

Received: August 10, 2016

Revision received: November 28, 2016

Accepted: December 4, 2016

OnlineFirst: December 29, 2016

Copyright © 2016 • Turkish Green Crescent Society

ISSN 2148-7286 • eISSN 2149-1305

<http://addicta.com.tr/en/>

DOI 10.15805/addicta.2016.3.0118 • Winter 2016 • 3(3) • 452–469

Extended Abstract

Development and Validation of the Mobile Addiction Scale: The Components Model Approach

Hüseyin Fidan¹

Mehmet Akif Ersoy University

Abstract

Mobile phones have entered our lives through technological developments, becoming the most commonly used technological device. In the last decade, they can now process almost every task that can be done with a computer. In particular, people who have been provided several advantages with their smart phones through an Internet connection are spending more and more time on mobile phones. Excessive use of mobile phones has become an addiction in society. The ability to access the Internet anytime on mobile phones, in addition to social applications and online games, increases Internet and mobile phone addiction. This study is based on the components model approach, developed within the scope of behavioral addictions to actualize the mobile phone addiction scale. Structural analysis was performed on this model, which proved it to be applicable as a mobile addiction scale. In the study, data from 284 participants was used, and mobile addiction was determined to relate to withdrawal, relapse, tolerance, and salience.

Keywords

Human-machine interaction • Mobile Addiction Scale • Mobile Internet addiction • Technology addiction • Behavioral addiction

Correspondence to: Hüseyin Fidan, Department of Industrial Engineering, Faculty of Engineering and Architecture, Mehmet Akif Ersoy University, Burdur. Email: hfidan@mehmetakif.edu.tr

Atıf: Fidan, H. (2016). Development and validation of the Mobile Addiction Scale: The components model approach. *Addicta: The Turkish Journal on Addictions*, 3, 452–469. <http://dx.doi.org/10.15805/addicta.2016.3.0118>

The idea of being free of the limitations of wires in terms of communications became a worldly focus of interest with the development of mobile phones by Martin Cooper in 1973 (Anjarwalla, 2016). The use of mobile phones began to increase rapidly following the first mobile phone call in 1983; afterwards, the second stage started with the production of smartphones by International Business Machines (IBM) in 1994 (Miller, 2012, p. 224). According to Marc Andreessen, co-founder of Netscape, smartphone technology is a kind of revolution that humankind has never experienced in their history on the planet (Consumer News & Business Channel, 2011). By 2014, approximately four billion people were using mobile phones. This figure is estimated to be 4.6 billion in 2016 and 5 billion in 2019 (Statista, 2016). The number of mobile phone users constitutes 30% of the world population; it is predicted to be 60% in 2019 (Fitchard, 2013). According to a report from International Telecommunication Union (2015), there were approximately 72 million mobile-phone subscribers in Turkey in 2015, which represents 95% of Turkey's total population. According to the Information and Communication Technology Usage in Households Survey by the Turkish Statistical Institute (TÜİK, 2015), 96.8% of households have mobile phones, 64.7% of which are connected to the Internet.

The concept of addiction, which is defined as obsession with an object or behavior, has been interpreted in relation to the abuse of tobacco, alcohol, drugs, and so on. However, some behaviors such as gambling, eating, and sleeping have been argued to cause addiction. Similar cases are also recognized for technological devices and applications like computers, the Internet, online games, tablets, and mobile phones. These may cause technology addictions in people due to overuse (Griffiths, 1995, p. 14). According to Lee, Chang, Lin, and Cheng (2014, p. 373), who emphasized that habitual use results in the endless desire to check for texts and calls, the behaviors that force individuals to act cause mobile addiction.

This study researches smartphone addiction as an important current issue within the scope of human-machine interactions based on *concept modeling*, which was developed through the contributions of Brown (1986) and Griffiths (1995) within the scope of behavioral addiction. This model has been applied to several behavioral addictions such as television, computer gaming, gambling, and Internet, but has not yet been applied to mobile phone addiction. Nor does the concept of mobile addiction have enough empirical support (Billieux, Maurage, Fernandez, Kuss, & Griffiths, 2015). In this context, no scale has been encountered relating to mobile addiction within the framework of behavioral addictions. In this study, we aim to develop the mobile addiction scale. Additionally, the developed scale will be used to determine the relationship between mobile Internet usage tendencies and mobile addiction.

Human Computer Interaction

Supplemental to technological devices and the software designed for these devices are humans. The usage efficiency of these technologies as suitably designed for human use has been studied within the scope of human computer interactions (HCI; [Diaper & Sanger, 2006](#)). One sees the concept of HCI in the article by American physiologist J. C. R. Licklider in 1960 for the first time ([Lesh, Marks, Rich, & Sidner, 2002, p. 1](#)). [Licklider \(1960, p. 4\)](#) tried to explain the concept of common life (symbiosis) by giving examples of insects and trees, and defined the concept as the common experience of cooperation between two different species.

HCI is defined as a discipline related to the design, evaluation, and application of interactive computer systems for human use ([Dix, Finlay, Abowd, & Beale, 1992](#)). HCI is an interdisciplinary concept and has been researched by various disciplines (i.e., human behaviors, sociology, psychology, computer science, & ergonomics; [Çağıltay, 2005](#)). In the 1990s, the concept became a field that gained the intensity of studies oriented toward technological interactions with the development of digital technology ([Hinze-Horae, 2007](#)). What is important among these systems are their ease-of-use, user-friendly design, simplicity, and flexibility ([Shneiderman, 1980](#)). In addition, user-oriented subjects such as habit and addiction have been studied ([Porter & Kakabadse, 2006](#)).

The Concept of Addiction

The concept of addiction is considered as being materially or mentally obsessed towards someone or something; the Turkish Language Society defines it as being overly attached to bad habits such as tobacco, alcohol, or drugs. Several people have assimilated this concept into drug and alcohol usage, as well as relating it to various behaviors with addictive potentials ([Griffiths, 1995](#)). Gambling ([Walker, 1989](#)), obesity ([Davis & Carter, 2009](#)), exercise ([Kaur, Agarwal, & Bhatia, 2009](#)), technology ([Griffiths, 1995](#)), television ([McIlwraith, Jacobvitz, Kubey, & Alexander, 1991](#)) and the Internet ([Young, 1998](#)), which are considered among these behaviors, may cause people to lose control and increase their risk for addiction.

This goes back to the mid-20th century when addiction was accepted as an illness that affects social life. In 1956 and 1987, alcoholism and addiction were respectively approved as illnesses by the American Medical Association (AMA; [Leshner, 1997](#)). While opinions on addiction were considered only under the scope of alcohol, tobacco, and drug use ([Bettinardi-Angres & Angres, 2010](#)), the conceptual description wasn't extended to include addictive behaviors until after 1987. Addiction is considered to be a social and personal problem, and has been defined as a compulsive behavioral pattern that increases the risk of illness ([Marlatt, Baer, Donovan, & Kivlahan, 1988](#)). This definition expresses that, in addition to substances causing physical addiction

such as alcohol, tobacco and drugs, behaviors that repeat themselves may also lead to addiction. In this framework, we discuss two types of addiction: drug addiction and behavioral addiction (Turel, Serenko, & Giles, 2011).

How does one understand whether a repeated habit is an addiction or not? The Diagnostic and Statistical Manual of Mental Disorders (DSM) is a basic source for classifying mental disorders and determining diagnostic criteria. Published by the American Psychiatric Association (APA), the DSM is accepted as a general classification system for mental disorders and was last revised in 2013 (DSM-V; Regier, Kuhl, & Kupfer, 2013). According to DSM criteria, diagnosing addictions can be done through the symptoms of tolerance, withdrawal, relapse, desire to recover, struggle, sacrifice, and persistence (APA, 2000, 2013).

Technology Addiction

Technology addiction, a problem that has arisen from information technologies, is a mental state caused by the overuse of technological devices (Turel et al., 2011, p. 1044). Technology addiction is considered to be a problem that grows alongside technological development and has been a research topic particularly among various scientific fields such as psychology, sociology, and informatics (Young, 2007). Aside from having similar characteristics to substance addiction, the concept has been defined as having different aspects and studied under the scope of behavioral addiction (Griffiths, 1995, 2005; McIlwraith et al., 1991; Shaffer et al., 2004; Turel et al., 2011).

Pioneer studies on technology addiction have been performed on addictions to television (Smith, 1986; McIlwraith et al., 1991), computers (Shotton, 1991), and the Internet (Young, 1998). In particular, the development of the Internet has led addiction-related academic studies to focus on this topic (Johansson & Götestam, 2004). The number of research subjects on technology addiction has increased alongside Internet-based technologies, and social-media, online-gaming, and mobile-phone addictions have become the subject of this research (Salehan & Negahban, 2013). It's been said that technology addiction, which the APA excluded from their diagnostic criteria in DSM-V, must be supported with further clinical findings so that it may be included in progressive practices (APA, 2013). However, some APA-emphasized studies that reveal clinical findings have been included in the literature. Helmuth (2001) presented the similarities of gambling, eating, and other similar behavioral addictions with alcohol, tobacco, and drug addictions. Ko et al. (2009) observed with MRIs that behavioral and substance addictions produce similar neurobiological mechanisms. Doctors working in a clinic in the US have performed their first treatment on a patient reported under the scope of Internet addiction to be addicted to Google-glasses usage (Yung, Eickhoff, Davis, Klam, & Doan, 2015).

Smartphone Addiction

Cell phones are technological devices that have been frequently developed since the first communication using portable wireless phones was achieved (West, 2013). Smartphones are said to have positive effects on cognitive and behavioral development, as well as to provide various advantages both socially and individually (Park, 2005; Walsh, White, & Young, 2010). However, several problems have arisen from their use (Bianchi & Phillips, 2005; Lee, Chang, Lin, & Cheng, 2014). Aside from physical problems with the head, neck, back, and hands, physiological problems such as stress, anxiety, depression, and addiction can also be seen related to mobile phone usage (Lu et al., 2011; Park, 2005; Toda et al., 2008; İnsani Yardım Vakfı [Humanitarian Relief Foundation], 2015).

The first studies on mobile addiction started at the turn of the century and were not included in the literature until the recognition of Internet, video game, and online game addictions (Billieux et al., 2015; Carbonell, Guardiola, Beranuy, & Belles, 2009). After smartphones took their place among humanity, studies focused more on the concept mentioned as mobile addiction, or *nomophobia*, in the literature (Billieux, Vander Linden, & Rochat, 2008; King et al., 2013; Kwon et al., 2013). One of the first studies on mobile phone addiction was carried out by Bianchi and Phillips (2005) and mentioned that mobile phone addiction is a type of technology addiction. In their study, the researchers observed the relation of mobile phone addiction to self-respect and extraverted personality structures; they determined that younger participants in particular had greater tendencies toward having mobile phone addiction (Bianchi & Phillips, 2005). According to Reid and Reid (2007), interactions caused by the Internet and Internet-based applications lay behind the overuse of mobile phones, which leads to addiction. Lee et al. (2014) emphasized that technology addiction is a behavioral disturbance, stated that mobile addiction had been studied per its physiological characteristics in the literature, and expressed that the concept must also be studied within the scope of compulsive behaviors. Kwon et al. (2013) developed a mobile addiction scale using the Internet addiction scale of Young (1998) and stated that mobile addiction can be explained through six factors: tolerance, withdrawal, daily life disorders, virtual relationships, overuse, and positive expectations. In addition, the study observed that mobile addiction was not related to gender and there were significant differences as far as educational level and occupational group (Kwon et al., 2013).

Different variables have been used in these studies as no standard criteria exist for diagnosing mobile addiction. In some studies, mobile addiction was observed studied using the diagnostic criteria from the DSM on substance addiction. Yen et al. (2009) stated that the overuse of mobile phones can also be considered as a technology addiction; they established in a survey study, in which they based the addiction criteria included in DSM IV-TR, that 48.9% of participants had at least one of these

criteria. Merlo, Stone, and Bibbey (2013) developed a scale based on DSM criteria and aimed to reveal the signs of problematic mobile phone use. In another study based upon DSM diagnostic criteria, the variables affecting mobile addiction were observed gathered under the factors of deprivation, lack of control, and tolerance (Choliz, 2012).

Aside from these, some researchers have stated that dealing with addiction only in terms of the diagnostic criteria of chemical substance addictions would be inadequate, emphasizing the need to utilize general components that cover the signs of behavioral addiction in order to diagnose addiction (Griffiths, 1995, 2005; Kuss, Shorter, Rooij, Griffiths, & Schoenmakers, 2013). Studies that state sufficient clinical evidence as required by the APA can be obtained this way expressed that addictions can be generally explained through six components: salience, emotional change, tolerance, signs of withdrawal, conflict, and relapse (Griffiths, 1995, 2005; Griffiths, Pontes, & Kuss, 2016; Turel et al., 2011).

In some studies on mobile addiction, one sees that mobile addiction alongside a variable has been studied in relational terms. Salehan and Nagehban (2013) observed that social media applications on mobile Internet usage are significant determinants of mobile addiction. In a similar study, social media functions on a technological device were emphasized to increase the risk of mobile addiction (Hong, Chiu, & Huang, 2012). Sultan (2014) determined that social media-based texting applications, like BlackBerry Messaging and WhatsApp, have addictive characteristics. According to the study carried out by Hope (2010), mobile-phone usage is considered to be a lifestyle among iPhone owners.

In general, studies in Turkey adapt foreign scales in the literature into Turkish, and these scales are proven to be appropriate for application. The smartphone addiction scale, developed by Kwon et al. (2013), was translated into Turkish and confirmed to be valid and reliable (Demirci, Orhan, Demirdağ, Akpınar, & Sert, 2014). The same scale was used with the Internet scale and mobile addiction was determined to be positively related with Internet addiction (Noyan, Darçın, Nurmedov, Yılmaz, & Dilbaz, 2015). In a study using the problematic mobile phone-use scale, developed by Bianchi and Philips (2005) it was determined to be reliable when adapted into Turkish (Şar & Işıklar, 2012). In a study including university students, the scale developed by Yıldırım and Correra (2015) was applied, and 42% of the subjects were determined to have mobile addiction (Yıldırım, Sumuer, Adnan, & Yıldırım, 2016).

Method

In this study, a components model based on the developmental contributions of Brown (1986) and Griffiths (1995) was used to develop a mobile addiction scale.

This is a descriptive study for determining the factors included in the scale that affect mobile addiction and their levels of effect.

Population and Sample

The population of the study consists of people living in Burdur's city-center, and the towns of Bucak, Golhisar, and Yesilova in Burdur province. These selected residential areas have the highest population density of the province (YerelNet, 2016). As of 2015, Burdur province's population was 258,339 with a total of 148,590 people living in these four towns. Forty percent of the population live in the city center and surrounding towns, and 60% live in the remaining towns and villages. The population data of these residential areas is shown in Table 1.

Table 1
Population Data and Number of Surveys

Settlement	Population	Population ratio (%)	Planned surveys	Valid surveys	Percentage of Valid Surveys
Central	78,331	52.7	155	148	52.1%
Bucak	47,726	32.1	95	90	31.6%
Göhlisar	16,939	11.4	35	34	11.2%
Yeşilova	5,594	3.8	15	12	4.2%
Total	148,590		300	284	

Table 2
Demographic Findings

Variable		<i>n</i> (%)	Mobil internet usage <i>n</i> (%)
Gender	Male	138 (48.6%)	134 (97.1%)
	Female	146 (51.4%)	144 (98.6%)
Age	15 – 25	190 (66.9%)	185 (97.3%)
	26 – 45	88 (31%)	88 (100%)
	45+	6 (2.1%)	5 (83.3%)
Income level	0 – 1,300 TL	169 (59.5%)	166 (98.2%)
	1,301 – 2,500 TL	61 (21.5%)	59 (96.7%)
	2,501 – 5,000 TL	40 (14.1%)	39 (97.5%)
	5000+ TL	14 (4.9%)	14 (100%)
Education level	High school	36 (12.8%)	34 (94.4%)
	University	229 (80.6%)	225 (98.2%)
	Post-graduate	19 (6.7%)	19 (100%)
Job	Student	116 (40.8%)	114 (98.2%)
	Workers	130 (45.8%)	128 (98.4%)
	Retired or jobless	21 (7.4%)	21 (100%)
	Housewife	17 (6%)	15 (88.2%)

In order to realize the factors and create a normal distribution, the number of samples must be 10 per question (Hair, Black, Babin, & Anderson, 2014). At least 240 samples are required for the mobile addiction scale, as it has 24 questions; however, 300 surveys were determined, which included various mobile Internet questions to compensate for invalid mobile Internet surveys. Distribution of the determined number of samples per town was calculated per population ratio and provided in Table 1. As a result of the application, 16 surveys were confirmed to be invalid and excluded from the analysis; the resulting number of samples was determined to be 284. The distribution of the number and percentage of the surveys applied within the scope of the study per town is given in Table 1, and participants' demographics are given in Table 2.

Data Collection Tool

Variables from the mobile addiction scale developed within the framework of behavioral addiction were prepared utilizing the studies of Griffiths (1995), Young (1998), Cholz (2012), Kuss et al. (2013), and Kwon et al. (2013). This process searched studies that especially covered the components model in which surveys were performed. In this scope, the studies of Cholz (2012) and Kwon et al. (2013) on mobile addiction, as well as the studies of Young (1998) and Kuss et al. (2013) on Internet addiction, were determined. As a result, 24 questions for the scales, 4 questions for mobile Internet tendencies, and 18 questions for demographic variables were formed for the survey for a total of 46 questions. The variables and survey questions obtained from the literature are given with references in Table 3.

Data Collection and Analysis

The study was carried out in Burdur city-center and the towns of Bucak, Golhisar, and Yesilova in May, 2016 using the data collection tool. As a result of a pilot survey with 20 subjects, no problems were encountered regarding understanding or completing the survey questionnaire. In the study, opinions related to mobile-phone use were received from participants of various age groups, income levels, and regions.

AMOS 21 and SPSS 15.0 package programs by IBM were used for statistical analysis in the study. In order for the analysis to have a normal distribution of variables, skewness and kurtosis values must be between -1.5 and 1.5 (Tabachnick & Fidell, 2013). In this regard, all variables were determined to be normally distributed.

Table 3
Mobile Addiction Scale Variables

Factor	Variable	Survey Question	Reference
Salience (BEL)	BEL ₁	I forget the work I plan when using a mobile phone.	Kwon et al. (2013)
	BEL ₂	Things that keep me from using mobile phones are boring to me.	Kuss et al. (2013)
	BEL ₃	When I'm not using a mobile phone, I think about what I used to do before being on the phone.	Kwon et al. (2013)
	BEL ₄	Using a mobile phone makes me more attractive than anything else.	Griffiths (1995)
Tolerance (TOL)	TOL ₁	As time goes by, I feel I the need to check my mobile phone more often.	Griffiths (1995)
	TOL ₂	I use my mobile phone for longer than I had planned.	Young (1998)
	TOL ₃	I feel I need to recheck soon after using the mobile phone.	Choliz (2012)
	TOL ₄	I think the time I spend using my mobile phone is increasing.	Kuss et al. (2013)
Withdrawal (UZ)	UZ ₁	Life is empty without my mobile phone.	Kwon et al. (2013)
	UZ ₂	I feel grumpy and nervous when I cannot use a mobile phone.	Kuss et al. (2013)
	UZ ₃	If I don't have my mobile phone, I think about what I would do if I had it.	Kwon et al. (2013)
	UZ ₄	I see my mobile phone as the cause of my wrist and neck aches.	Kwon et al. (2013)
Mood modification (DUY)	DUY ₁	It comforts me to use my mobile phone in distressing moments.	Kuss et al. (2013)
	DUY ₂	When using my mobile phone, I suddenly say "What am I doing?"	Added by researcher
	DUY ₃	My mobile phone takes me away from problems and negative thoughts.	Young (1998)
	DUY ₄	I feel safe when using my mobile phone.	Kwon et al. (2013)
Conflict (ÇAT)	ÇAT ₁	Using my mobile phone in a circle of friends has been seen as a problem.	Kuss et al. (2013)
	ÇAT ₂	I'm unsure whether I use my mobile phone too much.	Added by researcher
	ÇAT ₃	Due to overusing my mobile phone, I cause problems for those around me.	Choliz (2012)
	ÇAT ₄	I feel uncomfortable being around people when using my mobile phone.	Kwon et al. (2013)
Relapse (TEK)	TEK ₁	I reduce my mobile-phone usage, but it increases again.	Griffiths (1995)
	TEK ₂	Even if I have finished what I was doing on my mobile phone, I find myself saying "Let's take a look."	Added by researcher
	TEK ₃	I'm trying to stop using mobile phones.	Kuss et al. (2013)
	TEK ₄	Even if I do not use a mobile phone for a long time, my overuse continues when I start again.	Griffiths (1995)
Mobile Internet Tendency (INT)	INT ₁	I use programs on my mobile phone that require the Internet.	Added by researcher
	INT ₂	I consider a non-Internet mobile phone to be meaningless.	Added by researcher
	INT ₃	The Internet has increased the amount of time I spend on mobile phones.	Added by researcher
	INT ₄	When I hold my mobile phone, I immediately check the internet connection.	Added by researcher
Mobile Addiction (Dependent variables)		I think I'm addicted to my mobile phone.	Added by researcher

Findings

Explanatory Factor Analysis

Reliability analysis of the variables used in the scale, which was developed within the framework of the components model for mobile addiction, was performed and the results are given in Table 4. Variables INT_1 , ζAT_3 , DUY_2 , DUY_4 , and TEK_3 had been included in the scale but were excluded as they reduced the confidence level. According to Nunnally, confidence levels of approximately 0.6 are acceptable in scales with fewer variables (Nunnally, 1978, as cited in Caber, 2010, p. 162). For this reason, the DUY component had been initially included in the factor analysis but was excluded because the factors related to this component did not perform as expected per the results of explanatory factor analysis. Thus, analysis was performed using the BEL , TOL , UZ , ζAT , TEK , and INT components. Cronbach’s alpha value for all variables included in the analysis was determined as 0.910.

Table 4
Cronbach’s Alpha Values

<i>BEL</i>	<i>TOL</i>	<i>UZ</i>	<i>DUY</i>	<i>ÇAT</i>	<i>TEK</i>	<i>INT</i>
0.672	0.775	0.816	0.583	0.684	0.737	0.812

Results from the Kaiser-Meyer-Ohlin test (KMO; Kootstra, 2004, p. 4), which determines whether sample size is sufficient for factor analysis or not, is shown in Table 5, and the KMO is seen to be 0.828. This value indicates that study sample size is sufficient for the factors. The Bartlett test, also called the sphericity test, checks whether or not the variable correlation matrix equals the unit matrix (Polat, 2012, p. 102). Accordingly, the result of the sphericity test in Table 5 shows $p < .05$, which means the correlation matrix is different than the unit matrix and variables can be factored.

Table 5
KMO and Sphericity Test Results

KMO		.828
	χ^2	2,495.647
Sphericity test	<i>df</i>	210
	<i>p</i>	.000

Total variance values resulting from explanatory factor analysis (EFA) are given in Table 6. Six factors with eigenvalues higher than 1 were formed with vertical rotation using Varimax rotation. As one can see in Table 6, these factors demonstrate 67.68% of the total variance. Factoring was performed on all factors apart from the DUY component. The factors and factor loadings realized as a result of EFA are given in Table 7.

Table 6
Explained Total Variance

Component	Eigenvalues		
	Total	Variance (%)	Cumulative Variance (%)
1	6.877	32.747	32.747
2	2.140	10.193	42.940
3	1.616	7.695	50.635
4	1.320	6.285	56.920
5	1.196	5.696	62.617
6	1.063	5.063	67.680
7	.907	4.319	71.999

Table 7
Factor Loads

	Components					
	1	2	3	4	5	6
UZ ₁	.824					
UZ ₂	.767					
UZ ₄	.653					
UZ ₃	.644					
TEK ₂		.784				
TEK ₄		.675				
TEK ₁		.668				
INT ₃			.869			
INT ₂			.812			
INT ₄			.751			
TOL ₄				.798		
TOL ₁				.706		
TOL ₂				.574		
TOL ₃				.535		
BEL ₄					.799	
BEL ₃					.550	
BEL ₂					.466	
BEL ₁					.442	
ÇAT ₁						.766
ÇAT ₄						.749
ÇAT ₂						.591

Confirmatory Factor Analysis

Within the scope of the components model, confirmatory factor analysis (CFA) was conducted in order to determine the goodness-of-fit for the factors established through EFA. Value ranges for the concordant criteria (Hair et al., 2014) and the mobile addiction model's concordant criteria range is given in Table 8. Accordingly, criteria ranges of the model are at an acceptable level.

Table 8
Goodness of Fit Ranges and Mobile Addiction Model Values

Criterion	Acceptable Range	Good compliance	Model values
Chi-Square/df	$\chi^2 / df < 5$	$\chi^2 / df < 3$	3.215
CFI	$0,05 \leq CFI \leq 0,97$	$0,07 \leq CFI \leq 1$	0.916
RMR	$0,05 \leq RMSEA \leq 1$	$0 \leq RMR \leq 0,05$	0.078
GFI	$0,00 \leq GFI \leq 0,95$	$0,05 \leq GFI \leq 1$	0.918
NFI	$0,00 \leq NFI \leq 0,95$	$0,05 \leq NFI \leq 1$	0.905
RMSEA	$0,05 \leq RMSEA \leq 1$	$0 \leq RMSEA \leq 0,05$	0.088

Table 9
Factor Correlations, Validation (AVE) and Reliability (CR) Values

	BEL	TOL	UZ	TEK	ÇAT	AVE	CR
BEL	0.721					0.520	0.684
TOL	0.656	0.727				0.529	0.768
UZ	0.537	0.376	0.811			0.658	0.790
TEK	0.562	0.847	0.522	0.726		0.527	0.768
ÇAT	0.732	0.844	0.621	0.945	0.570	0.325	0.577

The correlation coefficients, relation level of components in the model, and square root of the average variance extracted (AVE) are shown in Table 9. The square root of AVE values must be higher than the related correlation coefficient for split validation (Fornell & Larcker, 1981). According to the values given in Tables 8 and 9, the mobile addiction scale was determined to be formed from five components: salience, tolerance, withdrawal, relapse, and conflict. The correlation values of the variables and components are given in Figure 1.

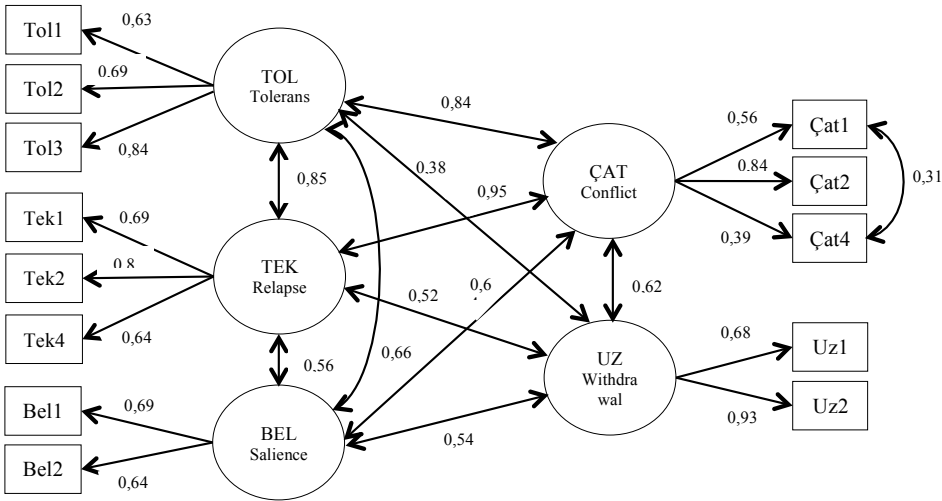


Figure 1: Variable correlations.

In order for the relationships of mobile addiction and the dependent variable with the factors and tendency towards mobile internet addiction to be determined in

accordance with CFA results, multi-linear regression analysis was performed. In the regression analysis results, R^2 , the determination coefficient, was found to be 0.571. This value indicates that the components in the model explain 57% of the level of mobile addiction. The regression coefficient values and significance of values are indicated in Table 10. Accordingly, mobile addiction has the highest significant relation with *TOL*, and has no relation with *ÇAT*. In addition, there is a positive relationship between tendency to use the Internet and mobile addiction.

Table 10
Regression Coefficients

	β	t	p
(Constant)	2.637	48.940	.000
<i>TOL</i>	.625	11.573	.000
<i>BEL</i>	.295	5.468	.000
<i>INT</i>	.475	8.797	.000
<i>TEK</i>	.444	8.229	.000
<i>ÇAT</i>	.115	2.127	.054
<i>UZ</i>	.440	8.143	.000

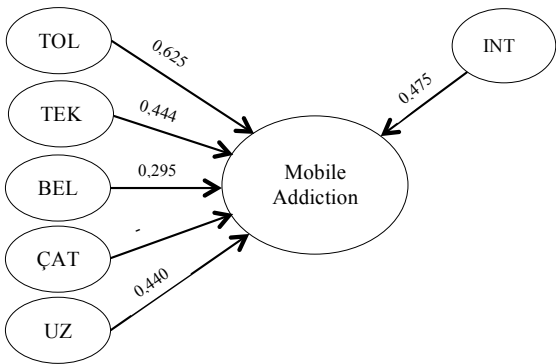


Figure 2. Relations of Internet usage tendency and scale components with mobile addiction.

In Figure 2, the regression coefficient values among mobile addiction, the scale components, and tendency to use mobile Internet are given. Accordingly, one can express the model mathematically as follows:

Mobil addiction = 2,637 + 0,625 * TOL + 0,444 * TEK + 0,295 * BEL + 0,44 * UZ + 0,475 * INT

Discussion and Conclusion

In the study, the mobile phone addiction scale was created on the basis of the components model, including substance and behavioral addictions as recommended by Brown (1986) and Griffiths (1995); validity of the model was provided using CFA. Using CFA goodness-of-fit criteria, this model was determined to have an applicable

structure and can be used in studies. The criteria in the components model were confirmed as useful in detecting mobile addiction, and the mathematical expression of the model has been formed.

Diagnosing mobile addiction was observed able to be determined using four diagnostic criteria: tolerance, relapse, salience, and withdrawal. However, albeit conflicting, a change in mood did not relate to mobile addiction, as was confirmed through CFA. In addition, mobile addiction was determined to relate to tolerance at a high level and to salience at a low level. This study supports the studies of Billieux et al. (2015) in that it determined tolerance to be a significant criterion and revealed the criterion *tendency to use mobile Internet* is more significant than the criteria of withdrawal, relapse, or salience.

Addiction negatively affects social structure; it is important that it includes addictions to developing technology such as the Internet, online games, and mobile phones. Playing online games was confirmed to have a potential for addiction using the DSM-V diagnostic criteria, and the relevant expectations become stronger when the APA includes in its diagnostic criteria all Internet transactions and technologies like mobile phones that have an increased risk of addiction. The APA draws attention to the inadequacy of clinical findings and has mentioned the lack of studies. In this framework, determining the relations of technological devices that have entered into society to addiction by developing scales whose structures have been reliably validated is important for providing these mentioned much-needed findings.

Kaynakça/References

- Anjarwalla, T. (2016). *Inventor of cell phone: We knew someday everybody would have one*. Retrieved from <http://edition.cnn.com/2010/TECH/mobile/07/09/cooper.cell.phone.inventor/>
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (DSM-IV)*. Washington, DC: Author.
- American Psychiatric Association. (2013). *Highlights of changes from DSM-IV-TR to DSM-5*. Retrieved from <http://www.dsm5.org/Documents/changes%20from%20dsm-iv-tr%20to%20dsm-5.pdf>
- Bettinardi-Angres, K., & Angres, D. H. (2010). Understanding the disease of addiction. *Journal of Nursing Regulation*, 1(2), 31–37.
- Bianchi, A., & Phillips, J. G. (2005). Psychological predictors of problem mobile phone use. *CyberPsychology & Behavior*, 8(1), 39–51.
- Billieux, J., Vander Linden, M., & Rochat, L. (2008). The role of impulsivity in actual and problematic use of the mobile phone. *Applied Cognitive Psychology*, 22(9), 1195–210.
- Billieux, J., Maurage, P., Fernandez, O. L., Kuss, D. J., & Griffiths, M. D. (2015). Can disordered mobile phone use be considered a behavioral addiction? An update on current evidence and a comprehensive model for future research. *Current Addiction Reports*, 2(2), 156–162.

- Brown, R. I. (1986). Arousal and sensation seeking components in the general explanation of gambling and gambling addictions. *The International Journal of the Addictions*, 21, 1001–1016.
- Caber, M. (2010). *Tur operatörü-seyahat acentesi elektronik müşteri ilişkileri yönetiminde web sitesi kalitesinin memnuniyet ve güven üzerine etkisi* (Doktora tezi, Akdeniz Üniversitesi, Sosyal Bilimler Enstitüsü, Antalya). <https://tez.yok.gov.tr/UlusalTezMerkezi/> adresinden edinilmiştir.
- Çağıltay, K. E. (2005). Dönüşümü kullanabilmek? İnsan bilgisayar etkileşimi, kullanılabilirlik ve e-devlet projeleri. *Bilişim*, 91, 16–17.
- Carbonell, X., Guardiola, E., Beranuy, M., & Bellés, A. A. (2009). Bibliometric analysis of the scientific literature on internet, video games, and cell phone addiction. *Journal of the Medical Library Association*, 97(2), 102–107.
- Choliz, M. (2012). Mobile-phone addiction in adolescence: The test of mobile phone dependence (TMD). *Progress in Health Sciences*, 2(1), 33–44.
- Consumer News & Business Channel. (2011). *Marc Andreessen is bullish on the economy*. Retrieved from <http://www.cnbc.com/id/47244961>
- Davis, C., & Carter, J. C. (2009). Compulsive overeating as an addiction disorder: A review of theory and evidence. *Appetite*, 53, 1–8.
- Demirci, K., Orhan, H., Demirdağ, A., Akpınar, A., & Sert, H. (2014). Validity and reliability of the Turkish version of the smartphone addiction scale in a younger population. *Klinik Psikofarmakoloji Bülteni*, 24(3), 226–34.
- Diaper, D., & Sanger, C. (2006). Tasks for and tasks in human–computer interaction. *Interacting with Computers*, 18, 117–138.
- Dix, A., Finlay, J., Abowd, G. D., & Beale, R. (1992). *Human computer interaction* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.
- Fitchard, K. (2013). *Ericsson: Global smartphone penetration will reach 60% in 2019*. Retrieved from <https://gigaom.com/2013/11/11/ericsson-global-smartphone-penetration-will-reach-60-in-2019/>
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 391–450.
- Griffiths, M. (2005). A ‘components’ model of addiction within a biopsychosocial framework. *Journal of Substance Use*, 10(4), 191–197.
- Griffiths, M. D. (1995). Technological addictions. *Clinical Psychology Forum*, 76, 14–19.
- Griffiths, M. D., Pontes, H. M., & Kuss, D. J. (2016). Online Addictions: Conceptualizations, debates, and controversies. *Addicta: The Turkish Journal on Addictions*, 3, 151–164. <http://dx.doi.org/10.15805/addicta.2016.3.0101>
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate data analysis* (7th ed.). Edinburgh, EH: Pearson Education.
- Helmuth, L. (2001). Beyond the pleasure principle. *Science*, 294(5544), 983–984.
- Hinze-Hoare, V. (2007). The review and analysis of human computer interaction (HCI) principles. *The Computing Research Repository (CoRR)*. Retrieved from <http://arxiv.org/pdf/0707.3638>
- Hong, F. Y., Chiu, S. I., & Huang, D. H. (2012). A model of the relationship between psychological characteristics, mobile phone addiction and use of mobile phones by Taiwanese university female students. *Computers in Human Behavior*, 28(6), 2152–2159.

- Hope, D. (2010). *iPhone addictive, survey reveals, live science*. Retrieved from <http://www.livescience.com/6175-iphone-addictive-survey-reveals.html>
- İnsani Yardım Vakfı, (2015). *Teknoloji kullanımı ve bağımlılığı açısından Türkiye gençliğinin fotoğrafı*, Sakarya Üniversitesi, İnsani ve Sosyal Araştırmalar Merkezi, Uluslararası Doktorlar Birliği, Sakarya. <http://insamer.com/wp-content/uploads/2015/03/Teknoloji-Bagimlilik.pdf> adresinden edinilmiştir.
- Johansson, A., & Götestam, K. G. (2004). Internet addiction: Characteristic of a questionnaire and prevalence in Norwegian youth (12-18 years). *Scandinavian Journal of Technology*, 45, 223–229.
- Kaur, J., Agarwal, N., & Bhatia, M. S. (2009). Exercise addiction. *Delhi Psychiatry Journal*, 12(1), 107–109.
- King A. L. S., Valenca A. M., Silva A. C. O., Baczynski T., Carvalho M. R., & Nardi A. E. (2013). Nomophobia: Dependency on virtual environments or social phobia? *Computers in Human Behavior*, 29(1), 140–144.
- Ko, C. H., Liu, G. C., Hsiao, S., Yen, J. Y., Yang, M. J., Lin, W. C., Yen, C. F., & Chen, C. S. (2009). Brain activities associated with gaming urge of online gaming addiction. *Journal of Psychiatric Research*, 43(7), 739–747.
- Kootstra, G. J. (2004). *Exploratory factor analysis: Theory and application*. Retrieved from <http://www.let.rug.nl/nerbonne/teach/rema-stats-meth-seminar/Factor-Analysis-Kootstra-04.pdf>
- Kuss, D. J., Shorter, G. W., Rooij, A. J., Griffiths, M. D., & Schoenmakers, T. M. (2013). Assessing internet addiction using the parsimonious internet addiction components model—a preliminary study. *International Journal of Mental Health and Addiction*, 12(3), 351–366.
- Kwon, M., Lee, J. Y., Won, W. Y., Park, J. W., Min, J. A., & Hahn, C. (2013). Development and validation of a smartphone addiction scale (SAS). *PLoS One*, 8(2), 1–7. <http://dx.doi.org/10.1371/journal.pone.0056936>
- Lee, Y. K., Chang, C. T., Lin, Y., & Cheng, Z. H. (2014). The dark side of smartphone usage: Psychological traits, compulsive behavior and technostress. *Computers in Human Behavior*, 31, 373–383.
- Lesh, N., Marks, J., Rich, C., & Sidner, C. L. (2002). “Man-Computer Symbiosis” revisited: Achieving natural communication and collaboration with computers. *IEEE Trans*, E85-A(1). Retrieved from www.merl.com/reports/docs/tr2004-053.pdf
- Leshner, A. (1997). Addiction is a brain disease, and it matters. *Science*, 278(5335), 807–808.
- Licklider, J. C. R. (1960). Man-Computer symbiosis. *Transactions on Human Factors in Electronics*, HFE(1), 4–11.
- Lu, X., Watanabe, J., Liu, Q., Uji, M., Shono, M., & Kitamura, T. (2011). Internet and mobile phone text-messaging dependency: Factor structure and correlation with dysphoric mood among Japanese adults. *Computers in Human Behavior*, 27(5), 1702–1709.
- Marlatt, G. A., Baer, J. S., Donovan, D. M., & Kivlahan, D. R. (1988). Addictive behaviors: Etiology and treatment. *Annual Review of Psychology*, 39, 223–252.
- McIlwraith, R., Jacobvitz, R. S., Kubey, R., & Alexander, A. (1991). Television addiction: Theories and data behind the ubiquitous metaphor. *American Behavioral Scientist*, 35, 104–121.
- Merlo, L. J., Stone, A. M., & Bibbey, A. (2013). Measuring problematic mobile phone use: Development and preliminary psychometric properties of the PUMP scale. *Hindawi Publishing Corporation Journal of Addiction*, 2013, 1–7. <http://dx.doi.org/10.1155/2013/912807>

- Miller, G. (2012). The smartphone psychology manifesto. *Perspectives on Psychological Science*, 7(3), 221–237.
- Noyan, C. O., Darçın, A. E., Nurmedov, S., Yılmaz, O., & Dilbaz, N. (2015). Akıllı telefon bağımlılığı ölçeğinin kısa formunun üniversite öğrencilerinde Türkçe geçerlilik ve güvenilirlik çalışması. *Anadolu Psikiyatri Dergisi*, 16(Özel sayı.1), 73–81. <http://dx.doi.org/10.5455/apd.176101>
- Park, W. (2005). Mobile phone addiction. *Mobile Communications*, 31, 253–272.
- Polat, Y. (2012). *Faktör analizi yöntemlerinin karşılaştırmalı olarak incelenmesi ve hayvancılık denemesine uygulanışı* (Doktora Tezi, Çukurova Üniversitesi, Fen Bilimleri Enstitüsü, Adana). <https://tez.yok.gov.tr/UlusalTezMerkezi/> adresinden edinilmiştir.
- Porter, G., & Kakabadse, N. K. (2006). HRM perspectives on addiction to technology and work. *Journal of Management Development*, 25(6), 535–560.
- Regier, D. A., Kuhl, E. A., & Kupfer, D. J. (2013). The DSM-5: Classification and criteria changes. *World Psychiatry*, 12(2), 92–98.
- Reid, D. J., & Reid, F. J. M. (2007). Text or talk? Social anxiety, loneliness, and divergent preferences for cell phone use. *CyberPsychology and Behavior*, 10(3), 424–435.
- Salehan, M., & Negahban, A. (2013). Social networking on smartphones: When mobile phones become addictive. *Computers in Human Behavior*, 29, 2632–2639.
- Şar, A. H., & Işıklar, A. (2012). Adaptation of problem mobile phone use scale to Turkish. *International Journal of Human Sciences*, 9(2), 264–275.
- Shaffer, H. J., LaPlante, D. A., LaBrie, R. A., Kidman, R. C., Donato, A. N., & Stanton, M. V. (2004). Towards a syndrome model of addiction: Multiple expressions, common etiology. *Harvard Review of Psychiatry*, 12, 1–8.
- Shneiderman, B. (1980). *Software psychology: Human factors in computer and information systems*. Cambridge, UK: Winthrop.
- Shotton, M. (1991). The costs and benefits of computer addiction. *Behaviour and Information Technology*, 10(3), 219–230.
- Smith, R. (1986). Television addiction. In J. Bryant & D. Zillmann (Eds.), *Perspectives on media effects* (pp. 109–128). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Statista. (2016). *Mobile phone users worldwide 2013-2019*. Retrieved from <https://www.statista.com/statistics/274774/forecast-of-mobile-phone-users-worldwide/>
- Sultan, A. J. (2014). Addiction to mobile text messaging applications is nothing to “lol” about. *The Social Science Journal*, 51, 57–69.
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using Multivariate Statistics* (6th ed.). Boston, MA: Pearson.
- Telecommunication Development Sector. (2015). *ICT Facts & Figures 2015*. Retrieved from <http://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx>
- Toda, M., Ezoe, S., Nishi, A., Mukai, T., Goto, M., & Morimoto, K. (2008). Mobile phone dependence of female students and perceived parental rearing attitudes. *Social Behavior and Personality*, 36(6), 765–770.
- Türkiye İstatistik Kurumu. (2015). *Hanehalkı bilişim teknolojileri kullanım araştırması*. <http://www.tuik.gov.tr/PreHaberBultenleri.do?id=18660> adresinden edinilmiştir.

- Turel, O., Serenko, A., & Giles, P. (2011). Integrating technology addiction and use: An empirical investigation of online auction users. *MIS Quarterly*, 35(4), 1043–1061.
- Walker, M. B. (1989). Some problems with the concept of “gambling addiction”: Should theories of addiction be generalized to include excessive gambling? *Journal of Gambling Behavior*, 5(3), 179–200.
- Walsh, S. P., White, K. M., & Young, R. M. (2010). Needing to connect: The effect of self and others on young people’s involvement with their mobile phones. *Australian Journal of Psychology*, 62(4), 194–203.
- West, D. (2013). Invention and the mobile economy. *Brookings Institution Policy Report, Issues in Technology Innovation*. Retrieved from <http://www.brookings.edu/research/papers/2013/03/05-invention-mobile-economy-west>
- Yen, C. F., Tang, T. C., Yen, J. Y., Lin, H. C., Huang, C. F., Liu, S. C., & Ko, C. H. (2009). Symptoms of problematic cellular phone use, functional impairment and its association with depression among adolescents in Southern Taiwan. *Journal of Adolescence*, 32(4), 863–873.
- YerelNet. (2016). *Yerel Yönetimler Portalı*. <http://burdur.yerelnet.org.tr/> adresinden edinilmiştir.
- Yıldırım, C., & Correia, A. P. (2015). Exploring the dimensions of nomophobia: Development and validation of a self-reported questionnaire. *Computers in Human Behavior*, 49, 130–137.
- Yıldırım, C., Sumuer, E., Adnan, M., & Yıldırım, S. (2016). A growing fear: Prevalence of nomophobia among Turkish college students. *Information Development*, 32(5), 1–10. <http://dx.doi.org/10.1177/0266666915599025>
- Young, K. S. (1998). Internet addiction: The emergence of a new clinical disorder. *CyberPsychology & Behavior*, 1(3), 237–244.
- Young, K. S. (2007). Cognitive behavior therapy with internet addicts: Treatment outcomes and implications. *Cyberpsychology & Behavior*, 10(5), 671–679.
- Yung, K., Eickhoff, E., Davis, D. L., Klam, W. P., & Doan, A. P. (2015). Internet addiction disorder and problematic use of Google Glass™ in patient treated at a residential substance abuse treatment program. *Addictive Behaviors*, 41, 58–60.