education	
Primary school	32 (35.6)
Middle school	14 (15.5)
High school	25 (27.8)
University	19 (21.1)
Paternal education	
Primary school	31 (34.4)
Middle school	15 (16.7)
High school	28 (31.1)
University	16 (17.8)
Family history of any psychiatric diagnosis	
No	71 (88.8)
Yes	9 (11.2)
Family history of any kind of addiction	
No	25 (30.5)
Yes	57 (69.5)

Table 2.  
*Correlations Between IGDS9-SF/YIAT-SF Scores and Inattention, Hyperactivity/Impulsivity, ODD, CD, Depression, Anxiety, and Family Function Scores*

	IGD (IGDS9-SF)	IA (YIAT-SF)
Inattention (T-DSM-IV-S)	0.194	0.336**
Hyperactivity/impulsivity (T-DSM-IV-S)	0.240*	0.220*
ODD (T-DSM-IV-S)	0.168	0.123
CD (T-DSM-IV-S)	0.193	0.30
Depression (CDI)	0.148	0.154
Anxiety (SCARED)	0.334**	0.381**
Family function (problem-solving)	0.007	-0.81
Family function (communication)	0.097	-0.031
Family function (roles)	0.094	0.068
Family function (affective responsiveness)	0.063	-1.113
Family function (affective involvement)	0.183	0.201
Family function (behavior control)	0.219	0.050
Family function (general functioning)	0.141	-0.29

\* Correlation is significant at the 0.05 level

\*\* Correlation is significant at the 0.01 level

IGD: internet gaming disorder; IGDS9-SF: internet gaming disorder scale-short form; IA: internet addiction; YIAT-SF: Young's internet addiction test-short form; T-DSM-IV-S: Atilla Turgay DSM - IV-based child and adolescent disruptive behavioral disorders screening and rating scale; ODD:oppositional defiant disorder; CD:conduct disorder; CDI: children's depression inventory; SCARED: screen for child anxiety-related emotional disorders

( $p=0.016$  and  $p=0.022$ , respectively). There was no association between IGDS9-SF/YIAT-SF scores and ODD, CDI, depression, and family functioning scores (Table 2).

## Discussion

The main aim of this study was to investigate associations between IGD/IA and other possible comorbid conditions (inattention, hyperactivity/impulsivity, ODD, CD, anxiety, depression, suicidality, and family dysfunction). Both IGD and IA scores correlated significantly with the scores of anxiety, hyperactivity/impulsivity, and suicidal ideation. However, there was no significant correlation between IGD and IA scores and symptoms of depression or family dysfunction. The mean time between the first internet gaming experience ( $6.5\pm 2.7$  years of age) and the parents' recognition of the disorder ( $8.1\pm 2.3$  years of age) was about 2 years.

Consistent with most of the previous studies, this study found a correlation between anxiety and IGD and IA (Jiménez-Murcia et al., 2014; Kim et al., 2016; King & Delfabbro, 2016). ADHD was shown as a frequent psychiatric condition co-occurring with IGD and IA (Ra et al., 2018). In this study, we evaluated ADHD symptoms in two categories as inattention and hyperactivity/impulsivity symptoms. Hyperactivity/impulsivity scores were significantly associated with both IGD and IA scores. Previous studies have shown the importance of impulsivity as a core ADHD symptom and underlined its significant association with impairment related to ADHD diagnosis, especially in major life activities (Barkley & Fischer, 2010; Ünsel Bolat et al., 2016). Although the etiology of IGD is not well understood, impulsivity among ADHD symptoms was particularly implicated as an important risk factor for many addictive disorders such as IGD (Gentile et al., 2017).

Most of the cross-sectional studies exploring the association between IGD and depression reported a positive association (Jiménez-Murcia et al., 2014; Kim et al., 2016; Strittmatter et al., 2015; Vadlin et al., 2016). However, few longitudinal studies investigated this association. One of these longitudinal studies reported that the symptoms of depression started after the onset of IGD and persisted (Gentile et al., 2011). In another study, IGD and IA differed in terms of the comorbidity of depression: IA, not IGD, was associated with symptoms of depression (King et al., 2013). In this study, we did not detect a significant correlation between symptoms of depression and IGD/IA. Inclusion of more patients diagnosed with severe and persistent IGD or IA might yield an association between IGD and the symptoms of depression, such as the one suggested by a previous longitudinal study (Gentile et al., 2011).

It is important to note that we found a significant positive correlation between IGD/IA and suicidal ideation. Although IGD/IA was not significantly correlated with symptoms of depression, suicidal ideation was correlated with both IGD and IA scores. This result is consistent with previous studies that reported an association between problematic gaming and suicidal ideation even after controlling for comorbid psychiatric disorders (Park et al., 2017). A nationally representative survey of high school students also reported a higher risk of suicidal ideation among gamers who spend more than 5 hours a day in front of a screen (Messias et al., 2011). The authors suggested that psychiatric evaluation

is necessary for individuals suffering from problematic gaming behavior even with no concomitant psychiatric disorders. This is because it is possible to detect and prevent suicidality among on-line gamers. The preventive strategy for these individuals will be beneficial for the elimination of psychiatric conditions, such as depression and suicidality, as well as problematic gaming.

The effects of family functioning on problematic gaming were also examined in previous studies. Some studies reported that poor family functioning resulted in increased problematic gaming symptoms, whereas other studies reported no association between the two variables (Choo et al., 2015; Schneider et al., 2017). A longitudinal study reported the effect of family dysfunction on problematic gaming after 3 years from the onset of problematic gaming (Da Charlie et al., 2011).

In this study, IGD scores were not significantly associated with depression scores and family functioning scores. In the follow-up studies mentioned above, it was stated that depression symptoms and impairment in family functioning appeared at a later period of IGD. The mean age of children in our sample was 11 years, which may explain this situation. A previous study investigating neurobiological mechanisms of addiction showed three steps related to mechanisms of addiction (1: binge and intoxication, 2: withdrawal and negative affect, and 3: preoccupation and anticipation; Volkow et al., 2016). In the second step, desensitization of reward circuits and increased stress activity cause negative emotions and reduce the motivation to continue daily activities. In the third step, differences occur in the regions of brain related to executive functions such as decision making and self-regulation. Volkow et al. (2016) suggested these mechanisms for the neurobiology of substance use disorder. The authors also highlighted similar mechanisms for behavioral addictions. We interpret that the younger participants in our sample increase the possibility that this addiction is in the first step in the neurobiological mechanism. Therefore, we interpreted that symptoms of depression and impairment in family functions may not occur, as the stages in which negative affect and impairment in executive functions are not reached. We consider that this interpretation is also supported by the emergence of symptoms of depression and deterioration in family functionality in later periods in follow-up studies.

## Limitations and Directions/Suggestions for Future Research

The main limitations of this study were its cross-sectional design, small sample size, and self-report measures. We evaluated self-report scores of the comorbid conditions that were indicated in the previous literature. Scoring the related conditions in detail instead of evaluating them only according to the diagnostic category may be advantageous in terms of taking into account the sub-threshold symptoms. Further longitudinal studies with larger sample sizes are needed to detect the direct correlation between the studied variables.

The DSM-5 stipulates that at least five out of nine criteria (1: preoccupation with gaming; 2: tolerance; 3: withdrawal symptoms; 4: loss of interest in previous hobbies; 5: losing a significant relationship, job or education, or career opportunity; 6: unsuccessful attempts to control gaming; 7: use gaming to escape; 8: continued excessive gaming activities; and 9: deceiving family members) must be met for a person to be diagnosed with IGD. Little is

known about who is at a higher risk of developing IGD. Moreover, the DSM-5 diagnostic system and cut-off values of IGD are still suggested to be validated by future studies (Gentile et al., 2017). In conclusion, this is a cross-sectional study evaluating the correlation between IGD/IA and other possible comorbid conditions (inattention, hyperactivity/impulsivity, ODD, CD, anxiety, depression, suicidality, and family dysfunction). We suggest that individuals suffering from anxiety and hyperactivity/impulsivity should be evaluated for their screen time. In addition, it is important to evaluate the suicidal ideation of individuals with problematic gaming behavior. Depression and family dysfunction may be other conditions that present with persisting IGD diagnosis. Most importantly, children suffering from anxiety or hyperactivity/impulsivity should be evaluated for their screen time.

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