



Canonical Analysis of the Association Between Attention-Deficit/Hyperactivity Disorder with Some Psychological Problems Among Students

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ARTICLE INFO

Article History:

Received 04.12.2018

Received in revised form

04.01.2019

Accepted 10.01.2019

Available online

30.01.2019

ABSTRACT

This study aimed to investigate the relationship between ADHD with internet addiction, depression, anxiety, stress and social phobia. The study was a descriptive-correlation study. Statistical Population of the study was females' students from Kosar university of Bojnord and, among which 327 students were selected by random sampling method. Participants completed ADHD Self-report Questionnaire (ASRS), Internet Addiction Test (IAT), Depression, Anxiety and Stress Scale (Das-21), and Social Phobia Inventory (SPIN). Data were analyzed by applying Pearson correlation coefficient and canonical correlation analysis statistical tests and SPSS version 23. Pearson correlation's results showed that ADHD components (attention deficit and hyperactivity/impulsivity) had positive significant relationships with internet addiction, depression, anxiety, stress and social phobia ($p < 0.01$). In addition, canonical correlation results indicated there were significant relationships between attention deficit and internet addiction, depression, stress and social phobia and also hyperactivity/impulsivity and internet addiction, depression, anxiety and stress. However, there was no significant relationship between attention deficit and anxiety, and hyperactivity/impulsivity and social phobia ($p > 0.05$). ADHD related to many psychological disorders. So it seems to screen students with the disorder and designing some treatment interventions for these students to decrease negative consequences are required.

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Keywords:

attention deficit/hyperactivity, internet addiction, depression, stress, social anxiety

1. Introduction

Attention deficit hyperactivity disorder (ADHD) most often diagnosed in childhood, but in some cases, the symptoms may persist from childhood to adulthood. ADHD is a neurodevelopmental disorder that is mostly diagnosed in childhood. This symptom includes inattention, hyperactivity and impulsivity, and disorganization, which negatively affects the performance abilities and accomplishment of individual and social duties and tasks (Kessler, Chiu, Demler, Merikangas, & Walters, 2005; Miller, Ho, & Hinshaw, 2014; Mosalanejad, Mosalanejad, & Lashkarpour, 2013). Perhaps, in half of the children with ADHD symptoms, this disorder appears in adulthood (Ivanov & Yehuda, 2014; Klein et al., 2012). ADHD occurs in 3-7% of school-age children and 4% of adults (Faraone & Antshe, 2008; Kavakci, Kugu, Semiz, Meydan, Karsikaya, & Dogan, 2012).

ADHD symptoms in adults may vary from children. Adults with this disorder are more likely than their peers to have low levels of social adjustment, difficulty in time management, poor communication skills and interpersonal skills, attention deficit disorder, executive action, impulsivity, emotional and psychological

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<http://dx.doi.org/10.17220/ijpes.2019.01.003>

problems, drug abuse and drinking alcohol, of education and work challenges (Bakhshani, Raghobi, & Babaei, 2011; Green & Rabiner, 2016). College students with hyperactivity symptoms experience depression and educational problems during their education (Rabiner, Anastopoulos, Costello, Hoyle, & Swartzwelder, 2008).

ADHD is also associated with other abnormalities, including Internet addiction (Bozkurt, Coskun, Ayaydin, Adak, & Zoroglu, 2013; Cao, Su, Liu, & Gao, 2007; Chou, Huang, Chang, Chen, Hu, & Yen, 2017; Yen, Ko, Yen, Chen, & Chen, 2009). Cross-cultural studies have shown that Internet addiction is associated with psychiatric disorders such as mood and anxiety disorders (including generalized anxiety disorder and social phobia disorder), and ADHD (Floros, Siomos, Stogiannidou, Giouzepas, & Garyfallos, 2014). Bozkurt, Cascan, Aydaydin & Zoruglo (2013) believe ADHD is one of the most common psychiatric disorders among adolescents with Internet addiction. There is another evidence that extreme use of the Internet is associated with problems such as depression, insomnia, attention deficit, hyperactivity disorder and social anxiety (Cheung & Wong, 2011; Ho et al., 2014; Morrison & Gore, 2010). Moreover, adolescents who spent most of their time on computer games reported more hyperactivity symptoms (Yoo, Cho, Ha, Yune, Kim, Hwang, Chung, Sung, & Lyoo, 2004). Another conducted study in Taiwan on university students also found that hyperactivity disorder was associated with addiction to the Internet, especially it was more significant among female students (Yen, Ko, Yen, Chen, & Chen, 2009).

A high percentage of psychiatric disorders in any age group belongs to individuals with ADHD. In adults, 65-89% suffer from one or more disorders, including mood disorders and anxiety, drug abuse and personality disorders, which in fact complicate the diagnosis, treatment and outcome of the clinical pattern (Sobanski, 2006). Nelson and Lieble (2017) in their study found that college students who are identified as ADHD significantly reported higher anxiety and depressive symptoms than those who are without ADHD. Some studies also have reported that compared to male students, female students with ADHD reported significant rate of anxiety and depressive symptoms (Fuller-Thomson, Lewise, & Agbeyaka, 2016). Parvaresh, Ziaol dini, Erfani & Shokuhi (2014) in their study found that there is a significant relationship between ADHD and depression in adulthood and it is one of the first symptoms of ADHD in adulthood. ADHD also significantly increases the risk of adjustment disorders, conduct disorders, oppositional-defiant disorders, mood, anxiety, personality disorders, and drug abuse (Yoshimasu, 2012).

O'Rourke, Bray, and Anastopoulos (2017) noted that most likely college students with ADHD have a background of anxiety disorders and may encounter a greater risk of anxiety symptoms and other related problems. In addition, researches showed that the most comorbid disorders related to ADHD that was assessed in a sample of 129 patients were major depressive disorder (53.8%), social phobia (35.5%), and GAD (23.1%) (Mörtberg, Tilfors, & Bejerot, 2012; Van Ameringen, Mancini, Simpson, & Patterson, 2010). What is more, research regarding the ADHD associated with stress showed that adults with ADHD, physiologically, has shown higher stress responses and elevated level of subjective stress when they compared with those who are not diagnosed with ADHD (Hirvikosi, Lindholm, Nordenstrom, Nordestrom, & Lajic, 2009), and ADHD symptoms positively related to perceived stress (Combs, Canu, Borman-Folks, Rocheleau, & Nieman, 2015).

The literature review indicated the comorbidity of ADHD with some aforementioned psychological problems. As it was discussed, university students with ADHD might be at risk of encountering many challenges during their studies, their social life and adaptation to the university.

Therefore, this study focused on exploring the relationship between ADHD with Internet addiction, depression, anxiety, and stress and social phobia.

2. Method

This research was a descriptive-correlational study regarding the method of data collection.

2.1. Population and Sampling Method

The statistical population of the study were all students of Kosar University of Bonord (in the east of Iran). The sample size was 327 students that were chosen according to Krejcie & Morgan Table from students of different majors by random cluster sampling method. The method was that in the beginning, different faculties were considered as a cluster; then the majors of the faculty and after that, students of their majors were taken.

Due to study ethic, the sample members' identity was kept confidential and they were asked to fill a questionnaire. Data were analyzed by Pearson correlation test and Canonical correlation in SPSS software. Data collection tools are as follows.

2.2. Data Collection Tools

2.2.1. Adult ADHD Self-Report Scale (ASRS)

This questionnaire was constructed by Kessler et al. (2005) and consists of 18 items and two parts; the first part (6 questions) is used to screen adult ADHD. The scoring method is Likert scale and it is graded from never to very often. The questionnaire has a sensitivity of 68.7% and a kappa coefficient of 0.76. Adler, Spencer, Faraone, Kessler, Howes, Biederman, and Secnik (2006) reported high internal consistency and high concurrent validity of the questionnaire. Mokhtari, Rabiei and Salimi (2015) in Iran, also reported its correlation with the Conner's ADHD questionnaire, which is 0.67, and its validity has been obtained using confirmatory factor analysis method.

2.2.2. Young's Internet Addiction Test (IAT)

In the Internet addiction test, the reader should answer each of the 20 questions on the 5-point scale ranging from rarely to always. The scores range from 0 to 100 in this test, which indicates a greater degree of dependency on the Internet and the severity of the problems caused by excessive use. Widyanto & McMurrin (2004) reported moderate to the good internal consistency of this scale, which Cronbach's alpha coefficients ranging from 0.54 to. They also reported good internal consistency and concurrent scale validity. Alavi et al. (2011) reported the Cronbach's alpha coefficient for the whole questionnaire to be 0.80.

2.2.3. Depression, Anxiety and Stress Questionnaire (DAS-21)

The questionnaire was developed by Levi bond and Levi bond (1995) and includes a set of three self-evaluation subscales that are used to measure negative emotional states of depression, anxiety and stress. Each subscale has 7 items. Levi bond and Levi bond [1995] performed a questionnaire in a non-clinical sample and reported Cronbach's alpha coefficients for three subscales of depression, anxiety and stress, respectively 0.91, 0.84 and 0.90. Antony, Bieling, Cox, Enns, & Swinson, (1998) analyzed the questionnaire, whose results showed that there were three subscales. The questionnaire validity was also obtained by convergent and discriminant validity (Asghari, Saed, & Dibajian, 2008).

2.2.4. Social Phobia Inventory (SPIN)

This questionnaire was developed by Conner et al. (2000) to assess fear or social anxiety. This scale has 17 items that are graded according to the 5-point Likert scale (not at all to extremely). The reliability coefficient of this questionnaire was tested by a test-retest method in social phobia disorder groups ranging from 0.78 to 0.89, and the reliability coefficient was reported by the Cronbach's alpha in normal individuals for the total scale of 0.94. Both convergent validity and divergent validity were established by comparing the SPIN and other adult assessment scale of social phobia or anxiety (Connor, Davidson, Churchill, Sherwood, Foa, & Weisler, 2000). In Iran, Hasanvand Amuzadeh (2016) has an internal consistency of 0.82 in the first half and 0.86 in the second half of the test, and a correlation between two half-tests 0.76 and Spearman Brown's correlation coefficient of 0.91. The internal consistency of the subscales of fear, avoidance and physiological discomfort was 0.74, 0.75 and 0.75, respectively.

3. Results

In this study, the average age of the students was 19.97 ± 2.8 , of which 75.7% were single and 24.3% were married, and 35.9% were native and 64.1% were from other cities. Moreover, the prevalence of ADHD among students was 17.4% (57 people). The descriptive statistics of Internet addiction, depression, anxiety, stress, social phobia, and hyperactivity (attention deficit and hyperactivity / impulsivity) are also presented in Table 1.

Table 1. Descriptive Statistics of Internet addiction: depression, anxiety, stress, social phobia and hyperactivity

Variables		Mean	Standard deviation	Minimum	Maximum	Kurtosis	Skewness
Dependent variables	Internet addiction	85.59	11.74	4.4	100	0.89	-1.07
	Depression	17.31	3.19	7	21	0.64	-1.01
	Anxiety	17.70	2.78	9	21	0.32	-0.92
	Stress	16.36	3.04	7	21	-0.17	-0.54
	Social phobia	68.69	11.92	30	85	0.42	-0.94
Independent variables	Attention deficit	31.21	5.82	16	45	-0.32	-0.04
	Hyperactivity/impulsivity	33.15	5.62	17	45	-0.08	-0.22

To study the normality of the research variables, given the sample size is more than 100, the statistics of Kurtosis and Skew were used. As shown in Table 1, the Kurtosis and Skew indices of the variables are between -2 and 2, indicating the normal distribution can fit the data. Internet addiction has the highest average and stress has the least amount among the research variables. The Pearson correlation method was used to investigate the relationship between the variables. The results of the correlation matrix between the research variables (ADHD, internet addiction, depression, anxiety, stress and social phobia) are shown in Table 2.

Table 2. Correlation matrix of research variables

Variable	Attention deficit	Impulsivity	Internet addiction	Depression	Anxiety	Stress	Social phobia
Attention deficit	-						
Hyperactivity/Impulsivity	0.64*	-					
Internet addiction	0.33*	0.34*	-				
Depression	0.29*	0.29*	0.21*	-			
Anxiety	0.26*	0.29*	0.37*	0.61*	-		
Stress	0.41*	0.46*	0.27*	0.70*	0.61*	-	
Social phobia	0.27*	0.26*	0.16*	0.46*	0.44*	0.43*	-

*Correlation is significant at the 0.01 level (2-tailed)

As it is shown in Table 2, there is a significant positive relationship in the significance level of 0.01 between the ADHD variable (attention deficit and hyperactivity/impulsivity) and internet addiction ($r=0.33$, $r=0.34$), depression ($r=0.29$, $r=0.29$), anxiety ($r=0.26$, $r=0.29$), stress ($r=0.41$, $r=0.46$) and social phobia ($r=0.2$, $r=0.26$) ($p < 0.01$).

Given that in this research, the number of dependent variables is more than one variable (Internet addiction, depression, anxiety, stress and social phobia), therefore, canonical correlation analysis is utilized to investigate the relationship between ADHD (attention deficit and hyperactivity/impulsivity) with a set of variables, including Internet addiction, depression, anxiety, stress and social phobia. The canonical correlation is the generalized form of multivariable regression that adds more than one dependent variable to the predictive equation [30]. Table 3 shows the results of the canonical correlation between ADHD with the set of criteria variables.

Table 3. Results of canonical correlation between predictor and criteria variables

Independent Var.		Value	F	p	Partial Eta Squared	Observed Power
Attention deficit	Wilks L.	0.94	2.94	0.013	0.05	0.84
Impulsivity	Wilks L.	0.89	5.45	0.000	0.10	0.99

The results of Table 3 reveal that the variables of attention deficit and impulsivity have a significant relationship with the set of variables Internet addiction, depression, anxiety, stress and social phobia ($p < 0.05$). Also, the results of canonical correlation between each of the criteria and predictive variables are shown in Table 4.

Table 4. Canonical correlation results between each of the criteria and predictor variables

Independent var.	Dependent var.	df	Mean Square	F	p	Partial Eta Squared	Observed Power
	Internet addiction	1	730.373	6.099	.014	0.02	.691
Attention deficit	Depression	1	44.242	4.788	.030	0.01	.587
	Anxiety	1	20.451	2.895	.090	0.01	.396
	Stress	1	56.433	7.929	.005	0.03	.801
	Social phobia	1	646.320	4.940	.027	0.02	.600
	Internet addiction	1	990.387	8.271	.004	0.03	.817
Hyperactivity/impulsivity	Depression	1	49.032	5.306	.022	0.02	.631
	Anxiety	1	47.281	6.693	.010	0.02	.731
	Stress	1	146.738	20.617	.000	0.07	.995
	Social phobia	1	459.513	3.512	.062	0.01	.463

According to Table 4, there is a significant relationship between attention deficit disorder with Internet addiction ($P=0.01$), depression ($P=0.03$), stress ($P=0.005$) and social phobia ($P=0.02$) ($p < 0.05$). Hyperactivity/impulsivity also has a significant relationship with Internet addiction ($P=0.004$), depression ($P=0.02$), anxiety ($P=0.01$) and stress ($P=0.000$) ($p < 0.05$), but there is no significant relationship between anxiety ($P=0.09$) and impulsivity with social phobia ($P=0.06$) ($P > 0.05$).

4. Discussion and Conclusion

The purpose of this study was to determine the relationship between ADHD and some psychological disorders on female students in Kosar University. The results showed a significant positive relationship between hyperactivity and internet addiction. This conclusion is consistent with the findings of Yen et al. (2009), Yu et al. (2004), Cao et al. (2007), Bozcourt et al. (2013). In fact, the Internet has some attractions that may improve focus and performance, and compensate for defects such as attention problems and poor performance. As a result, abnormal brain activity in individuals with ADHD may be associated with inhibition in online activities, and this limitation of self-control of students makes it impossible to control the use of the Internet. Additionally, people with ADHD experience problems in social communication and social responses that may create negative emotions in their peers, leading to isolation and exclusion. As a result, the Internet can be a

substitute for communication and social support (Sacchetti & Lefler, 2014; Humphreys, Galán, Tottenham, & Lee, 2016).

In addition, the results showed that there is a positive and significant relationship between ADHD with other psychological problems, such as depression, anxiety, stress and social phobia. These results are consistent with the findings of Sobansky (2006), Sobansky et al. (2007), Parvaresh et al. (2014), Yoshimasu et al. (2012), Koyuncu, Celebi, Ertekin, Kok, & Tukul (2016). Hirvikosi et al. (2009), Combs et al. (2015), and O'Rourke et al. (2017).

Findings show that students with hyperactivity symptoms experience more psychological and emotional problems than other students. This means that students with ADHD report lower levels of social adjustment, social skills and self-esteem, and have depression scores higher than their peers. In the findings of Bridman et al. (2002), women with ADHD reported high levels of depression. According to the findings, there is also a high risk of relationship between ADHD and anxiety. Ruth et al. (2004) in a study of 28 hyperactivity/attention deficit disorders of adults and their comparison with the control group, found that in these adults, memory loss is due to situational anxiety of doing a task rather than weakness in active memory or reduced semantic organization. Therefore, one of the causes of anxiety in this disorder is a fear that is associated with a lack of social or cognitive functions, and this fear can be an appropriate response to these deficiencies. Furthermore, people's anxiety is due to the fact that they experience more disabilities in their everyday lives, and their anxiety is due to a feeling of inadequacy in performing social and cognitive assignments. Koyonech et al. (2016) also agree with the findings that people with ADHD may show maladaptive coping behaviors in the community due to signs of the disorder that may not be understood and have negative consequences such as criticism, insult, humiliation and even violence. As a result, these people experience social phobia, which leads to a cognitive deterioration toward society, and these inhibitions continue to persuade social phobia and isolate the individual.

The results of this study have gained useful information about ADHD adulthood with some psychological disorders, but only on female students, which may limit the generalizability of the results of this research to male students. Therefore, in future studies, considering the role of gender as a moderator variable seems to be necessary. The use of self-report tools is another study limit that may lead participants in this research to choose the answers that tend to gain social approval. Therefore, the use of additional tools such as observing behavior and interviewing can increase the validity of the results. To conclude, given the relationship between ADHD with many psychological problems, students with this disorder are more likely to be inferior to normal students in terms of communicative, social, educational, and other functions. Therefore, it is necessary to do students screening to use beneficial interventions and therapies in order to reduce the negative psychological and social consequences.

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