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Modelling smartphone addiction: The role of smartphone usage, self-regulation, general self-efficacy and cyberloafing in university students

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ABSTRACT

The present study investigates the roles of smartphone usage, self-regulation, general self-efficacy and cyberloafing in smartphone addiction. We conducted an online survey which received responses from 598 participants attending a public university in Ankara, Turkey. The results showed that both the duration of smartphone usage and cyberloafing positively affected smartphone addiction. The effect of self-regulation on smartphone addiction was negative and significant. In addition, neither self-regulation nor general self-efficacy had an effect on cyberloafing. Research results are discussed within the context of the effect of smartphone addiction on learning environments and individuals.

1. Introduction

Along with providing the opportunity to access the internet, mobile phones have today become more than just a means of communication among individuals. They have transformed into tools which provide virtual environments and digital identities through which people seek enjoyment, and which also enable users to do shopping and manage their finances. This change has also altered the patterns of mobile phone usage and left this technology subject to potentially problematic usage. Such problematic usage of mobile phones interferes with other activities in daily life, alters interpersonal relations and may even affect people's health and happiness (Augner & Hacker, 2012; Chóliz, 2012; Leung, 2008). Problematic mobile phone usage can be categorized as: dangerous usage (e.g. using a mobile phone while driving), inappropriate usage (e.g. using a phone in cinema or class), and overuse (Walsh, White, & Young, 2007). All three usage types are considered as important indicators that someone is on the path to smartphone addiction (Chóliz, 2012). Smartphone addiction causes either directly or indirectly various problems in terms of mental health, campus life and interpersonal relationships (Choi, Lee, & Ha, 2012). There correlation between loneliness, timidity and smart phone addiction (Bian & Leung, 2015). According to the phenomenological research results regarding smartphone addiction, problematic behaviors such as desperate efforts to connect with others, excessive time spent on smartphones, losing temper, psychological disorders and disruptions in daily works were reported (Ko, Lee, & Kim, 2012).

It seems possible that those young people who tend to have a smartphone addiction are also likely to have social, domestic and academic problems. In fact, it has been stated that such individuals' use of smartphones is higher compared to others, and their tendency to use them gradually increases (Kwon et al., 2013). Young people of the most recent generation, also sometimes known as the 'wired generation' (Barnes, 2009), continually organize their activities through their smartphones in class or elsewhere, manage their social networks and use smartphones to keep in touch with each other (Jacobsen & Forste, 2011). When it is considered that

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young people's tendency to suffer from smartphone addiction is directly proportional to their mobile phone usage (Augner & Hacker, 2012; Martinotti et al., 2011; Walsh et al., 2007), and that mobile phone addiction is the most extreme unhealthy behaviour with regard to mobile phone usage (Hong, Chiu, & Huang, 2012), it can be assumed that inappropriate use of mobile phones in the classroom environment will affect students in a negative way. Furthermore, the opportunity to access the internet everywhere, using various methods, and the increase of eye-catching applications, may cause students to engage in extraneous activities during class, in other words, to practice 'cyberloafing' (Kim, Triana, Chung, & Oh, 2015). Cyberloafing might include communicating with friends via social networks, surfing on the internet or shopping online etc., and it affects students negatively (Blanchard & Henle, 2008; Tindell & Bohlander, 2012). While there are studies in which factors affecting cyberloafing behaviours have been studied (Junco, 2012; Tindell & Bohlander, 2012; Yılmaz, Yılmaz, Öztürk, Sezer, & Karademir, 2015), there have not yet been any studies examining the relation of cyberloafing to smartphone addiction. In addition, how certain personal traits (e.g. self-regulation, self-efficacy) affect smartphone addiction is not well enough known. In this regard, this study aims to analyse the effects of cyberloafing, self-regulation, and self-efficacy on smartphone addiction.

The rest of this paper is structured as follows. First, smartphone addiction and its causal factors are explained. These factors form variables including smartphone usage, self-regulation, general self-efficacy, and cyberloafing. Next, research hypotheses are provided along with the actual research regarding these variables. In the conclusion, the method used and the results of the research are discussed, and a model concerning the variables that explain smartphone addiction is provided.

2. Literature review

2.1. Smartphone addiction

In the literature mobile phone addiction has been given various different names such as 'problematic mobile phone usage', 'habitual mobile phone usage', and 'compulsive mobile phone usage' (Kim & Byrne, 2011). However, as a result of the addition of computational features to mobile phones and their enrichment through various applications, which have led to the transformation of mobile phones into today's smartphones, the expression 'smartphone addiction' is now used more commonly than 'mobile phone addiction'. While these concepts are sometimes used interchangeably (Kim & Byrne, 2011), this study is based on and uses the concept 'smartphone addiction'. Smartphone addiction is the excessive use of smartphones in a way that is difficult to control and its influence extends to other areas of life in a negative way (Park & Lee, 2012).

There were 4.55 billion mobile phone users worldwide in 2014, of whom 1.75 billion were smartphone users (EMarketer, 2014). While smartphone ownership by adults in America in 2011 was 35%, this rate was 64% in 2015 and younger Americans own more smartphones than others (Pew Research Center, 2015). Having reached such a wide rate of usage, smartphones are now more than just means of communication and affect human life in many different ways, especially as they are the devices which are in closest daily physical contact with individuals (Lee, Chang, Lin, & Cheng, 2014). Along with providing access to information through the internet, smartphones also enable the sharing and production of new material, and provide opportunities for communication, social interaction, game-playing, application use, and the creation of media files. Although they are beneficial devices which facilitate countless social and individual activities, the use of mobile phones brings with it various problems in the domestic, academic, occupational, and social spheres (Chóliz, 2012). As a type of problematic usage, smartphone addiction (Salehan & Negahban, 2013) has been described as 'an addiction-like behaviour leading individuals to use the cell phone compulsively' (Takao, Takahashi, & Kitamura, 2009). It has been argued that although smartphone addiction resembles other technological addictions it can be much more dangerous because smartphones offer unique features such as portability and ease-of-connectivity (Demirci, Orhan, Demirdas, Akpınar, & Sert, 2014).

Smartphone addiction is different from drug-based physiological addictions such as addiction to alcohol or heroin and is behaviour-based (Griffiths, 1998; Kim & Kim, 2002; van Deursen, Bolle, Hegner, & Kommers, 2015). The pleasure and excitement that initially arise from the use of smartphones may turn into a condition that is disruptive for both the individual and society in the long term. Overuse of smartphones and habitual checking may eventually push the users into compulsive usage or even to mobile phone addiction (Lee et al., 2014). While overuse causes sleeping problems and various health disorders, it also results in stress (Thomee, Harenstam, & Hagberg, 2011), and physical and mental development problems (Hadlington, 2015; Park & Park, 2014). When individuals cannot access their smartphones, they may fall into nomophobic behaviour such as: '(1) not being able to communicate, (2) losing connectedness with others, (3) not being able to access information, and (4) giving up convenience' (Yildirim, Sumuer, Adnan, & Yildirim, 2015).

When the research on smartphone addiction is studied, it can be observed that numerous variables have been taken into consideration. These include: user characteristics (Park & Lee, 2011); life stress (Chiu, 2014); academic success (Kibona & Mgaya, 2015; Mok et al., 2014; Olufadi, 2015; van Deursen et al., 2015); learning (Lee, Cho, Kim, & Noh, 2015); habits (Chen, Zhang, & Zhao, 2015); age (Kibona & Mgaya, 2015); self-regulation (Jeong, Kim, Yum, & Hwang, 2016; van Deursen et al., 2015; Ko et al., 2015); and duration of mobile phone usage (Hong et al., 2012; Kwon et al., 2013; Lin et al., 2015). Some research has suggested that smartphones might have an effect on the academic success of students (Junco & Cotten, 2012; Lepp, Barkley, & Karpinski, 2014; Kibona, & Mgaya, 2015). In this respect, smartphone addiction may cause individuals to disengage from class activities, to cheat in exams or break off their studies, and it may affect academic performance (Roberts, Yaya, & Manolis, 2014). Moreover, research has shown that students think smartphone addiction will have negative effect on academic success (Olufadi, 2015), but that they are not aware of their own smartphone addictions (Roberts et al., 2014).

While various features of smartphones have been pointed to as causes of addiction (Roberts et al., 2014), the major factors affecting smartphone addiction have yet to be revealed (Pi, 2013). Researchers have stressed the significance of research regarding smartphone usage and argued that it is necessary to conduct many more studies. Furthermore, it has been stated that self-regulation and the duration of smartphone usage are important variables affecting smartphone addiction (Jeong et al., 2016; Kwon et al., 2013; Lin et al., 2015). However, no relation has yet been suggested between cyberloafing and smartphone addiction. And there has been no research into how these variables, considered together, impact on and explain smartphone addiction. For this reason, the effects of self-regulation, the duration of smartphone usage and cyberloafing on smartphone addiction are analysed in this study.

2.2. Predictors of smartphone addiction

2.2.1. The duration of smartphone usage

Many smartphone users see their smartphone not only as a means of making phone calls, but also as a games console, a handheld computer, and even as a friend with whom they have a personal relationship (Kwon et al., 2013). The daily duration of calling and the number of messages sent are related to problematic phone usage (Augner & Hacker, 2012). In other words, excessive usage of smartphones causes addiction (Augner & Hacker, 2012; Kwon et al., 2013; Lin et al., 2015). According to the 'optimal follow theory', the frequent and repeated use of mobile phones may lead to addiction. Smartphone applications lead people to check their phones more frequently (Salehan & Negahban, 2013; van Deursen, Bolle, Hegner, &Kommers (2015). This habit of checking in turn causes people to use their phones much more (Oulasvirta, Rattenbury, Ma, & Raita, 2012). According to van Deursen et al. (2015), this process of checking is repeated since new messages, notifications and news feeds function as 'rewards' and, as a consequence, addiction may develop and control of behaviour be lost. According to the results of the study, habitual use of smartphones is included among the significant variables contributing to the smartphone addiction (van Deursen et al., 2015). It has been stated in all these studies that the duration of smartphone usage is a significant variable in terms of addiction. In line with these studies, the hypothesis can be suggested.

H1. The duration of smartphone usage has a positive effect on smartphone addiction.

2.2.2. Self-regulation

Self-regulation refers to "self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals" (Zimmerman, 2000, p. 14). Karoly (1993) described it as a number of processes 'internal and/or transactional, that enable an individual to guide his/her goal-directed activities over time and across changing circumstances (contexts). Regulation implies modulation of thought, affect, behaviour, or attention via deliberate or automated use of specific mechanisms and supportive metaskills' (p. 25). Another volitional aspect of self-regulation has been defined as the individual's ability to focus on predetermined goals in spite of distractors (Corno, 1993; Karoly, 1993; Kuhl, 1992; Zimmerman, 1995). Self-regulation also covers the regulation of both feelings and attention (Diehl, Semegon, & Schwarzer, 2006; Kim et al., 2015). Self-regulation theory as it relates to addictive behaviors (Brown, 1998; Köpetz, Lejuez, Wiers, & Kruglanski, 2013).

When the literature is analysed, it can be seen that self-regulation mechanisms have an important role in disorders such as internet addiction (Dawe & Loxton, 2004; LaRose, Lin, & Eastin, 2003), media addiction (LaRose & Eastin, 2004), and smartphone addiction (van Deursen et al., 2015). LaRose and Eastin (2004) suggested that an individual's failure to self-regulate might cause his/her media usage to increase and that this situation might turn into an addiction to media. van Deursen et al. (2015) suggested that low levels of self-regulation lie behind the risk of smartphone addiction. Jeong et al. (2016) came to the conclusion that individuals lacking skills in self-regulation are more likely to be addicted to smartphones. In parallel with these studies, the hypothesis below is suggested:

H2. Self-regulation has a negative effect on smartphone addiction.

2.2.3. Cyberloafing

Having developed a topology of concepts regarding personal Internet usage and studied the relations among these concepts, Lim, Loo, and Teo (2001) – quoted in Lim, Teo and Loo (2002, p.67) – defined cyberloafing as 'any voluntary act of employees using their companies' Internet access during office hours to surf non-work-related web sites for non-work purposes, and access (including receiving and sending) non-work-related email'. As personal technological devices such as smartphone and tablet PCs have become popular, the structure of internet access and usage has also changed and the potential for individuals to engage in cyberloafing behaviours has increased (Kim et al., 2015). When classroom environments are considered, it can be seen that students have now started to use their smartphones in multiple different ways, although there are differences between cyberloafing at work and cyberloafing in school (Baturay & Toker, 2015). Cyberloafing at school has been defined as the tendency for students to use the internet during course hours for activities not relevant to their schoolwork (Kalaycı, 2010). There are a number of studies in the literature relating to cyberloafing for specific student groups (Akbulut, Dursun, Dönmez, & Şahin, 2016; Yılmaz et al., 2015; Baturay & Toker, 2015). Research has also stated that cyberloafing behaviours cause various negative effects for students and the learning environment in general. For example, one study states that almost all of the students were texting in the class, but that no one was aware that the other students and the teacher were being affected negatively by this texting (Tindell & Bohlander, 2012). In a study carried out with a big working group, it was found that social network usage and cyberloafing in the form of texting affected academic success (GPA) negatively (Junco, 2012). Moreover, it has also been pointed out that cyberloafing is an obstacle in the integration of information and communication technologies into teaching and learning environments (Yılmaz et al., 2015).

A lack of self-regulation is classified as an important determinant of cyberloafing (Prasad, Lim, & Chen, 2010; Yellowees & Marks, 2007). In a similar way, Wagner, Barnes, Lim, and Ferris (2012) stated that high self-regulation is a significant variable in resisting cyberloafing behaviours. The ego depletion model of self-regulation is used to explain the relationship between the two variables (Muraven & Baumeister, 2000). Individuals with a high level of self-regulation may have the willpower to resist the temporary satisfaction that cyberloafing behaviours provide, be able to suppress their immediate reactions and avoid these behaviours. On the other hand, individuals with a low level of self-regulation might be inclined to cyberloaf more since they will lack attention, avoid focusing on their work and be unable to avoid distractors (Eerde, 2000; Restubog et al., 2011; Wilkowski & Robinson, 2008). Asserting that individuals with inadequate self-regulation will tend to cyberloaf more, Kim and Byrne (2011) suggested that the effects of individuals' self-regulation skills on their cyberloafing behaviours should be studied. Similar suggestions have also been put forward by other researchers (Askew et al., 2014; Kim et al., 2015; Lavoie & Pychyl, 2001; Prasad et al., 2010). A recent study by Prasad et al. (2010) showed a negative relationship between self-regulation and cyberloafing. In another study conducted about cyberloafing at work, a negative relationship between self-regulation and cyberloafing behaviour was found (Restubog et al., 2011). In parallel with these studies, the hypothesis below is suggested:

H3. Self-regulation has a negative effect on cyberloafing.

There is no study in the body of literature which studies cyberloafing and smartphone addiction together. On the other hand, students' potential for cyberloafing behaviours has increased as a result of the growing use of smartphones (Kim et al., 2015). To illustrate, some researchers have postulated that young people generally use their smartphones to connect to social networking sites (SNSs), which can be seen as among behaviours leading to cyberloafing, to shape and construct their social circle (Andreassen, Torsheim, & Pallesen, 2014; Jacobsen & Forste, 2011). The four behaviors involved in cyberloafing are described as Development, Recovery, Deviant and Addiction Behaviors. "Cyberloafing is a habit and could result in problematic behaviour". Excessive cyber idleness behaviour is also related with addiction behaviour (Doorn, 2011). It can be asserted that smartphone applications which trigger cyberloafing behaviours are connected to an addiction to smartphones. In this regard, the following hypothesis is suggested:

H4. Cyberloafing has a positive effect on smartphone addiction.

2.2.4. General self-efficacy

Self-efficacy describes individuals' beliefs in their capacity to exercise control over challenging demands and over their own functioning. Belief in self-efficacy also influences cognitions, affect, and behaviours and may also help to deal with stressful circumstances (Bandura, 1997). There is a limited number of research studies on general self-efficacy and cyberloafing. However, it has been stated that there is a medium level of positive effect between the two variables (Prasad et al., 2010). In another study, it is claimed that surfing the internet at the workplace (cyberloafing) results from high self-efficacy levels (Garrett & Danziger, 2008). Individuals with higher general self-efficacy levels typically have significantly higher computer self-efficacy levels and technological competencies (McCoy, 2010; Paraskeva, Bouta, & Papagianni, 2008). Also, self-efficacy concerning web-related tools is included among the variables having significant impacts on cyberloafing (Lee, Lee, & Kim, 2007). In line with this the following hypothesis is suggested.

H5. General self-efficacy has a positive effect on cyberloafing.

In summary, the model below has been constructed based on the body of literature in order to investigate the effects of self-regulation, the duration of smartphone usage, cyberloafing, and general self-efficacy on smartphone addiction (Fig. 1).

In this model, the directions shown by one-way arrows between the variables form the hypotheses of the research (see Fig. 1). These hypotheses are as follows:

H1: The duration of smartphone usage has a positive effect on smartphone addiction.

H2: Self-regulation has a negative effect on smartphone addiction.

H3: Self-regulation has a negative effect on cyberloafing.

H4: Cyberloafing has a positive effect on smartphone addiction.

H5: General self-efficacy has a positive effect on cyberloafing.

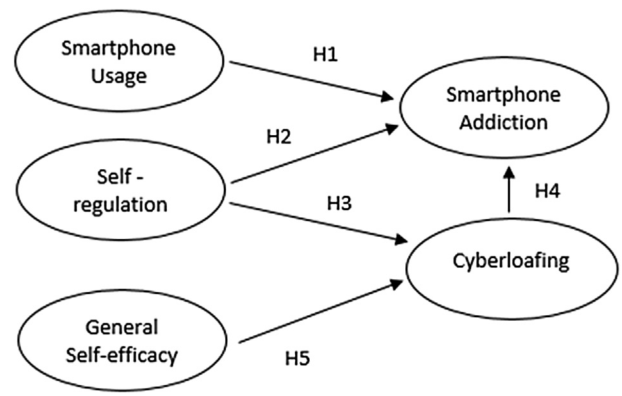

Fig. 1. Hypothetical models diagram.

3. Method

3.1. Participants

The research was conducted with 614 undergraduates, chosen by a convenience sampling method, who were studying in different departments at a public university in Ankara. The distribution of demographic characteristics of the sample is presented in Table 1.

When the demographic characteristics in Table 1 are viewed, it can be observed that 71% of the participants were female and 29% of them were male. 49% of students were in the first year of study, 18% in the second year, 18% in third year, and 15% in the fourth year. More than half (54%) of the participants were in the 19–20 age group.

3.2. Procedure

Data were collected through an online questionnaire that was distributed to the participating students in the sample via e-mail. Participants were sent a link together with a text describing the aim of the research and asked to participate on voluntary basis. Anonymity was ensured by not collecting identifying information about the participants (i.e., name, e-mail address). Furthermore, the collected data were accessed only by the researchers to maintain confidentiality. The time taken to fill in the questionnaire was around 15 min.

3.3. Instruments

A data collection tool consisting of two parts was used in the research. In the first part, there were questions pertaining to demographic characteristics (age, gender, year of study). The second part consisted of a 'Self-regulation Scale', 'General Self-efficacy Scale', 'Smartphone Addiction Scale' and 'Cyberloafing Scale', and two questions in order to measure smartphone usage.

The Self-regulation Scale was originally developed by Schwarzer, Diehl, and Schmitz (1999) in order to measure the attention-regulation aspect of self-regulation. It was then adapted into English by Diehl et al. (2006) and then into Turkish by Demiraslan Çevik, Haşlaman, Mumcu, and Gökçearslan (2015). As a result of the adaptation study, the scale consisted of one dimension and seven items (in a four-point Likert-type scale) in total. The Cronbach alpha internal consistency coefficient of the scale was found to be 0.84 and the test-retest reliability coefficient was found to be 0.67. The internal consistency coefficient of the entire scale was found to be 0.79 in the current study.

In the General Self-Efficacy Scale, there were ten items in a four-point Likert-type scale (1 = 'completely wrong', 4 = 'completely right'), which was developed by Schwarzer and Jerusalem (1995) in order to determine individuals' perceptions regarding their skills to cope with and adapt to life and which was converted into Turkish by Aypay (2010). As a result of the adaptation study, the scale consisted of two factors: 'effort and resistance' and 'skill and trust'. The internal consistency coefficient was calculated as 0.79 for the first factor, 0.63 for the second factor and 0.83 for the total scale. The test-retest reliability of the scale was 0.80. In the current study, the internal consistency coefficient for the first factor, 'effort and resistance', was 0.87; for the second factor, 'skill and trust', it was 0.80, and the internal consistency coefficient of the entire scale was found to be 0.88.

In the Smartphone Addiction Scale, there were ten items in a six-point Likert-type scale (1 = 'I absolutely disagree', 6 = 'I absolutely agree'), which was developed by Kwon et al. (2013) in order to measure the risk of smartphone addiction among young people and adapted into Turkish by Noyan, Darçın, Nurmedov, Yılmaz, and Dilbaz (2015). As a result of the work of adaptation, the Cronbach alpha coefficient of scale was calculated at 0.87 and the test-retest

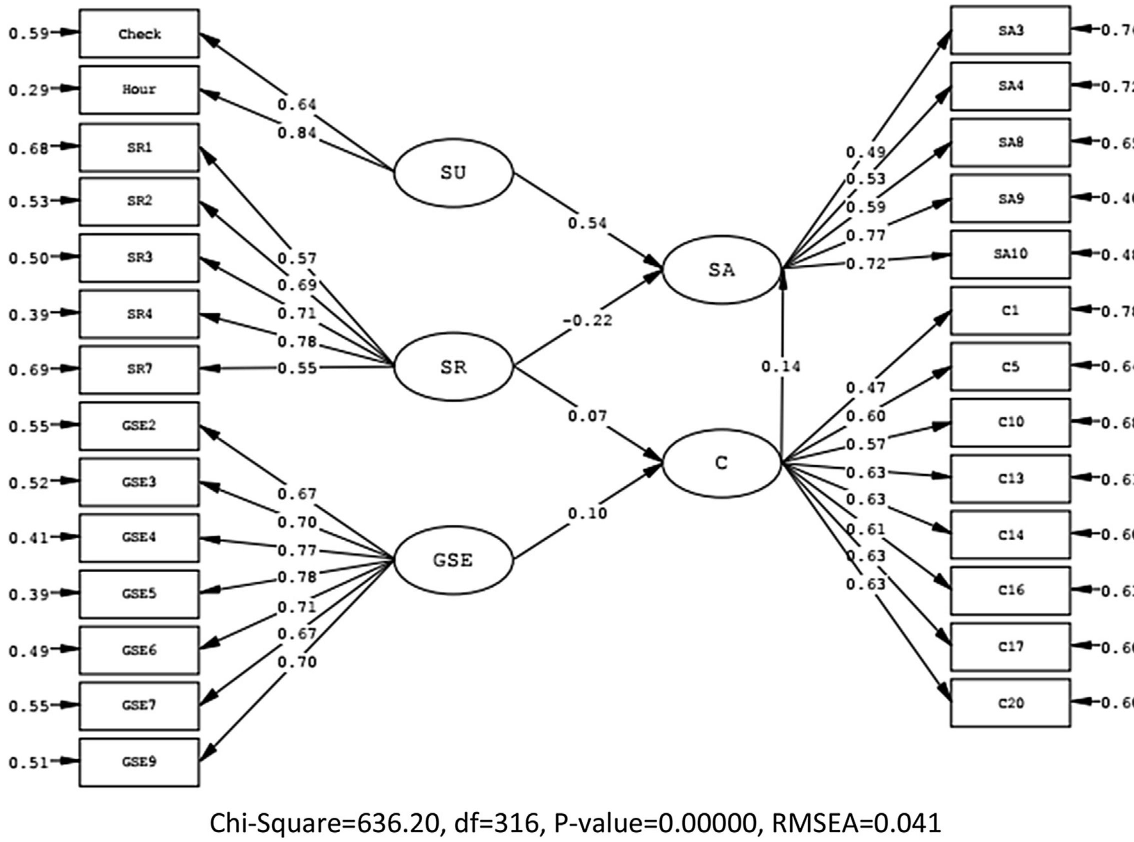

Fig. 2. Structural equation model path diagram (standardized coefficients).

Table 1
Demographic characteristics of the sample.

Variable	Type	n	%
Gender	Female	423	71
	Male	175	29
Grade	1st Year	293	49
	2nd Year	106	18
	3rd Year	110	18
	4th Year	89	15
Age	18	70	11
	19	168	28
	20	155	26
	21	67	15
	22+	118	20
	Total	598	100

reliability coefficient was calculated as 0.93. The internal consistency coefficient for the entire scale was found to be 0.76 in this study.

In the Cyberloafing Activities Scale, there were 23 items in a five-point Likert-type scale, which was developed by Yaşar (2013) in order to measure students' cyberloafing levels during learning activities. The Cronbach alpha value of the 'individual' dimension was 0.94, the Cronbach alpha value of the 'search' dimension was 0.77, the Cronbach alpha value of the 'social' dimension was 0.84, and the Cronbach alpha value of the 'news' dimension was calculated as 0.76. The internal consistency coefficient of the entire scale in this study was calculated to be 0.82.

Smartphone usage Items: Two questions were addressed to the participants in the research in order to measure smartphone usage. Checking habits and hours of usage are important variable for smartphone use behaviour (Oulasvirta et al., 2012; Shin & Dey, 2013). The first question was: 'How many times a day on average do you check your smartphone?' and the options given were: 'less than 10', '10–20', '20–30', '30–40' and 'more than 40'. The second question was: 'How many hours a day do you spend using your smartphone?' and the options given were: 'less than 1 h', '1–2 h', '3–4 h', '5 or more'. By collecting the answers given by the participants to these two questions, their smartphone usage points were acquired. The internal consistency coefficient of smartphone usage construct in this study was calculated to be 0.67.

3.4. Data analysis

3.4.1. Studying the assumptions

Before the data analysis, the data set was examined in terms of missing data, sampling size, univariate and multivariate normality, outliers, multicollinearity, and residual value (Tabachnick & Fidell, 2007). It was seen that there was no missing data in the data set. For the assumption of the sampling size, it has been determined that the ratio of observation number to the parameter number should be at least 10:1 (Kline, 2010). This condition was met in the research. Furthermore, since the kurtosis and skewness values were adequate, it could be seen that the univariate normality was met; and by using a scatter diagram, it was seen that the linearity was met. Based on the Mardia's test (1970) for multivariate normality, the relative multivariate kurtosis coefficient (1.027) was significant.

The correlation matrix was analysed to check for multicollinearity and singularity. With multicollinearity, the variables are very highly correlated; with singularity, the variables are redundant; one of the variables is a combination of two or more of the other variables (Tabachnick & Fidell, 2007). In addition, to analyse the multicollinearity problem, Variance Inflation Factor (VIF) and Tolerance (T) and Conditional Index (CI) values were examined. It was seen in the data set that VIF values were lower than 10, all of the T values were different from 0, CI values were lower than 30, and therefore there was no problem of multicollinearity (Hair, Anderson, Tatham, & Black, 1984).

In order to determine univariate outliers, standardized residual values were studied (Hair et al., 1984). In the determination of residual values; standardized, student and deleted student residual values were analysed. Mahalanobis distance value was considered in the determination of multivariate outliers. To establish whether residual observations were efficient observations or not, standardized dfbeta, covratio test and Cook's distance were examined. After the testing of assumptions, measurement model analysed data from the 598 subjects, who were left after 16 had been deleted from the data set.

3.4.2. Assumptions of model fitness

In structural equation modelling, various goodness-of-fit indices are used in the evaluation of model's fit to data. x^2/sd goodness-of-fit is used primarily in the research. Kelloway (1998) stated that the fact that x^2/sd rate is lower than 5 shows there is a high level of goodness-of-fit between the data set and model. Quoted from Bollen (1989) by Schermelleh-Engel, Moosbrugger, &Müller (2003) the fact that this rate is between 2 and 3 shows that there is an acceptable level of goodness-of-fit between the data set and model. The fact that other goodness of fit indices used in the research showed, for example, an NNFI value is higher than 0.95 (Bentler & Bonett, 1980), SRM-R value equal to 0.08 or lower than 0.08, CFI value higher than 0.95 (Hu & Bentler, 1999), indicated that the model had acceptable values of goodness-of-fit. In their study, as quoted from Browne and Cudeck (1993) by Schermelleh-Engeln et al., (2003) state that when the RMSEA index is lower than 0.05, the goodness-of-fit level is good, when it is close to 0.08, the goodness-of-fit level is acceptable, and the index's being close to 0.10 also indicated goodness-of-fit.

3.4.3. Analysis method

The structural equation modelling analysis emerges from the combination of multivariate statistical techniques and is a strong analytical method. In this regard, the analysis is an efficient way of testing the model and developing a method that can explain cause-and-effect relation of the variables in mixed hypotheses related to the statistical addiction-based models, and that enables the models, which have a theoretic foundation, to be tested as a whole. In line with this, the model is examined using the data acquired from the research. The data obtained as a result of the analysis was analysed in terms of various goodness of fit indices that are usually used in evaluation of the model's suitability with regards to the data in structural equation modelling.

4. Results

Findings are presented by first providing the results of measurement model and then the structural and path model.

4.1. Measurement model

We used the two-step approach to make meaningful inferences about theoretical constructs and their interrelations (Anderson & Gerbing, 1988). Firstly, we checked structure of the measurement model and then evaluated the structural model for testing of the hypotheses. These models were conducted using LISREL 8.7 software. Our measurement model fit the data well using the criteria which was described above the section 3.4.2. [($x^2_{(1207)}$ = 3426.28; x^2/df = 2.8); Comparative Fit Index (CFI) = 0.95; Non-Normed Fit Index (NNFI) = 0.94; Root Mean Square Error of Approximation (RMSEA) = 0.055; Standardized RMR (SRMR) = 0.058].

Convergent validity specifies that items which are indicators of a construct should share a high proportion of variance and several ways are available to estimate the relative amount of convergent validity among item measures (Hair, Black, Babin, Anderson, & Tatham, 2006).

One way of doing this is that the convergent validity of the scale items should be assessed according to factor loadings which should be greater than 0.50 (Hair et al., 2006). For this reason, we eliminated the measures with low factor loadings (<0.50) from the scales (except 0.47 and 0.49). As a result, "all path coefficients from latent factors to their corresponding indicators were appropriately high (ranging from 0.47 to 0.84 for standardized coefficients) and significant" (Sultan, Rohm, & Gao, 2009).

A second way is that the composite reliability for each construct should be 0.70. In this research the reliability of the measurement model was supported by testing Cronbach's α (from 0.67 to 0.88) and composite reliability (from 0.71 to 0.88).

A third way is that the Average Variance Extracted (AVE) for each construct should be above 0.50 (Fornell & Larker, 1981; Hair et al., 2006). The AVE values of the constructs exceeded the 0.50 cut-off, with the exception of Smartphone Addiction (AVE = 0.40), Cyberloafing Activities (AVE = 0.36), and Self-regulation (AVE = 0.44). The measures of General Self-efficacy (AVE = 0.51) and Smartphone Usage (AVE = 0.56) were close to the 0.50 cut off point. (Table 3).

However, the Smartphone Addiction (CR = 0.86), Cyberloafing Activities (CR = 0.88), and Self-regulation (CR = 0.83) dimensions were found to have adequate convergent validity based on their high composite reliability (>0.70) (Hair et al., 2006). As can be seen, even though the AVE values of three scales are lower than 0.50, two conditions that support the convergent validity are realized (Hair et al., 2006). "Moreover Fornell and Larcker said that if AVE is less than 0.5, but composite reliability is higher than 0.6, the convergent validity of the construct is still adequate". (Fornell & Larcker, 1981; Huang, Wang, Wu, & Wang, 2013).

Table 2 shows the correlation matrix, means, standard deviations and Table 3 shows Cronbach alphas (from 0.67 to 0.88), composite reliabilities (from 0.71 to 0.88), and AVEs (from 0.36 to 0.56). A normal distribution test of the variables showed that all skewness coefficients of the five dependent variables were smaller than 1, and all kurtosis coefficients were smaller than 1. This indicated that subsequent data analyses could be conducted. In addition Table 2 showed significant relationships between Smartphone Usage, Cyberloafing, Self-Regulation, General Self-efficacy, and Smartphone Addiction.

Discriminant validity was evaluated by comparing the square root of AVE calculated for each construct with the interconstruct correlations associated with the factors. The square root of AVE for all factors should be greater than all the correlations between that construct and other constructs. Table 4 shows the square roots of AVE and interconstruct correlations cross factor loading extracted for all latent variables. After assessing the measurement model validity, goodness-of-fit indexes were tested again. [(x2(314) = 633.26; x2/df = 2.02); Comparative Fit Index (CFI) = 0.97; Non-Normed Fit Index (NNFI) = 0.97; Root Mean Square Error of Approximation (RMSEA) = 0.041; Standardized RMR (SRMR) = 0.046].

4.2. Structural and path model

Structural Equation Modelling (SEM) was used to evaluate the

Table 2
Correlations among constructs, means, standard deviations, skewness, kurtosis, (N = 598).

Constructs	1	2	3	4	5	M	SD	Skewness	Kurtosis
Smartphone addiction	1.00					20.96	7.56	0.18	−0.70
Cyberloafing	0.17**	1.00				35.17	11.03	−0.03	−0.44
Self-regulation	−0.25**	0.11	1.00			16.81	3.36	0.003	0.22
General self-efficacy	−0.16**	0.16**	0.59**	1.00		31.36	5.82	−0.04	0.26
Smartphone usage	0.44**	0.08**	−0.07	−0.04	1.00	06.49	1.93	−0.35	−0.83

*Correlation is significant at the 0.05 level (2-tailed).
**Correlations are significant at 0.01 level.

Table 3
SEM results of the model.

Construct/Item	SL	T-values	R^2	α	ρ	AVE
SR: Self-regulation				0.79	0.80	0.44
SR1: I can concentrate on one activity for a long time. If necessary	0.57	13.91***	0.32			
SR2: If I am distracted from an activity. I don't have any problem coming back to the topic quickly	0.69	17.65***	0.47			
SR3: If an activity arouses my feelings too much. I can calm myself down so that I can continue with the activity soon.	0.71	18.22***	0.50			
SR4: If an activity requires a problem-oriented attitude. I can control my feelings	0.78	20.86***	0.61			
SR7: I stay focused on my goal and don't allow anything to distract me from my plan of action.	0.55	13.50***	0.31			
SU: Smartphone Usage				0.67	0.71	0.56
Check: How many times a day on average do you check your smartphone?	0.64	13.04***	0.41			
Hour: How many hours a day do you spend using your smartphone?	0.84	15.51***	0.71			
GSE: General Sel-efficacy				0.88	0.88	0.51
GSE2: If someone opposes me. I can find the means and ways to get what I want.	0.67	17.84***	0.45			
GSE3: It is easy for me to stick to my aims and accomplish my goals.	0.70	18.62***	0.48			
GSE4: I am confident that I can deal efficiently with unexpected events.	0.77	21.39***	0.59			
GSE5: Thanks to my resourcefulness. I know how to handle unforeseen situations.	0.78	21.73***	0.61			
GSE6: I can solve most problems if I invest the necessary effort.	0.71	19.26***	0.51			
GSE7: I can remain calm when facing difficulties because I can rely on my coping abilities.	0.67	17.70***	0.45			
GSE9: If I am in trouble. I can usually think of a solution.	0.70	18.74***	0.49			
C: Cyberloafing				0.82	0.82	0.36
C1: I go on online shopping sites.	0.47		0.22			
C5: I search for biographical information of people using a search engine.	0.60	9.50***	0.36			
C10: I visit employment or career sites.	0.57	9.21***	0.32			
C13: I check my e-mails.	0.63	9.69***	0.39			
C14: I visit discussion groups.	0.63	9.75***	0.40			
C16: I download files (such as music. software. and video).	0.61	9.54***	0.37			
C17: I read blog pages.	0.63	9.75***	0.40			
C20: I visit new sites.	0.63	9.73***	0.40			
SA: Smartphone Addiction				0.76	0.76	0.40
SA3: Feeling pain in the wrists or at the back of the neck while using a smartphone	0.49		0.24			
SA4: Won't be able to stand not having a smartphone	0.53	9.02***	0.28			
SA8: Constantly checking my smartphone so as not to miss conversations between other people on Twitter or Facebook	0.59	9.65***	0.35			
SA9: Using my smartphone longer than I had intended	0.77	10.84***	0.60			
SA10: The people around me tell me that I use my smartphone too much	0.72	10.58***	0.52			
Hypotheses			**Results**			
H1: Smartphone usage (SU) → Smartphone addiction (SA)	0.54	8.17***	Supported			
H2: Self-regulation (SR)→ Smartphone addiction (SA)	−0.22	−4.45***	Supported			
H3: Self-regulation (SR) → Cyberloafing (C)	0.07	0.99	Not Supported			
H4: Cyberloafing (C) → Smartphone addiction (SA)	0.14	2.98***	Supported			
H5: General self-efficacy (GSE) → Cyberloafing (C)	0.10	1.50	Not Supported			
Total				0.79		

Note: ***p < 0.01 (t>2.58), **p < 0.05 (t>1.96), *p < 0.10(t>1.65).
Note 2: SL= Standardized Loading; α = Cronbach's alpha; ρ = composite construct reliability; AVE = average variance extracted (Fornell & Larcker 1981).

structural model. Structural path estimates are given in Table 3. We predicted that an increase in hours spent using smartphone and checking phone would positively affect addictive smartphone behaviours of the university students (H1). This hypothesis was supported. The duration of smartphone usage had a positive effect on smartphone addiction ($\gamma = 0.54$). We assumed that students having higher self-regulation skills would show lower addictive smartphone behaviors (H2). This hypothesis was supported. Self-regulation had a negative effect on smartphone addiction ($\gamma = -0.22$). We predicted that students having higher self-regulation skills would show lower cyberloafing behaviors (H3). However, this hypothesis was not supported ($\gamma = 0.07$). We assumed that students engaging in more cyberloafing behaviors would show more addictive smartphone behaviors (H4). This hypothesis was supported. Cyberloafing had a positive effect on smartphone addiction ($\gamma = 0.14$). Finally, we predicted that

Table 4
Correlations matrix and square roots of AVE.

Constructs	1	2	3	4	5
1. Smartphone addiction	0.67				
2. Cyberloafing	0.17**	0.61			
3. Self-regulation	−0.25**	0.11**	0.68		
4. General self-efficacy	−0.16**	0.16**	0.59**	0.71	
5. Smartphone usage	0.44**	0.08*	−0.07	−0.04	0.75

*Correlation is significant at the 0.05 level (2-tailed).
**Correlations are significant at 0.01 level.

students having higher self-efficacy would engage in more cyberloafing behaviors (H5). This hypothesis was not supported ($\gamma = 0.10$).

Variables in the model explained 37% of the variance in the smartphone addiction. The findings also showed that the duration of smartphone usage had the highest degree of effect on smartphone addiction.

5. Discussion

With mobile phone features constantly developing, students have started to use their smartphones extensively. Wi-fi and mobile communication technologies (3G, 4G) mean that "Smartphones are glued eternally to owners' bodies with a portal to internet 24 h a day" (Samaha & Hawi, 2016). According to a study conducted with university students, internet connectivity plays an important role in selecting places to go to, and smartphones have an important place in lives of individuals, thereby affecting their social relationships (Bicen & Arnavut, 2015). When it is considered that students attend classes with their smartphones and are in a constant state of connectivity, the necessity for research on the variables predicting smartphone addiction becomes clear. The aim of this study was to analyse which variables predicted students' likeliness to become addicted to their smartphones. A model was built based on the relevant body of literature and 5 hypotheses were tested.

The results indicated that smartphone usage, which covered the daily duration of smartphone usage and the number of times the smartphone was checked in a day, had a positive effect on smartphone addiction (H1). Based on this result, when the smartphone usage rate increases, the tendency to experience addiction increases as well (Augner & Hacker, 2012; Kwon et al., 2013; Lin et al., 2015). Considering the increasing rate of smartphone usage in our day, it is important to control this rate and this brings the role of smartphones in the contemporary world into discussion. Addicted users have problem in controlling their amount of phone usage (Hong et al., 2012). The fact that smartphones are always within reach means that this addiction is different from others, and this poses a threat. Smartphone addiction might limit an individual's ability to communicate with his family and immediate environment; it may also affect her/his interest within a learning environment. Addicted users show a diminished level of concentration in learning. According to a recent study, the risk of smartphone was found to have a negative effect on academic performance (GPA) (Samaha & Hawi, 2016). Within this framework, students' phone usage during learning activities should be controlled (i.e., by limiting or restricting smartphone usage in class). In the literature relating to the restriction of this usage, studies have recently been carried out on the development of smartphone applications (apps). In a recent study, an application was developed to enable the restriction of smartphone usage and smartphone addiction was significantly reduced after using the application (Ko et al., 2015).

The current study showed that self-regulation negatively affected smartphone addiction (H2). According to this result, students having a low level of self-regulation skills are more inclined to demonstrate an addiction to smartphones. Addictive behaviours are stated to involve a loss of self-control (van Deursen et al., 2015). In this situation, it can be asserted that when students have a problem in controlling their use of smartphone, it is more likely that they have smartphone addiction; so for this reason, improving their self-regulation skills will be effective in decreasing or eliminating this addiction.

Although the results of the study indicated that self-regulation negatively affected cyberloafing, this was not statistically significant (H3). However, in Prasad et al.'s study (2010) and Restubog et al.'s research (2011) regarding self-regulation, a significant negative relationship was found with cyberloafing. The reason for failing to find a similar result with these studies may be due to the cyberloafing instrument used in the current study, which was different than the ones used in the abovementioned studies. Yet these contradictory results require further studies that examine the relationship between self-regulation and cyberloafing in an elaborative way.

This study showed that cyberloafing had a positive effect on smartphone addiction (H4). Based on this result, it can be asserted that students' level of having cyberloafing activities in class environment will increase their tendency to have smartphone addiction. No research is found in the body of literature that has studied these two variables together. This study makes an important contribution to the body of literature in this respect. With smartphones, distractions in the classroom environment have increased. It can be suggested that cyberloafing, which is defined as using smartphones in class environment for the purposes that are irrelevant to learning activities, can negatively affect students' learning processes. Furthermore, smartphone applications such as SNSs can trigger cyberloafing behaviours and this leads to an addiction to smartphones. Therefore, social network usage affecting both variables is a common point drawing the attention of the researchers (Andreassen et al., 2014; Lee, Ahn, Choi, & Choi, 2014). The place of social network, particularly in the lives of young individuals, should be reconsidered.

In this study it was observed that self-efficacy beliefs on smartphone addiction behaviors may be mediated by cyberloafing activities in class environment. Further studies should examine this indirect effect of self-efficacy on smartphone addiction. Finally, the results indicated that general self-efficacy positively affected cyberloafing, this was not statistically significant (H5). While there are a limited number of research studies about general self-efficacy and cyberloafing, a medium level of positive relationship has previously been found between the two variables, in contrast with this current study (Prasad et al., 2010).

6. Conclusion, limitations and suggestions

It is determined that the variable that predicted smartphone addiction the most is smartphone usage. In this case, rules can be made regarding students' use of phone/internet in the classroom and it should be ensured that these rules are followed consistently. Furthermore, educational seminars based on concrete examples or experiences of the negative results of smartphone addiction can be held, with the aim of raising awareness among students. The high usage rate of smartphones, caused by smartphones' popularity today, can be restricted by specific applications. In a similar way, learning experiences that will improve self-regulation skills might be designed. The educational potential of smartphones could be promoted or enhanced if students are taught a greater degree of self-regulation. This study also suggests that students using smartphones as a form of cyberloafing seem to have some kind of smartphone addiction. Decreasing cyberloafing in class might help students to focus on educational activities and learning objectives. Further research might focus on eliminating the cyberloafing in classroom environments. To illustrate, it would seem beneficial to offer seminars and activities aimed at the restriction of cyberloafing behaviours. Furthermore, training or learning activities regarding cyberloafing behaviours should also be not designed based on considering differences in students' level of general self-efficacy.

In this study, data was collected from a single university. For further research, it is suggested that data be collected from different parts of the country and from students in different departments and that these relationships be reanalysed. This study used self-reporting measures to collect data. Future research could be conducted using more direct measures, such as in Lin et al. (2015) (i.e. mobile apps), to decrease smartphone addiction and the results could be supported with qualitative data examining the addictive behaviour in a detailed way. The relationship between self-regulation and cyberloafing was not found to be significant. It would be beneficial to re-study this effect with new samples, adding pre-university or older adult groups as well. Moreover, in-depth studies dealing with qualitative aspects of cyberloafing and smartphone addiction could be conducted by other researchers. It is recommended that demographic and more detailed academic features be included in the model. It has also been stated in the literature that gender and academic success are related to smartphone addiction. More comprehensive models including these variables could be built and used in further research.

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