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2 Internet addiction and its psychosocial risks (depression, anxiety, stress and loneliness) among  
3 Iranian adolescents and young adults: A structural equation model in a cross-sectional study.  
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8 Running Title: Internet Addiction among Iranian Adolescents and Young Adults

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15 **Abstract**

16 Internet addiction has become an increasingly researched area in many Westernized countries.  
17 However, there has been little research in developing countries such as Iran, and when research  
18 has been conducted, it has typically utilized small samples. This study investigated the  
19 relationship of Internet addiction with stress, depression, anxiety, and loneliness in 1,052 Iranian  
20 adolescents and young adults. The participants were randomly selected to complete a battery of  
21 psychometrically validated instruments including the Internet Addiction Test, Depression  
22 Anxiety Stress Scale, and the Loneliness Scale. Structural equation modeling and Pearson  
23 correlation coefficients were used to determine the relationship between Internet addiction and  
24 psychological impairments (depression, anxiety, stress and loneliness). Pearson correlation, path  
25 analysis, multivariate analysis of variance (MANOVA), and t-tests were used to analyze the data.  
26 Results showed that Internet addiction is a predictor of stress, depression, anxiety, and  
27 loneliness. Findings further indicated that addictive Internet use is gender sensitive and that the  
28 risk of Internet addiction is higher in males than in females. The results showed that male  
29 Internet addicts differed significantly from females in terms of depression, anxiety, stress, and  
30 loneliness. The implications of these results are discussed.

31 **Keywords:** Internet addiction, Stress, Depression, Anxiety, Loneliness

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## 34 **1. Introduction**

35 Easy access to the Internet has led to an increase in the number of studies investigating the  
36 incidence and prevalence of Internet addiction (IA) (Pontes, Kuss & Griffiths, 2015). Prevalence  
37 of IA among adolescents and adults in Western and Eastern countries has gained the attention of  
38 researchers from different disciplines such as communication, education and psychology (Caplan  
39 & High, 2007; Greenfield, 2007; Li, O'Brien, Snyder, & Howard, 2015; Yen et al., 2008). Social  
40 and behavioral scholars generally concur that IA phenomenon exists and causes unhealthy  
41 psychological and social well-being (Shapira et al., 2003; Stavropoulos, Alexandraki, & Motti-  
42 Stefanidi, 2013; Wang & Wang, 2011; Yao & Zhong, 2014) among users, especially adolescents  
43 (Christakis, 2010; Smahel, Brown, & Blinka, 2012). This is because adolescents spend a lot of  
44 time on the Internet to establish and maintain social interactions with other people (Valkenburg  
45 & Peter, 2007).

46 Several psychological studies associated IA with personality traits of adolescents (i.e.,  
47 aggression and lack of self-control) (Öztürk, Bektas, Ayar, Özgüven Öztornacı, & Yağcı, 2015)  
48 The social and emotional risks of IA and its treatments have also been studied extensively (Hahn  
49 & Kim, 2014; Ko, Yen, Yen, Chen, & Chen, 2012). Although many studies have identified  
50 depression, loneliness, anxiety, and stress as major social and emotional risks associated with IA,  
51 quantitative studies describing this phenomenon in developing countries (such as Iran where the  
52 present study was carried out) remain rare, even though one study claimed the prevalence rate of  
53 IA in Iran is 22% (Ahmadi & Saghafi, 2013). Therefore, the present study attempts to investigate  
54 the link between several psychosocial variables (loneliness, depression, anxiety, and stress) with  
55 IA among Iranians using a structured model.

### 56 **1.1. Literature review**

### 57 **1.1.1. Conceptualization of Internet Addiction**

58 Scholars have not reached a consensus on the definition of IA and consequently, IA is used  
59 interchangeably with terms such as Internet dependence, compulsive Internet use, problematic  
60 Internet use, and Internet use disorder among others (Huang, Chen, Wang, & Wang, 2014). IA  
61 has often been referred to as the failure or lack of ability of a person to manage their use of the  
62 Internet, and that consequently triggers emotional and social difficulties in a person's personal  
63 and professional life (Pontes et al, 2015; Young & Rogers, 1998). Researchers have attempted to  
64 operationally define IA by examining its diagnostic criteria, including (i) preoccupation, (ii)  
65 social isolation, (iii) anxiety, (iv) psychological addiction, (v) loss of control, (vi) withdrawal  
66 symptoms, (vii) lack of ability to decrease Internet use, (viii) increasing tolerance, and (ix)  
67 increasing Internet use despite awareness of its detrimental consequences (Widyanto, Griffiths,  
68 Brunsten, & McMurrin, 2007).

69

### 70 **1.1.2. Predictors of Internet Addiction**

71 The theoretical perspective of displacement theory hypothesizes that involvement in online  
72 social activities displaces offline interaction with friends and family members, thereby  
73 preventing a person from establishing or sustaining social relationships and negatively affecting  
74 the psychological wellbeing of the person (Valkenburg & Peter, 2011). In line with this  
75 interpretation, researchers have investigated the relationship between IA and psychosocial  
76 wellbeing. For instance, Alavi and his associates (2010) examined the effect of excessive  
77 Internet use on psychiatric symptoms among 250 Iranian students and found that excessive  
78 Internet use was correlated positively with these symptoms (e.g., depression and anxiety). Lee  
79 and Leeson (2015) investigated IA and social anxiety among 626 adults and found that IA

80 significantly predicted depression and social interaction anxiety. Weinstein, Dorani, Elhadif et al.  
81 (2015) reported a positive correlation between IA and anxiety among male and female university  
82 students in Israel. Similarly, Hong, Huang, Lin and Chiu (2014) investigated depressive  
83 symptoms among Internet and Facebook addicts in Korea and Greece, respectively, and reported  
84 similar results. In another study, Yao and Zhong (2014) investigated the causal link between IA  
85 and the psychological well-being among college students in Hong Kong and found that IA raised  
86 the level of loneliness over time. Although depression was reported to be positively associated  
87 with IA, the relationship became insignificant over time. The analysis also showed that online  
88 socialization did not reduce feelings of loneliness.

89 Several studies have examined the association between IA and stress among adolescents. For  
90 instance, Yadav, Banwari, Parmar and Maniar (2013) examined how some psychological  
91 variables may vary with IA among 621 students in India. In Turkey (Akin & Iskender, 2011) and  
92 in the United States (Nie, Hillygus, & Erbring, 2002), it has been reported that students addicted  
93 to the Internet spend less time with family and friends than non-users, and feel more stressed out  
94 and anxious. In contrast, several studies have shown that the Internet provides an ideal social  
95 platform for lonely people to interact with others, widen their social network, improve their well-  
96 being, and recover from depression or stress (Tang et al., 2014).

97 Several studies have found that IA is related to gender. However, the results of these studies  
98 are far from conclusive. For instance, several studies indicate that men (Sharma, Sahu, Kasar, &  
99 Sharma, 2014) are at a greater risk of IA, while other studies have not found any association  
100 between gender and IA (Hwang et al., 2014). Differences in findings may be due to different  
101 factors, such as cultural differences in Internet use, purpose of Internet use, and Internet  
102 availability (Alavi et al., 2010). Despite the growing concern over the increasingly excessive

103 Internet use among Iranian adolescents, little is known about how Internet use affects their  
104 psychosocial wellbeing.

105 Currently, the majority of studies on IA have been conducted in developed countries (Kuss et  
106 al., 2014) rather than developing countries, such as Iran. Moreover, studies in the Iranian context  
107 have been limited to small sample sizes (Nastizai, 2009). Therefore, the present study is an  
108 attempt to answer the following questions and address the gaps in literature: (1) What are the  
109 differences in the effects of Internet use on depression, loneliness, anxiety, and stress between IA  
110 and non-IA groups among Iranian Internet users? (2) What is the relationship between gender  
111 and IA among Iranian Internet users?

112 In the present study, depression is operationally defined as an unpleasant emotional state  
113 demonstrated by several symptoms, such as negative and pessimistic attitudes, and loss of  
114 impulsiveness. Anxiety is defined as an emotional state leading to nervous behaviors. Stress is  
115 defined as an emotional state of physical and mental strain caused by factors changing an  
116 existing equilibrium. Loneliness is defined as an unpleasant emotional reaction to isolation or  
117 lack of friendship accompanied by anxiety (Akin & Iskender, 2011). It is hypothesized that  
118 Iranian individuals defined as Internet addicts will be significantly more likely to be depressed,  
119 anxious, stressed, and lonely compared to Iranian non-Internet addicts.

## 120 **2. Methods**

### 121 **2.1. Participants**

122 The participants comprised 1,052 home Internet users selected randomly from subscribers of  
123 Iranian Internet provider companies. The participants' ages were 16 years and above ( $M=32.3$   
124 years,  $SD=3.30$ ). Among the participants, 59% were male ( $n=624$ ) and 41% were female

125 (n=428). Their level of education varied from high school to PhD. In the present study, an  
126 Internet addict was operationally defined as anyone who scored more than 61 on the IA Test  
127 whereas a non-addict was anyone who scored less than 60 (Young, 1998). Among the  
128 participants, 420 were classed as non-addicts and 632 were classed as Internet addicts. Among  
129 the 632 individuals classed as addicted, 431 were male and 201 were female, whereas among the  
130 420 non-addicted individuals, 155 were male and 265 were female.

## 131 **2.2 Measures**

132 Three psychometric instruments were utilized to assess the variables in this study (i.e.,  
133 Depression Anxiety and Stress Scale-21, the Internet Addiction Test, and the Loneliness Scale).

### 134 **2.2.1. Depression Anxiety and Stress Scale-21 (DASS-21)**

135 The DASS-21 (Lovibond & Lovibond, 1995), comprises 21 questions, and assesses three  
136 separate dimensions of negative emotional states including anxiety, depression, and stress (see  
137 Table 1). Each of the three emotional subscales has seven questions. Each item is rated on a five-  
138 point Likert scale ranging from always (0) to never (4). Questions 1 to 7 assess depression,  
139 questions 8 to 14 assess anxiety, and questions 15 to 21 assess stress. The total scores of the  
140 instrument range from 0 to 42. The internal consistency of the original version of the entire  
141 DASS-21 was excellent ( $\alpha=0.93$ ) with subscales found to be satisfactory to high:  
142 depression=0.88; anxiety=0.82 and stress=0.90 (Henry & Crawford, 2005). The instrument was  
143 translated from English to Persian by Sahebi, Asghari and Salari (2005). Based on this  
144 translation, this version had acceptable validity and reliability in an Iranian context. The total  
145 reliability of the scale was 0.88, whereas that the subscales for depression, anxiety, and stress  
146 were 0.77, 0.79 and 0.78, respectively. Internal consistency, convergent validity, and concurrent

147 validity of DASS-21 were also in the acceptable to excellent ranges. In the present study, the  
148 total reliability of the scale, calculated via Cronbach's alpha, was 0.94, whereas the reliability of  
149 the subscales for depression, anxiety, and stress were 0.96, 0.94 and 0.89, respectively.

150

### 151 **2.2.2. Internet Addiction Test (IAT)**

152 The IAT (Young & Rogers, 1998) assesses Internet addiction. The instrument comprises 20  
153 items, and is divided into six dimensions (i.e., salience, excessive use, neglect of work,  
154 anticipation, self-control, and neglect of social relationships). Each item is assessed on a five-  
155 point Likert scale, ranging from 1 (rarely) to 5 (always). The scores range from a minimum of  
156 20 to a maximum of 100 (20 to 49 = average online user, 50 to 79 = experiencing occasional or  
157 frequent problems with Internet use, and 80 to 100 = internet use is causing significant  
158 problems) (Ghamari, Mohammadbeigi, Mohammadsalehi, & Hashiani, 2011). The higher score  
159 shows more dependence on the Internet. This inventory has been also used by other  
160 investigators of IA and has shown good but varied psychometric properties in relation to factor  
161 structure (Khazaal et al., 2008; Widyanto & McMurrin, 2004). The results of internal  
162 consistency (Cronbach's alpha) within the items in each subscales exhibited high to moderate  
163 reliability. In the present study, the Persian version had a Cronbach's  $\alpha$  reliability of 0.92.

164

### 165 **2.2.3. Loneliness Scale (LS)**

166 The Persian version of the Loneliness Scale (LS) was developed by Dehshiri, Borjali,  
167 Sheykhi and Habibi. It is a 38-item self-report instrument that assesses the loneliness of  
168 individuals. Each item is scored on a five-point Likert scale ranging from very strongly (1) to

169 not at all (5). The factor analysis of the final version displayed three subscales as follows:  
170 loneliness due to relationship with family (16 items;  $\alpha=0.80$ ), loneliness due to relationship  
171 with friends (11 items;  $\alpha=0.88$ ), and affective symptoms of loneliness (10 items;  $\alpha=0.79$ ).  
172 Higher scores demonstrate higher levels of loneliness. Test-retest reliability and internal  
173 consistency were 0.84 and 0.91, respectively. Convergent and divergent validities were  
174 acceptable. In the present study, LS had a Cronbach's  $\alpha$  reliability of 0.98.

### 175 **2.3. Procedure and data collection**

176 The study was conducted between September 2014 and March 2015. After receiving  
177 permission from Internet provider companies in Iran (*IranCell, TCI, Mobinnet* and *Shatel*),  
178 subscribers were informed of the goals of the study via email. The subscribers were assured that  
179 confidentiality and anonymity considerations would be observed. Subscribers willing to  
180 participate in the study confirmed their consent via email. Approximately 1300 confirmation  
181 emails were received. The researchers sent 1300 booklets including valid and reliable Persian  
182 versions of young IAT, DASS-21 and LS to participants via email. Of the 1300 distributed  
183 booklets, 1052 were returned.

184

### 185 **2.4. Data analysis**

186 In the present study, structural equation modeling (SEM) and Pearson correlation  
187 coefficients were conducted to establish the relationship between IA, stress, anxiety, depression  
188 and loneliness. A correlation matrix of the variables was examined and multivariate analysis of  
189 variance (MANOVA) was conducted with four statistical measures (i.e., Pillai's criterion,  
190 Wilk's lambda, Hotelling's trace, and Roy's Largest Root) to explore interactions between IA,

191 stress, anxiety, depression, and loneliness. A t-test was also applied to the data to compare the  
192 difference mean scores between males and females with respect to IA. Data were analyzed  
193 using AMOS 19 and SPSS 21 software.

194

### 195 **3. Results**

196 Before employing MANOVA, bivariate Pearson's correlation coefficients were run to  
197 determine the association between the variables (see Table 2). The results revealed that significant  
198 correlations ( $p < 0.01$ ) exist among the variables. In Table 2, IA is significantly and positively  
199 related to increased stress ( $r = 0.57, p < 0.01$ ), anxiety ( $r = 0.54, p < 0.01$ ), depression ( $r = 0.68, p < 0.01$ )  
200 and loneliness ( $r = 0.67, p < 0.01$ ) (i.e., individuals with higher levels of IA had higher levels of  
201 stress, anxiety, depression and loneliness). An independent MANOVA was performed to examine  
202 the difference between Internet-addicted and non-addicted groups on the study's four dependent  
203 variables (i.e., stress, anxiety, depression, and loneliness). The results showed that individuals  
204 with IA had significantly increased levels of stress, anxiety, depression and loneliness (Table 3)  
205 compared to those classed as non-IA individuals: Pillai Trace (0.97), Wilk's Lambda (0.94),  
206 Hotelling Lawley Trace (0.91), and Roy's Largest Root (0.91), ( $P < 0.01$ ) existed for Internet-  
207 addicted and non-addicted groups.

208 The F values for the study variables were: stress ( $F = [5, 1047] = 60.93, p < 0.001$ ), depression  
209 ( $F = [5, 1047] = 66.12, p < 0.001$ ), anxiety ( $F = [5, 1047] = 65.57, p < 0.001$ ) and loneliness ( $F = [5,$   
210  $1047] = 58.83, p < 0.001$ ). The mean scores of the dependent variables of the Internet-addicted  
211 group (i.e., depression, anxiety, stress, and loneliness) were higher than the mean scores of the  
212 non-addicted group (see Table 4). SEM with maximum likelihood (ML) estimation was

213 conducted to verify whether the assumed model provided good fit with the data. The results  
214 revealed that the overall model was fit for the sample because the different fit indices for the  
215 base model were appropriate and at the acceptable ranges ( $\chi^2=1.26$ ,  $df=1$ ,  $p<0.001$ ; GFI=0.93;  
216 AGFI=0.91; CFI=0.91; NFI=0.90; RFI=0.93; IFI=0.94 and RMSEA=0.038) (see Figure 1). Here,  
217 the model accounted for 39% variance of stress, 40% variance of anxiety, 45% variance of  
218 depression, and 39% variance of loneliness.

219 T-tests were performed to investigate the differences between males and females concerning  
220 the four variables of the study (i.e., stress, anxiety, depression, and loneliness) among the IA  
221 groups. The findings revealed a significant difference in the variables between females and males  
222 in the addicted group [(t Stress=2.26,  $p<0.01$ ); (t anxiety=2.19,  $p<0.01$ ); (t Depression=3.51,  
223  $p<0.01$ ) and (t Loneliness=1.18,  $p<0.01$ )]. Males obtained higher mean scores on all these  
224 variables (see Table 5).

225

#### 226 **4. Discussion**

227 Previous research has demonstrated that adolescents and young adults use the Internet more  
228 frequently than any other age group, for different purposes, such as entertainment or  
229 communication with friends and strangers (Valkenburg & Peter, 2011). Therefore, this group of  
230 users appears to be more vulnerable to IA and its psychosocial problems (Smahel et al., 2012;  
231 Valkenburg & Peter, 2011). The present study examined a number of psychosocial risks of IA  
232 (i.e., stress, depression, anxiety, and loneliness) between male and female Iranian Internet addict  
233 and non-addict groups. The findings indicated that addictive Internet use is gender sensitive and  
234 that the risk of IA is greater for Iranian males than females, and that Iranian male Internet addicts

235 are more subject to depression, anxiety, stress, and loneliness. Similarly, previous studies have  
236 shown that males are more prone to becoming Internet addicts than females (Adiele & Olatokun,  
237 2014; Sharma et al., 2014). However, several studies have reported that gender does not predict  
238 IA (Ha & Hwang, 2014; Smahel et al., 2012; Yadav et al., 2013). The difference in the findings  
239 could be related to cultural differences in Internet use, the purpose of Internet use, and nature of  
240 Internet service on offer (Li et al., 2015).

241 As expected, the mean scores on stress, depression, anxiety, and loneliness among Internet  
242 addicts were higher than those of non-addicts. These findings suggest that the more addicted a  
243 person is to the Internet, the more stressed, depressed, anxious, and lonely the person is. The  
244 scores were consistent with the results of previous studies carried out in developed countries,  
245 which have reported a significant and positive relationship between IA, stress, depression,  
246 anxiety, and loneliness (Hwang et al., 2014; Weinstein et al., 2015)

247 However, drawing a causal relationship between such psychosocial impairments and IA  
248 requires further investigation. Some scholars suggest that the association between IA and  
249 psychological symptoms cannot be easily determined. For instance, Yadav and colleagues (2013)  
250 argued that differentiation of anxiety, stress, and depression is difficult, and for students,  
251 admitting they are anxious or stressed is easier than admitting they are depressed. Some scholars  
252 argue that whether the use of the Internet for different purposes has negative or positive  
253 psychosocial effects may depend on the individual. Kraut et al. (2002) noted that although the  
254 Internet might be beneficial to well-adjusted individuals, it may have detrimental effects on  
255 poorly adjusted adolescents who spend a considerable amounts of time on the Internet.

256 The association between IA and psychological symptoms appears to be reciprocal, indicating  
257 that excessive Internet use might increase levels of social isolation and may lead to depression.

258 Life stressors (e.g., school-related problems), anxiety, low self-esteem, and motivation may also  
259 increase the risk of IA (Tang et al., 2014) especially for a depressed person (Wang & Wang,  
260 2011).

261

## 262 **5. Limitations and implications**

263 The findings of the present study should be interpreted with caution. First, the study shows  
264 that psychosocial impairments do not clearly precede IA nor are they a result of excessive  
265 Internet use. Further studies with a more comprehensive analysis may indicate whether causal  
266 relationships between psychosocial variables and IA can be established. Second, data were  
267 collected via self-reported questionnaires from adolescents and young adults via subscribers to  
268 online sites. This non-representative self-selecting sampling strategy was likely to include very  
269 excessive users of the Internet (and was reflected in the high rates of IA) and the methodology of  
270 self-report includes many well known biases (e.g., social desirability bias, recall bias, etc.).  
271 Future studies could use different methodologies (e.g., structured interviews), different sample  
272 populations and/or different subgroups of adolescents. A separate survey could be carried out to  
273 examine other demographic factors, such as study duration, marital status, and education. The  
274 results of this study also have several implications. For instance, the findings suggest that  
275 excessive Internet users need to focus on other hobbies/activities that do not require online  
276 access. The culture of Internet use requires more attention, especially from parents so they can  
277 supervise Internet usage of their teenage and/or young adult children.

278

279        **6. Conclusion**

280        The present study is the first attempt to present a quantitative model describing the association  
281        between psychosocial symptoms (loneliness, depression, anxiety, and stress) with IA among  
282        Iranian adolescents and young adults. Further research on IA is needed in developing countries  
283        such as Iran. Internet addicts need to be screened and monitored to identify psychosocial  
284        symptoms of excessive online use.

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401

402

403 Table 1: The scoring procedure of DASS-21

Degree	Variable		
	Depression	Anxiety	Stress
Normal	0- 4	0- 3	0-7
Mild	5-6	4-5	8-9
Moderate	7-10	6-7	10-12
Severe	11-13	8-9	13-16
Very severe	14+	10+	17+

404 \*\* $p < .01$

405

406 Table 2: Descriptive statistics, inter-correlations and alphas for Internet addiction, stress, anxiety,  
 407 and loneliness

Variable	Internet Addiction	Stress	Anxiety	Depression	Loneliness
Internet Addiction					
Stress	.577**				
Anxiety	.549**	.641**			
Depression	.681**	.692**	.636**		
Loneliness	.674**	.575**	.496**	.535**	1
Cronbach's Alpha	.95	.89	.94	.96	.98
M	48.28	17.11	14.39	15.15	27.96
SD	21.32	4.75	4.84	4.82	5.57

408 \*\* $p < .01$

409

410 Table 3: Results of the MANOVA analysis for Internet addicted and non-addicted groups

Value		DF	EF	Sig.
Pillai's Trace	0.97	5	1044	0.001
Wilks' Lambda	0.94	5	1044	0.001
Hotelling's Trace	0.91	5	1044	0.001
Roy's Largest Root	0.91	5	1044	0.001

411

412

413 Table 4: ANOVA results of the interaction between Internet addiction on stress, depression,  
414 anxiety and loneliness

Variables	Internet addicted group	Non addicted group	Mean		
	M (S.D)	M (S.D)	Square	F	Sig.
Stress	43.2 (3.41)	32.7 (3.66)	116.16	60.93	0.001
Depression	68.5 (4.56)	44.9 (3.81)	129.73	66.12	0.001
Anxiety	54.8 (3.75)	37.1 (2.32)	129.46	65.57	0.001
Loneliness	41.5 (3.23)	29.7 (3.05)	131.12	58.83	0.001

415

416

417 Table 5: Results of t-tests for males and females regarding stress, anxiety, depression and  
418 loneliness in the Internet addicted group

Variables	Male M (S.D)	Female M (S.D)	t	p
Stress	7.11 (3.06)	5.57 (2.39)	2.26	.001
Anxiety	5.13 (2.55)	3.48 (2.45)	2.19	.000
Depression	8.18 (3.01)	5.66 (1.91)	3.51	.000
Loneliness	7.21 (2.90)	6.59 (2.86)	1.18	.214

419

420

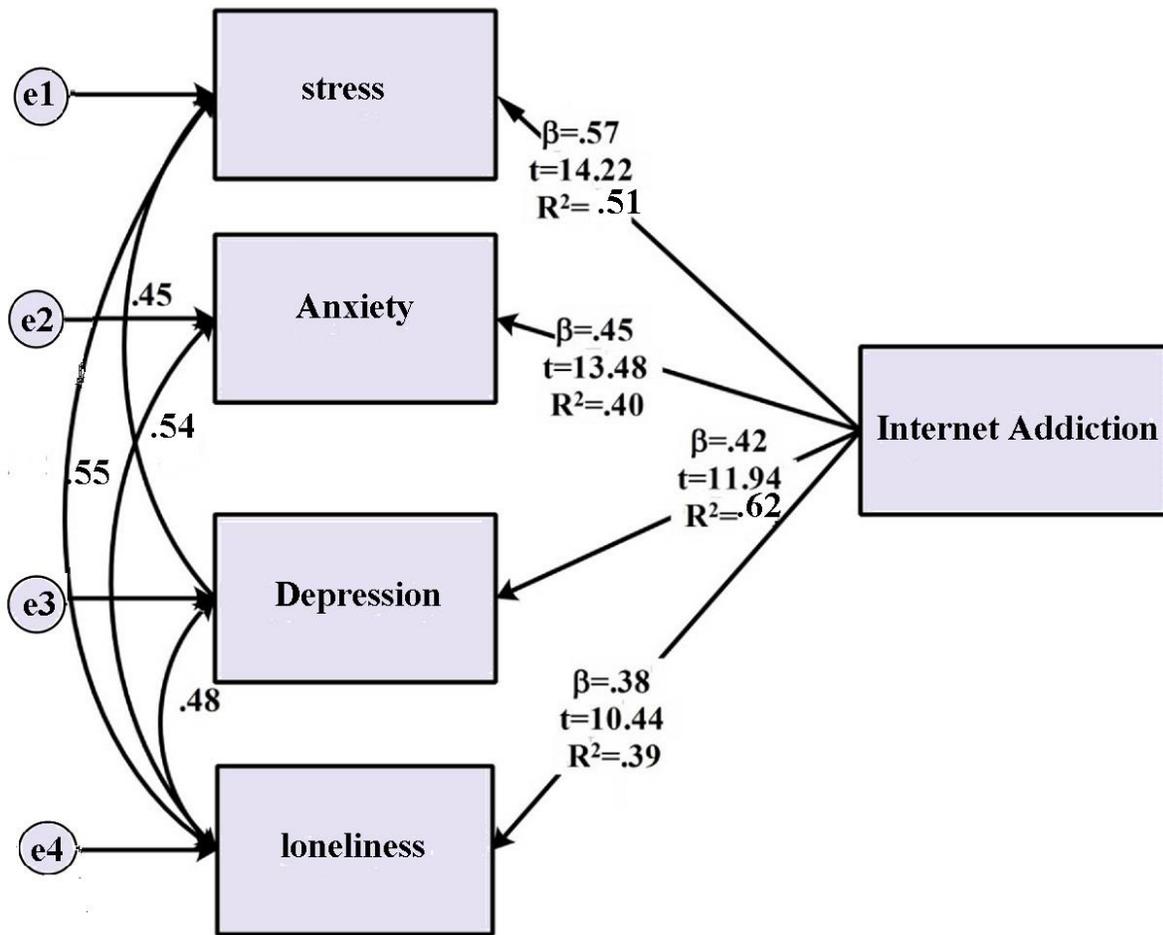
421 **Figure Caption**

422

423 **Fig.1.** Path Analysis between Internet Addiction, Depression, Anxiety, Stress and Loneliness

424 **Figure 1:**

425



426