

## Validity and Reliability Study of the Internet Addiction Test

Hafize Keser

*The Department of Comp. of Inst. Technologies Education, Ankara University, Ankara, Turkey*

Necmi Eşgi\*

*The Department of Comp. of Inst. Technologies Education, GaziOsmanPaşa University, Tokat, Turkey*

Tuğba Kocadağ

*The Department of Comp. of Inst. Technologies Education, GaziOsmanPaşa University, Tokat, Turkey*

Şanser Bulu

*The Department of Comp. of Inst. Technologies Education, GaziOsmanPaşa University, Tokat, Turkey*

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<b>Article history</b>	<p>This study aimed to identify the construct validity and internal reliability coefficients of the “Internet Addiction Test”, which developed by Young to determine how children perceive themselves about internet addiction. Sample for the adoption study was composed of children ages between 12 and 17 living in the city of Tokat/Turkey (N=480). For the adopted scale, reliability coefficient Cronbach alpha was calculated as 0.90 and Spearman Brown value was calculated as 0.86. Exploratory factor analysis was used to confirm the construct validity; and confirmatory factor analysis used to determine whether the factor model was correct. As a result of this analysis, it was determined that 20 items were grouped under 4 factors. Cronbach <math>\alpha</math>, internal consistency coefficient for the first factor was 0.91; second factor was 0.87; third factor was 0.89; fourth factor was 0.90; and for the whole scale was 0.90. Spearman Brown value for the scale was 0.86. Guttman Split-Half value for the scale was 0.85. These calculated coefficients were all in the acceptable range, and these suggested that the test and the each factor had internal reliability. Validity and reliability analysis were reviewed about the adoption of Internet Addiction Test and it was concluded that the results that were found was in the acceptable ranges.</p>
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### Introduction

Internet addiction reveals itself with symptoms such as, not able to limit internet use, keep using internet although it has social and academic harm, and feeling anxiety when internet access is limited (Shapira, Goldsmith, Keck Jr. etc., 2003). Most of the studies in the

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\* Correspondence: Faculty of Education, The Department of Comp. of Inst. Technologies Education, GaziOsmanPaşa University, Tokat, Turkey, 60150, [necmiesgi@gmail.com](mailto:necmiesgi@gmail.com).

literature about the internet addiction was conducted on college students and adults (Bakken, Wenzel, Götestam, Johansson et al., 2009; Beard and Wolf, 2001; Ferraro, Caci, D'Amico et al., 2007; Leung, 2004). However since teenagers became the group using the internet most (Subrahmanyam and Lin, 2007; TÜİK, 2007) studies that investigate factors related to internet addiction on teenagers was conducted in recent years (DiNicola, 2004; Kim, Ryu, Chon, Yeun et al., 2006; Jang, Hwang, and Choi, 2008). On one hand, it is believed that the internet as a resource enables teenager to access information and conduct research; and this way, support skills such as problem solving, creativity, and critical thinking (Berson and Berson, 2003); on the other hand it is believed that since, it is used abusively and for other purposes than learning, it diminishes development of individual's skills (Colwell and Kato, 2003; Kerber, 2005). For this reason, when individuals use the internet in a balanced fashion, it would support the intended learning and high cognitive development.

The Internet became part of our life, it opened the doors of a brand new world to us, and it provided variety of opportunities and experiences. Millions of people around the world uses internet to access information, to communicate with their friends, to work, to play games, and other purposes. The internet should be neither viewed as harmful nor disparaged. In addition internet is an alternate environment that became part of our daily life. We need to be informed about the potential results of using the internet excessively and understand the people who use internet pathologically (Davis, 2001). By being informed about the results of using internet pathologically, and with appropriate sensitivity, it would be easier to benefit from the useful functions of the internet. Healthy internet use means using internet for a legitimate purpose, for a reasonable time period, without any cognitive or behavioral issues. Healthy internet users can distinguish internet communication and real life communication (Davis, 2001). However, not everybody uses internet for their needs and purposes for a reasonable time without any problems. Individuals face with problems and negatively affected by unhealthy internet use.

Internet addiction term was first suggested by Goldberg in 1995. However, scientific discussions started with Young. Young is one of the pioneer scientists who brought the "Internet Addiction Disorder" concept in to daylight. Some scientist argued that there is a relationship between individuals' internet use and psychosocial health, home and work problems (Caplan, 2002; Morahan and Schumacher, 2000; Young, 1996; Young, 1997). Similarly, some studies show us individual experience problems because of pathological internet use (Morahan and Schumacher, 2000; Pratarelli et al., 1999). In addition, there were evidence suggesting there is a relationship between pathological internet use and psychosocial variables (depression, social isolation etc.) and home/work problems (Kraut and Paterson, 1998; Young and Rogers, 1998). Generally, pathological internet use is defined as "internet use that creates psychological, social, school or work related difficulties in individual's life" (Beard and Wolf, 2001; as cited in Caplan, 2002). Symptoms such as obsessive ideas about internet, tolerance, reduction of impulse control, not being able to stop internet use, and deprivation indicators can be seen as unhealthy internet use symptoms (Young, 1999; as cited in Davis, 2001).

According to Song, Larose, Eastin and Lin (2004) Internet Addiction (IA) or pathological internet use (PIU) is a form of impulse control disorder and is similar to mass communication tool addictions such as television however potentially more dangerous. Because, while television fills the spare time at home excessive and intrusive internet use at work, school and play can affect personal, family, and work relationships.

As such described by Griffiths (1997, 1999), Stein (1997), Young (1996, 1997), Young and Rogers (1998), unhealthy internet use because of a coercion or a clinical disorder was described in the literature, based on the drug abuse and gambling addiction descriptions in the DSM IV (Diagnostic and Statistical Manual of Mental Disorders), as “internet addiction” or “pathological internet use” (Shapira; Goldsmith; Keck Jr. et al., 2000). Similarly Goldberg described internet addiction as a coping mechanism as a behavioral disorder based on DSM IV drug addiction diagnostic measures (Goldberg, 1996; as cited in Yang and Tung, 2004). In addition, Young devised another definition named as Unhealthy Internet Use based on the pathological gambling addiction measures in DSM IV and developed a diagnostic form composed of 8 items (yes/no) (Young, 1996; Young, 1997; Young and Rogers, 1998).

Davis (1999), by enhancing Young’s definition proposed a cognitive behavioral model (as cited in Yang and Tung, 2004). Cognition plays a role in developing and continuation of pathological internet use. Cognitive disorders broken cycle and reinforcement, creates and enhances symptoms of pathological internet use and problematic behaviors related to spending too much time on internet (Davis, 2001). For some people internet is only a mere tool that brings up some addictions for various stimulants (selective pathological internet use) (Davis, 1999; as cited in Davis, 2001). Cognitive behavioral model of pathological internet use separates pathological internet use into two categories as selective pathological internet use and general pathological internet use. While selective pathological internet use mentions internet use for specific purpose such as online sexual behavior or online gambling, general pathological internet use mentions global behaviors such as spending time on internet without any specific purpose. Selective pathological internet use can be taught as selective content addiction and can appear without internet. General pathological internet use generally related to internet chat and e-mail addiction. This can be considered related to the social aspect of the internet. Need for a social contact and reinforcement of online behavior increases desire for staying on virtual online environment (Davis, 2001).

Kandell (1998) described internet addiction as "requires psychological dependence". This psychology included phenomena can be described with this items (as cited in Caplan, 2002): 1. Attributing importance to internet related activities 2. Feeling negative feelings (anxiety, depression, emptiness etc.) while offline. 3. Increased tolerance to online situations. 4. Ignoring problematic behaviors. Griffiths (1999) defined internet addiction as a form of technology addiction (such as computer addiction) and sub category of behavioral addictions (such as obsessive gambling addiction).

In contrast to Young (1997), Griffiths (1999) argued that most of the people using internet excessively was not internet addict; internet was just a tool exacerbating their other addictions. Opposed to Griffiths’ definition, Kandell (1998) defined internet addiction as “once addicted, without considering what have been done, it is a psychological addiction” (as cited in Yang and Tung, 2004).

According to Grohol (1999) it is not possible to define internet addiction. Although there were consensus on some simple points related to internet addiction there haven’t been a common “internet addiction” definition. A person can experience problems because s/he spent so much time on internet similar to, avoiding social interaction or family time because of spending too much time on reading or watching television. Like, not putting the book addiction or workaholism in the same category as schizophrenia, we cannot put internet addiction too. Very few people experience problems because of spending too much time on internet when they do not have other issues. As these issues are not because of the technology,

but related to behaviors of the people. In another words there is no inherent feature that creates problems in the internet (Bölükbaş, 2003).

Researchers such as Ceyhan (2008) and Gününç (2009) developed data collection instruments to measure internet addiction in Turkey. Researchers such as Esen (2007) and Öztürk et al. (2007) conducted research to treat and reduce internet addiction.

The test that was developed by Young in 1998 and used again in this study to conduct validity and reliability study was implemented on 250 college students, studying at Ankara University College of Education Computer Education and Instructional Technologies Department, by Balta and Horzum (2008) in spring 2006. 20 items test was reduced to 19 items and three factors were determined by the researchers. Three factor model explained the 52.83% of the variation. Items in the test had weights ranging between .81 and .39. Internal reliability coefficient, calculated by Cronbach  $\alpha$  for the data from the implementation of the test, was .89. Since, there were a considerable time gap and significant difference of the size and properties of the sample, repetition of the study was needed.

## **Method**

“Diagnostic Survey” developed by Young (1996) by adopting “Pathological Gambling” measures in DSM – IV further improved and Young (1998) created a 20 item “Internet Addiction Test” (IAT). Internet addiction Test is a self-report type test that people can use to assess themselves that can be accessed from the internet addiction center web site (<http://www.netaddiction.com>) founded by Young. In the provided web site children can self-evaluate themselves; first test items are presented, then after answering all items and pressing the calculate button at the bottom of the page, presented with the result. Internet addiction test is a Likert type survey and participants are needed to choose from “not appropriate”, “rarely”, “occasionally”, “frequently”, “often”, and “always” choices. These choices are given points 0,1,2,3,4, and 5 in the same order. If subjects receive a score of 80 or over they are described as “internet addicted”, if they receive scores between 50 and 79 defined as “showing partial symptoms”, if received less than scores of 50 points defined as “not showing symptoms”.

This study aimed to adopt the “Internet Addiction Test”, which developed by Young, into Turkish and determine the construct validity and internal reliability coefficients of this test. Internet Addiction Test has 20 items categorized in the four factors by Principle-Component Analysis method.

20 items original English test was translated into Turkish by 5 translators and translations were analyzed in terms of semantic, conceptual, expressional, experiential measures. Five translations were consistent based on these measures, however simplest versions were chosen for easier understanding. After Turkish translation was completed 20 items were given to 4 scholars and 11 students and intelligibility of the items were confirmed. The study group was 480 children between the ages of 12 and 17 living in Tokat City.

## **Data Analysis and Results**

As a method, exploratory factor analysis was determined to ensure construct validity, and confirmatory factor analysis was determined to ensure the validity of factor model. In exploratory factor analysis principle components method, in confirmatory factor analysis

maximum probability method was chosen. Cronbach alpha value was determined for the reliability of the test since it is an internal reliability coefficient.

SPSS 15.0 statistical analysis software was used to analyze data for the validity and reliability study. For construct validity, factor analysis operation was run. After the factor analysis was conducted, reliability tests were conducted for the whole test, sub factors, and each of the items separately. Principal Component Analysis was conducted to test for construct validity. Kaiser-Meyer-Olkin (KMO) coefficient and Barlett Sphericity test was conducted to assess if data fits to assumptions of Principal Component Analysis (Tabachnick and Fidell, 2007).

Varimax rotation was used to interpret factors better since this rotation gives the most sensitive distinction between factors and one of the most often used rotations (Ho, 2006). Eigenvalue was selected as 1.00 while determining the number of factors (Aşkar and Dönmez, 2005). To determine the items that will be in the test item-total correlation was used. Cronbach alpha was used to test the reliability of the test. According to Erkuş (2009) validity and reliability tests should be conducted after the item analysis. For this reason, before the validity and reliability analysis was conducted item properties were described. Items' mean values, standard deviations, item-total correlation coefficients, minimum maximum t values are provided in Table 2. for the Test's draft format.

**Table 2.** Descriptive statistics for the items in the Internet Addiction Test's draft format

Item No	N	Mean	Standard Deviation	Item-Total Correlation <sup>1</sup>	Discriminant t value (Min %27-Max%27) <sup>2</sup>	p
1	480	1,780	0,1	0,567	11,231	0,00
2	480	1,793	0,1	0,387	09,774	0,00
3	480	1,971	0,1	0,570	10,696	0,00
4	480	1,965	0,2	0,398	10,897	0,00
5	480	1,974	0,2	0,592	11,967	0,00
6	480	1,871	0,2	0,561	09,871	0,00
7	480	1,605	0,1	0,590	09,983	0,00
8	480	1,873	0,2	0,573	13,758	0,00
9	480	2,091	0,2	0,508	13,745	0,00
10	480	1,701	0,0	0,483	11,487	0,00
11	480	1,897	0,3	0,436	13,923	0,00
12	480	1,734	0,0	0,447	12,692	0,00
13	480	2,043	0,3	0,561	13,743	0,00
14	480	2,892	0,5	0,532	09,891	0,00
15	480	2,049	0,3	0,698	14,702	0,00
16	480	1,734	0,1	0,429	09,793	0,00
17	480	1,796	0,2	0,456	14,567	0,00
18	480	1,634	0,1	0,576	11,916	0,00
19	480	1,736	0,2	0,579	13,093	0,00
20	480	1,971	0,1	0,581	11,970	0,00

<sup>1</sup>n=480    <sup>2</sup>n<sub>1</sub>=n<sub>2</sub>= 130

As it can be seen from the Table 2, mean values for the items range between 1.605 and 2.892. Standard deviations for the items range between .1 and .5.

Correlation coefficients between the item scores and total test scores composed of the sum of all item scores were provided in Table 2. Item-total correlations range between .387 and .698. All of these values were statistically significant at the p level of .01. These findings can be interpreted as each item in the test measures the same property as the whole test.

Participant scores calculated by summing up the corresponding points to given answers are ordered from the smallest to biggest value, and among the 480 participants 130 with the

smallest scores were described as bottom 27% group and 130 participants with the highest scores as top 27% group. Independent group t-Test was used to determine the difference between the top group and bottom group mean scores for each item in the test. Analysis results are provided in Table 2. There was a statistically significant difference at the .01 level between the top and bottom group mean scores for each item in the test. This shows us each item discriminate between the individuals with the property intended to be measured and individuals without this property.

Mean value was 39.687, median was 28.00, mode was 37.00, standard deviation was 1.3, variance was 147.213, and range was 67.00 for the draft test total descriptive statistics. The smallest score for the group was 20.00 and the highest score was 84.00. Skewness coefficient was .068 and kurtosis coefficient was .037. Based on these findings it could be argued that the collected data's distribution is close to normal distribution.

### ***Findings Related to Validity of the Internet Addiction Test***

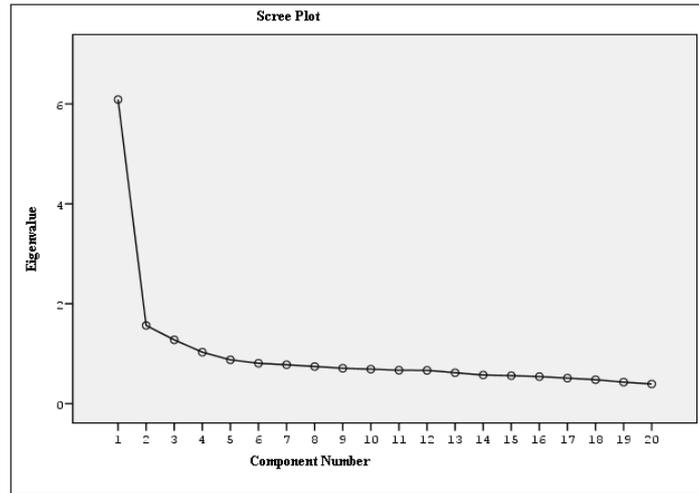
Two steps were completed to confirm validity of the test. In the first step, Exploratory Factor Analysis was conducted to the data collected from 480 participants. After completing the changes based on the findings of the Exploratory Factor Analysis, Confirmatory Factor Analysis was conducted for each factor. Sample size of 200 or participant/item proportion of 10/1 or 2/1 is enough for the factor analysis (Kline, 2005). Data collected was found to be sufficient for this reason.

Construct validity shows “the degree of correct measurement of an abstract concept in relation to intended behavior” (Büyüköztürk, 2007; Fraenkel and Wallen, 2008; Büyüköztürk, Çakmak, Akgün and et al., 2010). Factor analysis (Principal Component Analysis) was conducted to test construct validity of the adopted test (Tabachnick and Fidell, 2007). Exploratory Factor Analysis was conducted to determine factor model. To determine whether the data was meeting the assumptions of the Principal Component Analysis, Kaiser-Meyer-Olkin (KMO) and Barlett test results were checked before the factor analysis was conducted. KMO coefficient and Barlett test results were statistically significant ( $p < 0.001$ ), and this shows us data was appropriate for the Principal Component Analysis, factors can be determined, and sample size was sufficient (Field, 2005; Büyüköztürk, 2007).

Kaiser-Meyer-Olkin (KMO) and Barlett sphericity test for the data gathered from the pilot implementation of the test shows the sample size was sufficient. Kaiser-Meyer-Olkin value was .920 and this can be interpreted as ideal (Tabachnick and Fidell, 2001). Bartlett Sphericity Test result for the same data was  $X^2_{480} = 24786.05$ ,  $p < .001$ . This indicates that data came from multivariate normal distribution (Tabachnick and Fidell, 2001). This findings shows that factor analysis can be used on the data from the pilot data collection.

### ***Findings Related to Exploratory Factor Analysis***

Data from the draft version of the adopted Internet Addiction Test was analyzed using Factor Analysis method and varimax rotation, one of the orthogonal rotation methods, was used. Explained variance of over 1 was determined for four factors as a result of this analysis. Also Scree-plot graphic was interpreted to determine factors.



**Figure 1.** Scree-plot graphic for the draft version of the Internet Addiction Test

When Figure 1 was reviewed it could be seen that after the fourth factor the line plateaus. The contribution of the factor five and following factors to the variance is similar to each other. 20 items in the adopted draft internet addiction test are grouped under four factors. Once the items in each factor were reviewed it was seen that items were measuring similar characteristics. After deciding on the four factors exploratory factor analysis was conducted on four factors; results of this analysis is provided in Table 3.

Table 3, includes the explained variances and total values for the factors with eigenvalues greater than 1.

**Table 3.** Eigenvalues and explained variances of internet addiction test factors

Factor	Eigenvalues	Initial Eigenvalues		Rotation Sum of Squared Loadings		
		Explained Variance (%)	Explained Variance (%)	Eigenvalues	Explained Variance (%)	Explained Variance (%)
1	5,499	24,413	24,413	3,411	18,103	18,103
2	1,460	8,602	33,015	2,406	13,201	31,304
3	1,205	9,136	42,151	2,271	11,987	43,291
4	1,078	9,194	51,345	1,155	8,054	51,345

Each item's loadings in each factor were given in Table 3. for under each factor. According to Kline (2005) loadings are coefficients explaining the relationship of that item to the factors. According Tabachnick and Fidell (2001) loadings of an item belonging to a factor should be greater than .32. Also when an item has a loading greater than .32 for more than one factor and the difference between these loadings are less than .10 these items should be removed from the test because they show overlap (Tabachnick and Fidell, 2001). When item loadings were reviewed there were not any items with loadings below the acceptable level of .32. When items were reviewed for overlap there were not any overlapped items.

Loadings of 20 items in the Internet Addiction Test for four factors are provided in Table 4.

**Table 4.** Loadings of items in the Internet Addiction Test

Item No	Factor			
	1	2	3	4
1	,631	,015	,132	,208
5	,583	,203	,288	,293
6	,571	,216	,238	,062
16	,544	,248	,154	,198
17	,523	,252	,224	,273
2	,134	,636	,023	,040
7	,111	,621	,012	,240
8	,176	,598	,137	,191
9	,121	,573	,256	,282
18	,079	,547	,230	,219
3	,287	,299	,399	,071
4	,128	,134	,392	,156
12	,212	,104	,387	,029
19	,178	,147	,375	,154
10	,223	,218	,234	,546
11	,215	,243	,212	,484
13	,124	,139	,107	,469
14	,268	,223	,127	,429
15	,101	,134	,153	,392
20	,105	,158	,216	,354

As a result of the factor analysis, items in the test are grouped under four factors; and factor loadings for these items are provided in Table 5. Also item-total correlations and discriminant values are in this table too.

**Table 5.** Exploratory factor analysis results for pilot version of the Internet Addiction Test

Factor 1: Difficulty to Control		Explained Variance: %18,103
Item No	Items	Item-Total Correlation
1	How often do you find that you stay on-line longer than you intended?	0,443*
5	How often do others in your life complain to you about the amount of time you spend on-line?	0,572*
6	How often do your grades or school work suffer because of the amount of time you spend on-line?	0,461*
16	How often do you find yourself saying “just a few more minutes” when on-line?	0,406*
17	How often do you try to cut down the amount of time you spend on-line and fail?	0,589*
Factor 2: Avoidance		Explained Variance : %13,201
Item No	Items	Item-Total Correlation
2	How often do you neglect household chores to spend more time on-line?	0,352*
7	How often do you check your e-mail before something else that you need to do?	0,510*
8	How often does your job performance or productivity suffer because of the Internet?	0,529*
9	How often do you become defensive or secretive when anyone asks you what you do on-line?	0,627*

18	How often do you try to hide how long you've been on-line?	0,585*
Factor 3: Social Isolation		Explained Variance : %11,987
Item No	Items	Item-Total Correlation
3	How often do you prefer the excitement of the Internet to intimacy with your partner?	0,487*
4	How often do you form new relationships with fellow on-line users?	0,498*
12	How often do you fear that life without the Internet would be boring, empty, and joyless?	0,595*
19	How often do you choose to spend more time on-line over going out with others?	0,659*
Factor 4: Deprivation		Explained Variance : %8,054
Item No	Items	Item-Total Correlation
10	How often do you block out disturbing thoughts about your life with soothing thoughts of the Internet?	0,631*
11	How often do you find yourself anticipating when you will go on-line again?	0,477*
13	How often do you snap, yell, or act annoyed if someone bothers you while you are on-line?	0,480*
14	How often do you lose sleep due to late-night log-ins?	0,453*
15	How often do you feel preoccupied with the Internet when off-line, or fantasize about being on-line?	0,691*
20	How often do you feel depressed, moody, or nervous when you are off-line, which goes away once you are back on-line?	0,523*
Total Explained Variance : % 51,345		

\*p<0,001

When Table 4 and Table 5 were reviewed it could be seen that the first factor was composed of items 1, 5, 6, 16, and 17. When items in the first factor were studied it was discovered that all of these items were related to difficulty to control, for this reason this factor was named "*Difficulty to Control*". Difficulty to Control factor was composed of five items with loadings ranging from .456 and .589. This factor explains 18.103 % of the variance.

When Table 4 and Table 5 were reviewed it could be seen that the second factor was composed of items 2, 7, 8, 9, and 18. When items in the second factor were studied it was discovered that all of these items were related to avoidance, for this reason this factor was named "*Avoidance*". Avoidance factor was composed of five items with loadings ranging from .456 and .589. This factor explains 13.201 % of the variance.

When Table 4 and Table 5 were reviewed it could be seen that the third factor was composed of items 3, 4, 12, and 19. When items in the third factor were studied it was discovered that all of these items were related to social isolation, for this reason this factor was named "*Social Isolation*". Social Isolation factor was composed of four items with loadings ranging from .456 and .589. This factor explains 11.987 % of the variance.

When Table 4 and Table 5 were reviewed it could be seen that the fourth factor was composed of items 10, 11, 13, 14, 15, and 20. When items in the fourth factor were studied it was discovered that all of these items were related to deprivation, for this reason this factor was named "*Deprivation*". Deprivation factor was composed of six items with loadings ranging from .456 and .589. This factor explains 8.054 % of the variance.

It is necessary to conduct an item analysis after conducting a reliability and validity analysis for the test scores when the test are trying to measure the same construct or concept (Büyüköztürk, Çakmak, Akgün et. al, 2010). Properties of the items in the test are provided in Table 5. Correlation coefficients between the items in the final version of the test and total item points of factors of each items range from .352 and .691 based on the factor analysis conducted. These coefficients were statistically significant at .01 levels. These can be interpreted as the items in the tests and the factors they belong to measure the same constructs. Correlations between the factors are presented at Table 6.

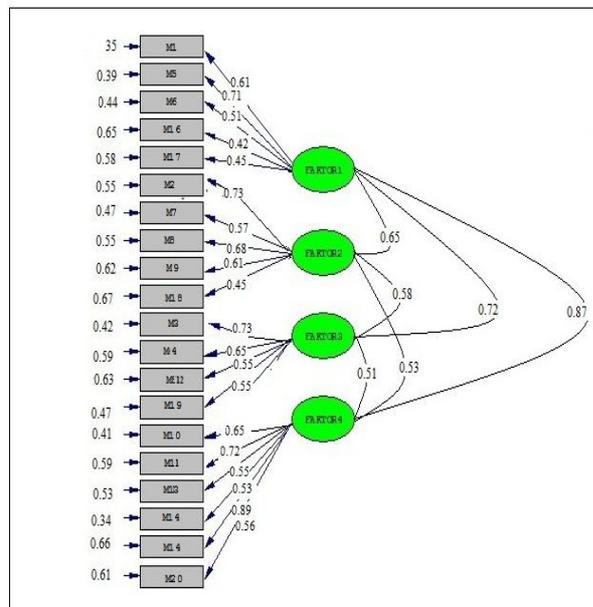
**Table 6.** Correlations between the factors in the Internet Addiction Test

	1. Factor	2. Factor	3. Factor	4. Factor
1. Factor				
2. Factor	,367			
3. Factor	,472	,645		
4. Factor	,454	,523	,839	

As it can be seen in Table 6, correlations between the factors are .367 and .839. Since the correlations between the factors were at medium level it can be interpreted that each factor measures different dimensions of the construct.

**Findings Related to Confirmatory Factor Analysis**

Principle factors related to Internet Addiction Test were found with the exploratory factor analysis. Confirmatory factor analysis was conducted to assess whether there was enough relationship between the found factors and the items belonging to that factor and how effective the factor model to explain the original construct. Path diagram for the conducted confirmatory factor analysis was provided in Figure 2 and the match index was provided in Table 7.



**Figure 2.** Path diagram for confirmatory factor analysis of Internet Addiction Test

When beta values were reviewed for all items it was found that latent variables represented the observed variables in .01 level. Also t values calculated for all items were greater than the

critical value of 2.56 at .01 significance level. As a result each item represents its latent variable effectively and could be included in the test.

After parametric estimates were done to ensure model fit, fit indexes that enables for the model to be assessed as a whole were reviewed. Fit indexes for the internet addiction test were provided in Table 7.

**Table 7.** Fit indexes as a result of Internet Addiction Test confirmatory factor analysis

Fit Indexes	Values
Degree of freedom (df)	521
Chi-Square ( $X^2$ )	1340,32 (P = 0.0)
$X^2/df$	2,572
Root mean square of error approximation (RMSEA)	0,031
Comparative Fit Index (CFI)	0,98
Goodness of Fit Index (GFI)	0,81
Adjusted Goodness of Fit Index (AGFI)	0,79
Root Mean Square Residual (RMR)	0,037
Normed Fit Index (NFI)	0,96
Non-Normed Fit Index (NNFI)	0,97

Chi-square is a type of fit index that tests whether the covariance matrix of the original variable is different than proposed matrix. Ratio of calculated Chi-square value to degree of freedom is very important. When this ratio is smaller than 3 it indicates perfect fit, when it is smaller than 5 it indicates moderate fit (Kline, 2005). As it can be seen on Table 7. the calculated Chi-square value on this study was 1240.32 and the degree of freedom was 521. Ration of calculated Chi-square value to the degree of freedom was  $1340.32 / 521 = 2.572$  and this indicates a perfect fit between the covariance matrix of the original variable and proposed matrix.

In a non-central  $X^2$  distribution, Root Mean Square of Error Approximation (RMSEA) is used to show population covariance and when it is between .00 and .05 it shows a perfect fit and when it is between .05 and .08 it shows a good fit (Brown, 2006; Sümer, 2000). As it can be seen on Table 7, the error mean square calculated on this study was .037 and it indicates a perfect fit.

Root Mean Square Residual (RMR) is mean of residual covariance between the approximation of population covariance matrix and sample covariance matrix. RMR has values between 0 and 1 and when it is smaller than .05 it indicates perfect fit, and when it is smaller than .08 it indicates good fit (Brown, 2006). As it can be seen on Table 7, the calculated RMR value for this study was .037 and it indicates a perfect fit.

Comparative Fit Index (CFI) compares freedom model's (model showing there is no relationship between hidden variables) covariance matrix and proposed structural equation model's covariance matrix. If the critical values for this index range between .97 and 1.00 it indicates a good fit and if it ranges between .05 and .97 it indicates an acceptable fit (Tabachnick and Fidell, 2001). As it can be seen in Table 7, Comparative Fit Index for this study was .98. This value indicates a good fit.

Goodness of Fit Index (GFI) index shows how the model measures the covariance matrix in the sample and accepted as explained variance of the sample (Çokluk, Şekercioğlu and Büyükoztürk, 2010). Goodness of Fit Index have values ranging from 0 to 1 and 1 represent the perfect fit and 0 represents the no fit. GFI values between .95 and 1.00 indicates perfect

fit, values between .90 and .95 indicates acceptable fit (Sümer, 2000). As it can be seen from the Table 7, GFI value for this study was .81 and this indicates a weak fit. This can be related to sensitivity of GFI index to sample size (Sümer, 2000; Tabachnick ve Fidell, 2001).

Adjusted Goodness of Fit Index (AGFI) is a Goodness of Fit Index (GFI) value adjusted according to the degrees of freedom. If the critical values defined for this index ranges between .95 and 1.00, this indicates a perfect fit, if the critical values ranges between .90 and .95 this indicates an acceptable fit. As it can be seen on Table 7. AGFI value for this study was .79 and this indicates a weak fit. This can be related to high sensitivity of AGFI to sample size (Sümer, 2000; Tabachnick ve Fidell, 2001).

Normed Fit Index (NFI) evaluates the model prediction by comparing freedom model  $X^2$  value and models  $X^2$  value. However, NFI can give a smaller fit for the model than actual when the sample size is small. In this situation NFI can be calculated by including the degrees of freedom and this index is called Non-Normed Fit Index (NNFI) (Tabachnick and Fidell, 2001). When the critical values for these indexes range from .90 and 1 it indicates a good fit. As it can be seen on Table 7 NIF and NNFI values for this study are .96 and .97. These values show there was a good fit.

When calculated values and expected critical values are compared, most of the values on this study seemed to be acceptable. The lower values of Goodness of Fit Index (GFI) and Adjusted Goodness of Fit Index (AGFI) than the critical values can be related to these indexes sensitivity to sample size (Sümer, 2000; Tabachnick and Fidell, 2001). Studies with bigger samples would hopefully yield better fit indexes. However, these circumstances have not created a concern for the study. When the results as a whole were reviewed model had fit indexes and principle parameter predictions were parallel with the data. As a result each factor was representing the items it was composed of appropriately.

### ***Findings Related to Reliability of the Adopted Internet Addiction Test***

According to Green and Salkind (2005) a value greater than .85 could be considered a good value for test's internal reliability coefficient. Similarly, according to Tezbaşaran (1997) reliability coefficient of equal or greater than .70 is needed. Also, according to Büyüköztürk (2007) items with item correlations greater than .30 should be included in the tests as a result of item analysis. Cronbach Alpha internal reliability coefficients that provide information whether the test measures the intended construct as a whole or whether the items included in each factors measures the related construct were calculated (Arıcak and Ilgaz, 2007).

Cronbach Alpha internal reliability coefficients that provide information whether the test as a whole measures the intended construct or whether each factor in the test or each item in each factor measures the related construct were calculated.

Cronbach  $\alpha$  internal reliability coefficient for first factor was .91; for the second factor .87; for the third factor .89; for the fourth factor .90; and for the whole test it was .90. Spearman Brown value for the test was calculated as .86. Guttman Split-Half value for the test was calculated as .85. These coefficients were at acceptable level for each factor and for the whole test and it can be concluded that test had internal reliability.

## Discussion

As the most important information resource and communication tool, the internet secured a place in people's life as an unavoidable tool because it provides many advantages. Advances in Personal Computers and mobile phones (cell phones) forces internet into our daily life. Besides its many advantages, the internet brings many disadvantages and limitations with it. Parents, whom are responsible from the safety of their children, are required to protect and inform their children from the dangers that can come via the internet.

Internet, besides being an information resource and communication tool, became an "addiction" for many people. Internet addiction numbers are increasing rapidly all over the world. Environmental factors play an important role in children's informed and appropriate internet use. For these reasons, parents ideas and attitudes toward internet is very important for elementary school students appropriate internet use. As a matter of fact children should be informed about the internet use at an early age and encouraged for appropriate usage.

Internet addiction can affect schooling and daily life at immense levels and it should be taken seriously. Both educators and clinicians take internet addiction's presence and level of addiction very seriously because of these immense effects. As a result, in addition to psychological test and surveys other measurement instruments were developed to study internet addiction. For this reason, this study aimed to improve national literature and fulfill the need for an internet addiction measurement instrument. Reliability and validity analysis for the Turkish adopted version of Internet Addiction Test was reviewed by referencing the related studies in the literature and results found to be in the expected boundaries.

Appropriateness of the sample group for the adaptation study was checked fit KMO and Barlett statistics (KMO = 0.92,  $X^2_{2480} = 24786.05$ ,  $p < 0.001$ ). Exploratory Factor Analysis was conducted for construct validity and scaling. Internal reliability analysis, which has an important relationship with validity (Arıcağ and İlğaz, 2007), was conducted and calculated alpha value ( $\alpha = 0.90$ ) indicated a high internal reliability. According to Green and Salkind (2005) internal reliability coefficient equal or higher than .85 indicates a good internal reliability. Similarly, according to Tezbaşaran (1997) reliability coefficients higher than .70 and according to Büyüköztürk (2007) items with item total correlations of .30 or higher as a result of item analysis is necessary. 20 items in the test were grouped under 4 factors. Named as *Difficulty to Control*, *Avoidance*, *Social Isolation*, and *Deprivation*, these four factors are composed of in order, 5, 5, 4, and 6 items.

*Social Isolation* shows increased desire to stay online and time spent on internet; it shows compared to start of the internet use excessive tendencies toward internet usage. *Social Isolation* also indicates problems of social relationships, socialization problems, issues with other people because of excessive internet use. *Avoidance* indicates distancing from daily chores, and academic work and other duties. Individual does not do, could not cope, forgets, or does not care about, their duties; only thinks about the internet, connecting to internet, or being online. *Difficulty to Control* indicates excessive use of internet and experiencing problems as a result of not being able to stop this behavior. *Deprivation* indicates the feelings when individual could not be online, when there is a lack of internet service or in similarly internet free circumstances. If a person planned to be online and restricted to get online s/he can get angry, behave hateful; these feelings occur because of deprivation property. The test scoring was done by assigning, 0 point to "not appropriate" choice, 1 point to "rarely" choice 2 points to, "occasionally" choice, 3 points to "frequently" choice, 4 points to "often" choice, and 5 points to "always" choice.

It was mentioned previously that test had four factors as a result of exploratory factor analysis. When considered the item loadings in each factor, factor eigenvalues and explained variances it can be claimed that the test had construct validity. As a matter of fact, higher than .30 loadings of items in the test, and higher than 40 % of variance being explained considered being enough for behavioral sciences (Kline, 1994; Scherer et al. 1988). Confirmatory Factor analysis was done after concluding the four factor model with Exploratory Factor Analysis. As a result of the Confirmatory Factor Analysis, test model was approved by observed values, the model had a good fit values, in another words the data confirms the model. Item factor correlations were calculated to assess the level of representation of each item of the factor it belonged to. The calculation of correlation between the scores of each item and the factor scores is very important for understanding the representation degree of each item of the whole factor (Balci, 2007). Correlations that were calculated for this reason, between each item and the factor it belonged to range between .35 and .69. As a result of this, it can be claimed that each item and each factor significantly represents the purposes of the test as a whole and intended properties. When observed statistics were compared with the critical values suggested by previous researchers, test found to be very reliable and in terms of internal reliability choices were homogeneous and related to the construct of the Internet Addiction Test. Exploratory Factor Analysis results were checked with Confirmatory Factor Analysis scores. X<sup>2</sup>, RMSEA, CFI and GFI are defined as measure for the Confirmatory Factor Analysis in the literature (Tabachnick and Fidell, 2001; Brown, 2006; Westorn and Gore, 2006). These measures were considered for fit analysis in this study. Based on these measures it can be said that the test measures reliably.

Cronbach  $\alpha$  internal reliability coefficient for the first factor was .91, for the second factor was .87, for the third factor was .89, for the fourth factor was .905 and for tge test as a whole .90. Spearman Brown value for the test was .86. Guttman Split-Half value was .85. All these coefficients for each factor and the test as a whole were at acceptable levels and it can be concluded that the test had an internal reliability.

It was concluded that Adopted Internet Addiction Test was valid and reliable to measure individuals' internet addiction or tendencies toward internet addiction in Turkish Culture too. It would be easier to identify people with internet addiction or showing symptoms of internet addiction with this test that is highly reliable and valid based on the study findings.

It should always be considered that developed tests cannot be reliable and valid for a long time because individuals' attitudes and behaviors can change. For this reason it is suggested that reliability and validity analysis for the Internet Addiction Test should be repeated with different samples in the future.

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