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Problematic Internet Use Associated with Attention Deficit Hyperactivity Disorder in Turkish College Students

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ABSTRACT

Objective: Evaluation of attention deficit hyperactivity disorder (ADHD) may shed light on the underlying mechanisms of internet addiction (IA) due to the causal relationship between IA and ADHD. We aimed to evaluate the relationship between ADHD and IA.

Materials and Methods: This cross-sectional study was conducted on 796 voluntary students between April and June 2018 at the Ondokuz Mayıs University Kurupelit campus. Data were collected using a sociodemographic data form, Young's Internet Addiction Test (IAT), and the ADHD Self-Report Scale (ASRS).

Results: The participants consisted of 375 males (47.1%) and 421 females (52.9%). The median IAT score was 35 (23–47) in males, and it was significantly higher than those in females [30 (22–40)] ($z=2.87$, $p=0.004$). There was no significant difference in the ASRS scores between males [30 (23–38)] and females [30 (24–38)] ($z=0.21$, $p=0.836$). Risky and addictive internet use was significantly higher in students who had higher ASRS scores than the cut-off value (79.7% and 100.0% vs. 20.3% and 0.0%, respectively). There was a significant positive correlation between the IAT and ASRS scores ($\rho=0.59$, $p<0.001$). The “hyperactivity/impulsivity” and “attention deficit” sub-scores, which are sub-dimensions of the ASRS, also showed a significant positive correlation with the IAT scores ($\rho=0.57$, $p<0.001$, and $\rho=0.59$, $p<0.001$, respectively).

Conclusion: IA symptoms were found common among Turkish college students, especially in males. The presence of ADHD symptoms may be an essential risk factor for problematic internet use. Therefore, further studies supported by clinical diagnoses are needed to investigate the relationship between IA, ADHD, and gender.

Keywords: Addictive behavior, adolescent, attention deficit disorder with hyperactivity, college student, internet addiction

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INTRODUCTION

In recent years, the internet has become one of the most valuable assets for academics and entertainment. Although the internet provides a fast and easy way to discover information and communicate with others worldwide, lack of control over internet use can lead to internet addiction (IA), which may harm daily functions, family relationships, and emotional stability (1). The concept was first introduced by Dr. Kimberly Young (2), who described IA as excessive internet use, the urge to use the internet, repeat efforts to stop using the internet, loss of importance of time spent away from the internet, spending more time than planned on the internet, feelings of distress when away from the internet, and the social problems imposed by these situations. Despite the lack of standardized diagnosis and diagnostic tools with reliability and validity studies, the DSM-V has accepted the IA of “internet gaming disorder” as a new psychiatric disorder (3). IA prevalence ranges between 2% and 18% worldwide and is reported by many countries as a novel and severe mental health problem among college students (4).

Attention deficit hyperactivity disorder (ADHD) is a neuropsychiatric disorder characterized by a delay in behavioral control and impaired clinical and psychosocial domains attention deficit, hyperactivity, or impulsivity (5). Although the psychiatric disorder begins in childhood, ADHD symptoms persist into adulthood in about two-thirds of cases (6, 7). Although ADHD prevalence is 5.3% in children and adolescents, this rate decreases to 4.4% in adults (8). Many studies have demonstrated the relationship between IA and ADHD (8–10). Evaluation of ADHD may shed light on the underlying mechanisms of IA due to the causal relationship between IA and ADHD comorbidity or the fact that they share a common etiology (11).

Data on the relationship between IA and ADHD in young adults are lacking in previous studies, except in Kim et al. (8) and Chou et al. (9). As data regarding Turkish young adults are also insufficient, we aimed to determine (a) the prevalence of IA in college students, (b) the association between IA and ADHD symptoms, and (c) whether gender plays a role in the relationship between IA and ADHD symptoms. We believe that the data from this community-based study will add meaningful information for physicians who need to assess addiction risks, such as family physicians and psychiatrists.

MATERIALS and METHODS

This cross-sectional study was conducted during April–June 2018 at the Kurupelit campus of Ondokuz Mayıs University.

Participants

The study was conducted in four faculties (Medicine, Dentistry, Engineering, and Education) determined using a random sampling method from 10 faculties on campus. The minimum sample size for students to be selected from each faculty was calculated as 204 using the formula of $nt^2pq/d^2(n-1) + t^2pq$ (where $t=1.96$, $p=0.20$, $q=0.80$, $d=0.05$, and $n=1200$). Considering that some forms would not be completed, we planned to recruit 210 students from each faculty to the study. After written informed consent was obtained, the questionnaire was administered to a total of 840 students. While the self-report questionnaires were transferred to the computer, 44 forms that were incomplete or inappropriate were excluded from the study. The completion rate of the questionnaires was 95.0%.

Instruments

Sociodemographic data form. An 11-item sociodemographic questionnaire developed by us was used to obtain information on age, gender, and aim of internet use.

Internet Addiction Test (IAT). To determine whether the students have IA symptoms or not, the IAT was used. The original scale was developed by Dr. Kimberly Young (2) based on the “Pathological Gambling” criteria of the DSM-IV. In this 20-item Likert-type scale, the participant is asked to select among the choices “rarely,” “occasionally,” “frequently,” “often,” and “always,” scored from 1 to 5, respectively. A total score of 70 or above indicates significant impairment in functionality, and members of this group were defined as “internet addicts.” Those who have scores between 40 and 69 were described as “risky internet users,” or those who experience various problems in daily life related to the internet. Those who have scores between 20 and 39 were considered “average internet users,” or those who do not experience problems related to internet use, whereas those who have scores between 0 and 19 were considered “low-level internet users.” The Turkish adaptation of the test was developed by Balta et al. (12) with a Cronbach alpha value of 0.89.

Adult Attention Deficit and Hyperactivity Disorder Self-Report Scale (ASRS). The World Health Organization’s adult ASRS consists of 18 questions (13). The scale has two subscales for “attention deficit” and “hyperactivity/impulsivity,” each consisting of nine questions. Question numbers 1, 2, 3, 4, 7, 8, 9, 10, and 11 pertain to hyperactivity/impulsivity, whereas questions 5, 6, 12, 13, 14, 15, 16, 17, and 18 are related to attention deficit. In the Likert-type scale, the participants were asked to select among the responses of “never,” “rarely,” “sometimes,” “frequently,” and “very often.” Scale score ranges between 0 and 72. A score of 30 and higher is considered a positive finding for ADHD. The test was adapted to Turkish by Dogan et al. (14) with a Cronbach alpha value of 0.88. Cronbach alpha values of the subscales are also high (attention deficit: 0.82; hyperactivity/impulsivity: 0.78).

Statistical Analysis

Statistical analyses were performed using the SPSS version 22.0 (IBM Corporation, Armonk, NY, USA) package program. The normality distribution of the numerical variables was tested with

Table 1. Some characteristics of the participants

	n	%
Faculty		
Dentistry	196	24.7
Medicine	200	25.1
Engineering	200	25.1
Education	200	25.1
Living (with)		
Family	286	35.9
Friends	378	47.5
Alone	132	16.6
Smartphone users	791	99.4
Continuous internet access	763	95.9
The aims of internet use		
Education	658	82.7
Social networking	636	79.9
Information	536	67.3
Media-news	520	65.3
Sports	230	28.9
Gaming	20	2.5
Film, TV series, music	18	2.3

the Kolmogorov–Smirnov test. Continuous data incompatible with normal distribution were reported as the median and interquartile range. The Chi-square test was used to compare categorical variables, the Mann–Whitney U test was used to compare the median scores of the scales, and Spearman’s rank correlation was used to test the association between the IAT and ASRS scores. We used Bonferroni adjustment when computing post hoc pairwise in multiple comparisons in statistical analysis. The binary logistic regression analysis was used to determine the factors associated with IA. The p-value of <0.05 was considered statistically significant.

Statement of Ethics

The study received ethics approval from the Ondokuz Mayıs University Clinical Research Ethics Committee (2018/176); institutional permits were obtained from the rectorate and related deans. We obtained written informed consent from all participants.

RESULTS

A total of 796 students from four different faculties were included in our study, consisting of 375 (47.1%) males and 421 (52.9%) females (Table 1). The median age was 22 (21–23) years. We found that the daily median duration of internet use was 4 (3–6) hours on weekdays and 5 (4–7) hours on weekends. There was no difference between the genders.

The median IAT score was 32 (22–43). The IAT score in males [35 (23–47)] was significantly higher than that in females [30 (22–40)] ($z=2.87$, $p=0.004$). The prevalence of risky and addictive internet use was statistically more prevalent in males (40.0%) than in females (11.6%) according to the Bonferroni post hoc test ($\chi^2=18.2$, $p<0.001$) (Table 2).

Table 2. Level of internet addiction according to gender

	Level of internet addiction									
	Low		Average		Risky		Addict		Total	
	n	%	n	%	n	%	n	%	n	%
Gender										
Male	65	46.8 ^{a,b}	160	40.7 ^b	137	55.7 ^a	13	72.2 ^a	375	47.1
Female	74	53.2 ^{a,b}	233	59.3 ^b	109	44.3 ^a	5	27.8 ^a	421	52.9
Total	139	100.0	393	100.0	246	100.0	18	100.0	798	100.0

χ^2 : 18.3; $p < 0.001$ (each superscript letter denotes a subset of IA categories whose column proportions do not differ significantly from each other at the 0.05 level)

Table 3. Level of internet addiction by ASRS cut-off point

	Level of internet addiction symptoms									
	Low		Average		Risky		Addict		Total	
	n	%	n	%	n	%	n	%	n	%
ASRS score										
≥30	31	22.3 ^a	183	46.6 ^b	196	79.7 ^c	18	100.0 ^c	428	53.8
<30	108	77.7 ^a	210	53.4 ^b	50	20.3 ^c	0	0.0 ^c	368	46.2
Total	139	100.0	393	100.0	246	100.0	18	100.0	796	100.0

χ^2 : 145.4; $p < 0.001$ (Each superscript letter denotes a subset of IA categories whose column proportions do not differ significantly from each other at the 0.05 level.)

Table 4. Binary logistic regression analysis to determine factors predictive for internet addiction

	B	Wald	Sig.	Exp(B)	95% CI for Exp(B)	
Gender	0.356	2.017	0.156	1.427	0.874	2.331
Age	-0.062	1.247	0.264	0.940	0.843	1.048
ASRS score	0.108	83.194	0.000	1.114	1.088	1.140
Aim of internet use						
Sports	0.815	9.831	0.002	2.259	1.357	3.760
Education	0.358	2.002	0.157	1.431	0.871	2.350
News	-0.050	0.040	0.842	0.951	0.581	1.557
Social networking	0.177	0.425	0.514	1.194	0.701	2.035
Film, music	1.496	1.829	0.176	4.462	0.511	38.984
Constant	-4.903	11.238	0.001	0.007		

The median ASRS score of the students was 30 (23–38). The median ASRS score was 30 (23–38) in males and 30 (24–38) in females. There was no significant difference in the ASRS scores between male and female young adults ($z=0.21$, $p=0.836$).

The prevalence of risky and addicted internet users was distinctly high in students with high ASRS scores (79.7% and 100.0% vs. 20.3% and 0.0%, respectively). As presented in Table 3, there was a significant difference in internet usage rates among those who scored below and above the ASRS cut-off point ($\chi^2=145.4$, $p < 0.001$).

The logistic regression analysis showed that watching sports challenges and high ASRS scores were significantly associated with IA

symptoms (Table 4). We found that rising one point in the ASRS score increased the risk 1.11 times for IA symptoms; watching sports events on the internet increased the risk by 2.26 times.

There was a significant positive correlation between the IAT scores and ASRS scores ($\rho=0.58$, $p < 0.001$) (Fig. 1). IA scores also showed a significant positive correlation with scores of ASRS subscales ($\rho=0.57$, $p < 0.001$, for hyperactivity/impulsivity and $\rho=0.59$, $p < 0.001$, for attention deficit). Correlation coefficients showing the relationship between ASRS subscales and IAT scores were found to be higher in males than in females ($\rho=0.53$ vs. $\rho=0.44$ for “hyperactivity / impulsivity,” $\rho=0.53$ vs. $\rho=0.37$ for “attention deficit”).

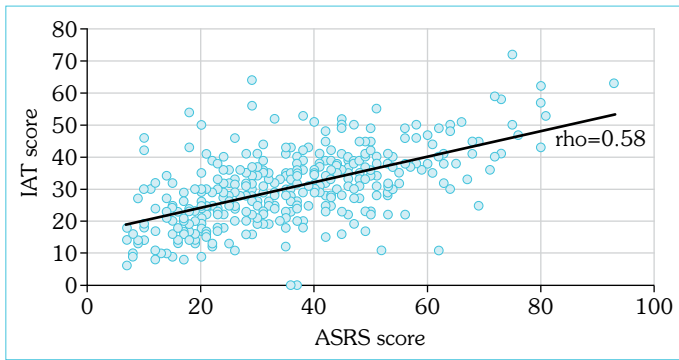


Figure 1. Correlation between the IAT and the ASRS scores

DISCUSSION

Studies related to the globally increasing issue of IA have shown varying results among adolescents and young adults and between different countries. We found that 15.7% of college students were risky or addicted internet users. Similarly, one study conducted on 1173 college students in China reported the prevalence of IA as 15.2% (15). In another study, which used the Chen IA scale, IA prevalence in college students was shown to change between 8% and 10% (16). Despite differences in cut-off values or scales used, the frequency of IA symptoms was found higher in Turkish adolescents and young adults (17, 18). This difference may be due to having newer data and a relatively higher rate of households with internet access in Turkey, as 83% (19).

Many studies reported that IA prevalence was higher in males (4, 16). In our study, risky internet use was also found significantly higher among males than among females ($p=0.003$). However, some studies could not find a difference in IA rates among genders (20). Furthermore, a few studies found IA rates to be higher in females (18, 20). According to these studies, the various outcomes related to the prevalence of IA draw attention. This variation may be due to the fact that a definitive scale related to IA has not been developed yet, diagnostic measurements have not been determined yet, different cut-off values are used in each study, and studies were conducted at different times and may be due to cultural factors. Another possible explanation is that females have a larger orbitofrontal cortex, which has a decisive role on the direction of impulsive choice responding. And they also have greater prefrontal cortex connectivity with and control over the dorsal striatum as compared to males (21). This feature could partially account for their greater ability to control impulsive actions and inhibit undesirable behaviors than males.

In our study, no significant difference was found in ASRS scores among males and females, and both genders had similar ADHD symptom rates ($p=0.943$). In a study examining the relationship between ADHD and the gender variable, the overall rate of comorbid psychiatric disorders was found similar in males (84%) and in females (74%) with persistent ADHD. However, internalizing disorders such as depression and anxiety were more prevalent in females with persistent ADHD, while externalizing disorders such as personality disorders and substance abuse was shown to be more prevalent among males (22). As depression has been associated with IA, high depression comorbidity in adult females with ADHD may cause a higher correlation with IA (17, 23, 24). The differences in genders observed in studies, as in IA, may result from various tests and cut-off values used in studies.

Studies investigating the relationship between IA and ADHD have found a positive correlation between ADHD and IA in both adults and college students, and ADHD was found as the most important factor for IA (9, 10). We also found a positive and significant correlation between the IAT and ASRS scores. Previous studies have shown a positive relationship between ADHD and online gaming, video game watching, and online gambling (5, 10). The higher frequency of this addictive internet use in males may explain the relatively high correlation coefficient between the IAT and ASRS scores in males.

Inattention, rather than distractibility, is the main symptom of inattentive-type ADHD, while hyperactivity/impulsivity symptoms subside early in life and attention deficit symptoms persist throughout life (8). Although attention deficit has been shown as the most related symptom to IA in individuals with ADHD, it was proposed that impulse control disorder in IA was a new subtype (25). Today, answers to the questions of “Is impulsivity a risk factor for IA or its result?” and “Is it a case in which both hypotheses are valid?” are still sought after (26). To better understand the relationship between IA and ADHD in adults, clinicians should evaluate factors for both attention deficit and hyperactivity/impulsivity. Although these conditions may coexist in an individual, they are of different degrees.

The logistic regression analysis showed that high ASRS scores and watching sports challenges were risk factors for IA symptoms (Table 4). This relationship may point to a different face of problematic internet use. New technologies have also led to some adolescents engaging in online gambling, perpetrating and being a victim of cyberbullying, and reporting IA or excessive internet use (27). This problematic internet use can be explained by the increased sensitivity of people with ADHD toward rewards. The feeling of being in control and the freedom of self-representation through internet activity can provide a highly encouraging motivational compensation to people with ADHD (28). The biological changes that occur when online gaming further increase the concentration and performance of people with ADHD and also provide the opportunity to compensate for the frustration of poor performance in real life (29). The “insufficient rewards hypothesis” suggests that individuals who are less satisfied with natural rewards tend to adopt a substance to promote their means of rewards further. ADHD has a marked tendency to induce comparable dopamine release and pleasurable sensations via compulsive and risky behaviors, including abusive use of alcohol, cocaine, amphetamine, other illicit substances, and gambling (30). Risky internet behavior may also be a compensatory activity for poor social skills, interpersonal difficulties, and lack of pleasure of a person with ADHD.

Our study has some limitations. First, the classification of ADHD and IA was based on self-report screening tools. These scales are not diagnostic, and therefore, the results should be carefully interpreted. Second, since only voluntary participants were included in the study, the results are not representative of all college students. Lastly, because of the cross-sectional nature of the study design, causal inferences cannot be made. Because the cause and effect are evaluated simultaneously, it is difficult to determine which one occurs first.

In conclusion, IA symptoms were found to be relatively high in Turkish college students, especially in males. The prevalence of IA is increasing, and there is a need to inform adolescents and young adults how to use the internet appropriately. The presence of ADHD symptoms may be an important essential risk factor for excessive problematic internet use. Therefore, further studies supported by clinical diagnoses are needed to investigate the relationship between IA, ADHD, and gender.

Ethics Committee Approval: The Ondokuz Mayıs University Clinical Research Ethics Committee granted approval for this study (date: 24.05.2018, number: KAEK: 2018/176).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – CK; Design – CD, CK; Supervision – CD; Resource – CD, CK; Materials – CK; Data Collection and/or Processing – CK; Analysis and/or Interpretation – CD, CK; Literature Search – CD, CK; Writing – CD, CK; Critical Reviews – CD, CK.

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