

The relationship of Internet addiction severity with Attention Deficit Hyperactivity Disorder symptoms in Turkish University students; impact of personality traits, depression and anxiety

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Abstract

Aim: The aim of this study was to investigate the relationship of Internet addiction (IA) with Attention Deficit Hyperactivity Disorder (ADHD) symptoms while controlling the effect of personality traits, depression and anxiety symptoms in Turkish university students.

Methods: A total of 271 university students participated in the present study. The students were assessed through the Internet Addiction Scale (IAS), the Wender Utah Rating Short Scale (WURS-25), the Turkish version of the Adult ADHD Self-Report Scale (ASRS), the Eysenck Personality Questionnaire Revised Abbreviated Form (EPQR-A), the Beck Depression Inventory (BDI) and the Beck Anxiety Inventory (BAI).

Results: According to IAS, participants were separated into three groups, namely, moderate/high, mild and without IA groups. The rates of groups were 19.9% (n = 54), 38.7% (n = 105) and 41.3% (n = 112), respectively. Correlation analyses revealed that the severity of IAS is positively correlated with WURS-25, ASRS (total, inattention and hyperactivity/impulsivity subscales), neuroticism personality trait, depression and anxiety scores, whereas it is negatively correlated with extraversion personality trait. Hierarchical regression analysis indicated that depression and anxiety symptoms, introversion and neuroticism personality traits and the severity of ADHD symptoms (particularly hyperactivity/impulsivity symptoms) are the predictors for IAS score, respectively.

Conclusions: The severity of ADHD symptoms has predicted the severity of IA even after controlling the effect of personality traits, depression and anxiety symptoms among Turkish university students. University students with severe ADHD symptoms, particularly hyperactivity/impulsivity symptoms may be considered as a risk group for IA.

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1. Introduction

1.1. Internet addiction (IA)

Although the Internet has become one of the most important information resources for university students, excessive Internet use can be defined as uncontrolled and harmful use of the Internet, in other words, IA [1]. The previous studies indicated that the rates of IA among adolescents and young people ranged from 2.4% to 37.9% in Asia, whereas researches on similar age groups in Europe

showed that the rates of IA ranged between 3.1% and 18.3% [2]. The variations in these results could be due to different methodologies, cultural reasons, sample or scale selection. Nevertheless, according to IAS, incidence rate of the IA among Turkish university students ranged between 7.2% [1] and 12.26% [3]. Two recent reviews suggested that there is a relationship between IA and psychological symptoms/disorders particularly attention deficit hyperactivity disorder (ADHD), depression, anxiety, impulsivity and hostility [4,5].

1.2. IA and ADHD

Although ADHD is a childhood-onset psychiatric disorder, around two-thirds of the patients with childhood ADHD may still have ADHD symptoms during their adulthood [6–8], about 15% still meet the DSM-IV criteria for the full ADHD syndrome, and the rest meet the criteria

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for the DSM-IV diagnosis of “ADHD in partial remission” [7]. As a result, it is now widely accepted that ADHD is a frequent chronic condition with a lifelong perspective, and adult ADHD is a reliable and valid diagnosis.

Ramos-Quiroga et al. [9] indicated that the presentation of ADHD symptoms can change from adolescence to adulthood with less overt hyperactivity but ongoing attentional problems, disorganization and symptoms of emotional dysregulation like mood swings, temper outbursts, and irritability. These symptoms may overlap with behavioral addiction (i.e. IA), which is one of the most common comorbid diagnosis with ADHD. Some symptoms such as “being easily bored” and “having an aversion for delayed reward” reported in ADHD [10,11], may also commonly be seen among university students with IA. Yoo et al. [12] suggested that the children with ADHD had higher IA scores compared with the non-ADHD group. In a systematic review, Carli et al. [5] have reported that symptoms of ADHD appeared to have the most significant and consistent correlation with IA. The comorbidity of these two disorders may indicate the causal relationship among them or common etiology shared by them. Nevertheless, evaluating factors related with this comorbidity may shed a light on treatment of resistant IA.

1.3. IA, Depression and Anxiety

Similar with ADHD [12–15], major depressive disorder [13], depressive and anxiety symptoms [4,5,16] are also found to be related with IA. Although, these relationships are not as strong as the relationship between IA and ADHD [5], since they are commonly related with IA [16–18], they were suggested to be important factors to evaluate when considering IA [1,17,19]. Moreover, personality traits can be related with negative affect such as depression and anxiety symptoms.

1.4. IA and Personality

Personality is a special focus within IA research [20]. One of the main reasons for the focus on personality is the potential link between personality traits like neuroticism and a predisposition for psychopathology ranging from addiction [21], including IA [1,20], to depression and anxiety symptoms [22], which are also closely related with IA [4,5,13,16].

Dalbudak et al. [1] suggested that among Turkish university students exhibiting high novelty seeking scores, together with low self-directness and cooperativeness scores are closely associated with IA. According to previous studies that used Eysenck Personality Questionnaire (EPQ), there was the relationship between IA and personality traits. That is, these studies suggested a relationship between introversion personality trait and IA [23–25]. Moreover, among university students, high neuroticism/stability and psychoticism/socialization scores, and low lie scores predicted IA [24]. Finally, Yan et al. [25] suggested neuroticism as a potential

predictor of IA among college students. Nevertheless, these studies did not control depression or anxiety symptoms when evaluating the relationship between IA and personality traits. It is important to consider depression and anxiety when evaluating this relationship, because similar with IA, neuroticism personality trait is also characterized by high levels of negative affect.

Although there are some studies that evaluated the relationship between IA and ADHD, this is the first study to control variables such as personality traits, depression and anxiety while evaluating this relationship. We hypothesized that severity of ADHD symptoms may still be related with severity of IA even after controlling these variables.

2. Methods

The study was conducted with volunteers from Turgut Ozal University in Ankara between January and May in 2013. Written informed consent was obtained from the students after the study protocol was thoroughly explained.

2.1. Participants

A total of 300 university students were randomly selected from Turgut Ozal University. The inclusion criteria were Internet use for communicative purposes on a regular basis and willingness to participate in the study. The exclusion criteria were rejection to participation, demanding any fee and incomplete participation to the study. According to these criteria 29 university students were excluded from the study. Thus, the study was conducted with 271 university students (110 males and 161 females).

2.2. Assessments

All the students were assessed by using a semi-structured socio-demographic form and the questionnaires were completed by students in a classroom setting via paper-and-pencil format.

2.2.1. Internet addiction scale (IAS)

IAS was developed by Nichols and Nichi [26] to measure the severity of IA and tested on a group of 233 college students. The Cronbach's α of the IAS was 0.95, and the explained variance was 46.50%. The IAS is scored by summing the Likert responses across the 31 items. In a reliability and validity study of the Turkish version of the IAS [3], the Cronbach's α value was 0.93 in 253 university students. In the present study Cronbach's α was 0.92.

Kayri and Gunuc [3] suggested the classification of scores into 5 groups: 30–60, 61–70, 71–80, 81–89 and >90. They also suggested that those who score 90 or higher should be considered as addicted to the Internet and that those who score between 81 and 89 should be considered as at high risk of IA. Durkee et al. [2] suggested that to better reflect the taxonomy of Internet users, IA should be assessed as a non-dichotomous categorical variable. Thus, in the present

study, the participants were differentiated into three groups according to IAS score, namely, moderate/high severe IA (IA or high risk group with cut off score of 81), mild severe IA (score ranging between 61 and 80) and group without IA (score ranging between 30 and 60). This grouping was also similarly computed in our previous study [1].

2.2.2. Adult ADHD Self-Report Scales (ASRS-v1.1)

ADHD symptoms were measured with the ASRS [27], an 18-item scale based on Diagnostic and Statistical Manual of Mental Disorders: Fourth Edition (DSM-IV-TR) criteria [28]. The Turkish version of ASRS has demonstrated good reliability and validity in university students [29]. Reliability analysis showed that the Turkish version of ASRS has a high level of internal consistency (Cronbach's alpha = 0.88). Cronbach's alpha coefficients for 'inattention' and 'hyperactivity/impulsivity' subscales were also high (0.82 and 0.78).

2.2.3. Wender–Utah Rating Scale-25 (WURS-25)

The Wender Utah Rating Scale (WURS-25) is a 25-item self-report questionnaire for the retrospective assessment of childhood ADHD symptoms in adults for ADHD. The WURS-25 is a 5-point Likert scale based on the Utah criteria which were developed by Ward et al. [30]. The Turkish validity and reliability of WURS-25 were established by Oncu and colleagues and the cut-off score point was 36 [31]. Principal components analysis revealed 5 factors explaining 61.3 % of the variance. The factors were labeled as irritability, depression, school problems, behavioral problems, impulsivity and attentional deficits. The Turkish form of WURS-25 demonstrated excellent internal consistency (Cronbach's alpha = 0.93), and the test–retest coefficient for the WURS-25 (total score) was 0.81 [31].

2.2.4. Eysenck Personality Questionnaire Revised Abbreviated Form (EPQR-A)

The EPQR-A includes 24 items in four personality traits: "neuroticism/stability" trait was used to assess the stability of emotion; "extraversion/introversion" trait was used to assess the tendency of extraversion and introversion; "psychoticism/socialization" trait was used to assess the subjects' psychiatric characteristics and "lie" trait was used as the validity scale [32]. Similar with the original scale, factor analysis of the Turkish version yielded 4 factors; the neuroticism, extraversion, psychoticism, and lie traits [33]. The reliability and validity of the questionnaire were supported in a Turkish university student sample [33]. Kuder–Richardson alpha coefficients for the extraversion, neuroticism, psychoticism, and lie traits were 0.78, 0.65, 0.42, and 0.64, respectively, and the test–retest reliability of the traits was 0.84, 0.82, 0.69, and 0.69, respectively.

2.2.5. Beck Depression Inventory–Beck Anxiety Inventory

Symptoms and severity of depression were evaluated by using the Beck Depression Inventory (BDI) [34], Turkish version [35], and symptoms and severity of anxiety were

evaluated by the Beck Anxiety Inventory (BAI) [36], Turkish version [37]. Both scales have been validated on Turkish populations. Cronbach's alphas were 0.89 for BDI and 0.90 for BAI in the present study.

2.3. Statistical analysis

Group differences in demographic variables were computed through chi-square test. In order to compare groups regarding severity of IA with ADHD symptoms, personality traits, depression and anxiety scores, One-way ANOVA was used. To test the relationship of IAS with ADHD, personality traits, depression and anxiety scores, Pearson's correlations were used. Hierarchical Linear regression model was used to determine the predictors of IAS score.

3. Results

Among the university students who participated in the present study, rates of those with moderate/high IA, with mild IA and without IA were 19.9% (n = 54), 38.7% (n = 105) and 41.3% (n = 112), respectively. On the other hand, according to IAS, when the accepted cut-off score for IA was 90, the rate of membership in the IA group did not differ between males (11.8%, n = 13) and females (8.7%, n = 14). In addition, the rate of IA was 10% among university students (not shown).

The results revealed that ASRS (total, inattention, and hyperactivity/impulsivity) and neuroticism scores were higher in the moderate/high IA and the mild IA groups than the group without IA, whereas extraversion and lie scores of EPQR-A were higher in the group without IA than the other groups. WURS-25 and anxiety scores were higher in the moderate/high IA group than the other groups, whereas these scores were also higher in the mild IA group than the group without IA. Finally psychoticism and depression scores were higher in the moderate/high IA group than the other groups (Table 1).

Correlational analysis revealed that IAS was mildly correlated with ASRS, subscales of ASRS, depression, anxiety, neuroticism and psychoticism personality traits, moderately correlated with WURS-25, whereas it was negatively correlated with extraversion and lie personality traits (Table 2).

In hierarchical linear regression model, IAS score was taken as a dependent variable, whereas depression and anxiety scores were entered as independent variables in step 1, subscales of EPQR-A score in step 2, ASRS score in step 3a and subscales of ASRS score in step 3b. The results revealed that both depression and anxiety predicted the IAS in the first step. In the second step, neuroticism, introversion and lie personality traits were the predictors of IAS besides depression and anxiety. In the third step, when ASRS score was included in the model as an independent variable, neuroticism and extraversion personality traits of EPQR-A predicted severity of IA, whereas when subscales of

Table 1
Comparing scale scores according to severity of Internet addiction (IA).

	Severity of IA						F	p
	without IA n = 112		mild IA n = 105		moderate/high IA n = 54			
	Mean	S.D.	Mean	S.D.	Mean	S.D.		
ASRS ^a	15.30	7.20	20.42	6.82	21.74	8.68	19.29	<0.001
Inattention ^a	7.72	4.08	10.42	3.58	10.76	4.96	15.65	<0.001
Hyperactivity/Impulsivity ^a	7.58	4.17	10.00	3.85	10.98	4.42	15.85	<0.001
WURS-25 Total ^b	12.47	6.69	17.03	7.64	24.57	9.74	44.71	<0.001
EPQR-A								
Extraversion/Introversion ^c	4.27	1.36	3.19	1.93	3.30	2.05	11.82	<0.001
Lie ^c	5.21	1.12	4.55	1.61	4.33	1.93	8.27	<0.001
Neuroticism ^a	2.00	1.48	2.82	1.57	3.41	1.39	17.91	<0.001
Psychoticism ^d	1.34	0.90	1.31	0.98	1.96	1.08	9.32	<0.001
Depression ^d	5.23	6.83	7.60	9.34	17.69	19.31	22.98	<0.001
Anxiety ^b	8.92	7.53	11.94	7.18	18.11	7.66	27.92	<0.001

ASRS: Adult ADHD Self-Report Scale, WURS-25: Wender Utah Rating Short Scale, EPQR-A: Eysenck Personality Questionnaire Revised Abbreviated Form.

^a Moderate/high IA, mild IA > without IA.

^b Moderate/high IA > mild IA > without IA.

^c Moderate/high IA, mild IA < without IA.

^d Moderate/high IA > mild IA, without IA.

ASRS (inattention and hyperactivity/impulsivity) instead of ASRS total score were entered as independent variables, hyperactivity/impulsivity were predictors (Table 3).

4. Discussion

The main finding of the present study, which is also consistent with our hypothesis, was that the severity of ADHD symptoms was still related to the severity of IA even after controlling personality traits and negative affect. When the subscales of ASRS were separately entered into analyses, only severity of hyperactivity/impulsivity symptoms predicted the severity of IA. This may suggest that students with severe hyperactivity/impulsivity symptoms may enjoy the pace which Internet serves them. Previous studies indicated

that IA is related with impulsivity [38–40], which may mediate the relationship between IA and ADHD. Internet is characterized by rapid response, immediate reward and multiple windows with different activities, which may reduce the feelings of boredom or aversion to delayed reward in students with symptoms of ADHD. Internet can also provide an unreal life for these students, in which they can go into artificial lives or live out their fantasies without inhibition. Lack of self-control may make it difficult for these students to control their Internet use, making them vulnerable to IA. Previous studies suggested that ADHD disorder is common among those with IA [13,14], and that there is a relationship between the severity of ADHD symptoms and the severity of IA [12,15]. Consistent with these, in the present study, significant associations have been found between the severity of ADHD symptoms and the

Table 2
Correlations between the scale scores.

	IAS	ASRS	ASRS-I	ASRS-H/I	WURS-25	E	L	N	P
ASRS Total	0.38*								
Inattention (I)	0.33*	0.91*							
Hyperactivity/Impulsivity (H/I)	0.37*	0.91*	0.66*						
WURS-25	0.54*	0.36*	0.31*	0.34*					
EPQR-A subscales									
Extraversion (E)	−0.26*	−0.21**	−0.20**	−0.18**	−0.19**				
Lie (L)	−0.24*	−0.49*	−0.44*	−0.45*	−0.30*	0.26*			
Neuroticism (N)	0.32*	0.09	0.10	0.06	0.38*	−0.06	0.03		
Psychoticism (P)	0.20**	−0.02	−0.04	−0.002	0.44*	−0.10	−0.03	0.15***	
BDI	0.39*	0.10	0.07	0.10	0.37*	−0.08	−0.04	0.23*	0.24*
BAI	0.44*	0.22*	0.14***	0.26*	0.57*	−0.12***	−0.002	0.38*	0.35*

Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI). Correlation between BDI and BAI: $r = 0.46$, $p < 0.001$, ASRS: Adult ADHD Self-Report Scale, WURS-25: Wender Utah Rating Short Scale, EPQR-A: Eysenck Personality Questionnaire Revised Abbreviated Form.

* $p < 0.001$.

** $p < 0.01$.

*** $p < 0.05$.

Table 3
Hierarchical Linear regression model when IAS score was taken as a dependent variable.

		Unstandardized Coefficients		Standardized Coefficients	t	p
		B	Std. Error	Beta		
Step 1	Depression	0.316	0.081	0.233	3.89	<0.001
	Anxiety	0.681	0.122	0.336	5.60	<0.001
Step 2	Depression	0.283	0.077	0.209	3.69	<0.001
	Anxiety	0.537	0.121	0.265	4.43	<0.001
	Lie	-2.091	0.555	-0.196	-3.77	<0.001
	Neuroticism	1.737	0.563	0.168	3.08	0.002
	Extraversion	-1.312	0.476	-0.144	-2.76	0.006
Step 3a	Depression	0.292	0.075	0.215	3.91	<0.001
	Anxiety	0.435	0.121	0.215	3.60	<0.001
	Lie	-0.927	0.617	-0.087	-1.50	0.134
	Neuroticism	1.686	0.549	0.163	3.07	0.002
	Extraversion	-1.189	0.464	-0.131	-2.56	0.011
Step 3b	ASRS Total	0.477	0.122	0.228	3.92	<0.001
	Depression	0.293	0.075	0.216	3.90	<0.001
	Anxiety	0.417	0.123	0.206	3.39	0.001
	Lie	-1.109	0.608	-0.104	-1.83	0.069
	Neuroticism	1.796	0.551	0.173	3.26	0.001
	Extraversion	-1.242	0.466	-0.136	-2.67	0.008
	Hyperactivity/Impulsivity	0.790	0.220	0.207	3.59	<0.001

Step 1: Variables entered in the first step: Depression and Anxiety; $F = 42.32$, $df = 2, 268$, $p < 0.001$, Adjusted $R^2 = 0.234$. Step 2: Variables entered in the second step: Personality traits; $F = 26.79$, $df = 5, 265$, $p < 0.001$, Adjusted $R^2 = 0.323$, R^2 change = 0.096. Step 3: Variable entered in the third step: Firstly, Adult ADHD Self-Report Scale (ASRS) total score; $F = 26.09$, $df = 6, 264$, $p < 0.001$, Adjusted $R^2 = 0.358$, R^2 change = 0.037. Secondly, inattention and hyperactivity/impulsivity subscales of ASRS; $F = 25.48$, $df = 6, 264$, $p < 0.001$, Adjusted $R^2 = 0.352$, R^2 change = 0.031.

severity of IA. Nevertheless, cross-sectional design of the present study makes it impossible to say anything about the direction of the causal relationship.

Consistent with the previous studies [4,5,19], severity of depressive and anxiety symptoms was related the severity of IA. The reason for these findings may be that the students with negative emotions, such as anxiety or depression, may use the Internet to relieve these emotions [4,41,42]. On the other hand, students spending excessive time and effort online may prefer to use Internet to lessen engaging in social activities rather than to socialization online. As a result, when these students are not online they show symptoms of withdrawal such as irritability, depression, anxiety and boredom as seen in other addictions [43,44]. Nevertheless, about 86% of IA cases have some other comorbid DSM-IV diagnosis [45], which raises the complex question of causality since we cannot be sure if IA is a cause or consequence of these disorders [13,46].

Consistent with the previous studies, neuroticism and psychoticism personality trait scores [23–25] were higher in the moderate/high IA group, whereas extraversion personality trait score [25] was lower in this group. Moreover, high neuroticism [24,25] and low extraversion [25] personality traits predicted the severity of IA in the present study. These findings were consistent with both previous studies [24,25] and Eysenck's personality model, which suggest that high psychotic and neurotic personality traits, and low extravert personality trait are closely associated with addictive behaviors [47,48]. Extraversion is characterized by being outgoing, talkative, high on positive affect (feeling good),

and in need of external stimulation, whereas introverts are chronically over-aroused and jittery and are therefore in need of peace and quietness to bring them up to an optimal level of performance. Introvert individuals may prefer interacting online with others, where anonymity can be maintained, rather than to engage contact in real life, as extroverts may do. Thus, being introvert can be considered as risk factor for IA in university students, whereas being extrovert may be protective. On the other hand, neurotic people, who have low activation thresholds, can become easily nervous or upset and cannot control themselves during stress. Thus, consistent with previous studies [24,25], students with neurotic personality traits may have higher risk for IA. Students with these personality traits may have negative emotions, unstable personality and unstable interpersonal relationships with others [33]. Consistent with these, some previous studies indicated that unstable interpersonal relationships were also related with IA [49,50]. Students with introvert and neurotic personality traits may also have negative emotions, such as anxiety and depression, resulting with losing their control on the Internet use, which may cause impairments in daily functioning and relationships [4,51–53]. Nevertheless, because of the cross-sectional design, causal relationship of IA with these personality traits and negative emotion cannot be determined in the present study.

Another interesting finding is that, consistent with a previous study [24], low lie personality trait predicted IA in the present study. Actually, lie dimension of EPQR-A is used to measure the validity of the other dimension in the EPQR-A, but the lie trait may also reflect the social hide

ability [54,55]. Lie personality trait was also suggested to be related to social maturity [24], which may suggest that students who are less mature may be more inclined to become Internet addicts.

The current study has some limitations. First of all, university students with IA did not reflect whole university students. Secondly, university students who participated were non-clinical samples and all scales were self-rated. Thirdly, since this study is cross-sectional the findings of this study can not address the causal relationships among the primary constructs of interest. Nevertheless, this is the first study to evaluate the relationship between severity of IA with severity of ADHD symptoms, while controlling other variables such as personality traits, depression and anxiety.

The severity of ADHD symptoms has predicted the severity of IA even after controlling the effect of personality traits, depression and anxiety symptoms among Turkish university students. The present study may suggest that to better understand IA among university students, clinicians must carefully evaluate ADHD symptoms among this population. Individuals with high severity of ADHD symptoms, particularly hyperactivity/impulsivity symptoms may be considered as a risk group for IA.

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