Internet addiction among college students: Some causes and effects

Meltem Huri Baturay[1] · Sacip Toker[2]

Abstract

Internet addiction among college students in terms of causes and effects are investigated. Correlation study method is utilized; structural equation modelling is applied to analyze the data. There are fifteen hypotheses generated for the model. The data is collected via numerous instruments proven as reliable and valid by the previous studies. There are 159 undergraduate students as participants of the study. Antecedent variables are game addiction, bad relationships with friends, family and professors, neglecting daily chores, hindrance of sleep pattern, use internet for researching, weekly internet use hours, leisure time activities, reading and playing computer games. Consequence variables are self-esteem, self-confidence, social self-efficacy, loneliness, and academic self-efficacy. The results indicates that game addiction, neglecting daily chores, bad relationships with professors are significantly associated with internet addiction. Internet addiction decreases one's self-esteem, self-confidence, social self-efficacy, academic self-efficacy and triggers loneliness. Parents, professors and educational institutions may be illuminated about prevention or monitoring of internet addiction. The current study investigates Internet addiction with respect to its implications for social behavioral, and psychological phenomenon but not in a clinical sense. Hence, studies on Internet addiction merely concentrate on antecedents and features that may cause more addiction; however, both antecedents and consequences are not examined. The value of the current study is to provide more systematic, comprehensive, and theory-based empirical causations via structural equation models. The model may help to diagnose Internet Addiction and illuminate college students its potential harmful socio-psychological consequences.

Keywords Internet addiction · Game addiction · Self-esteem · Self-confidence · Social and academic self-efficacy · Loneliness

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Meltem Huri Baturay and Sacip Toker contributed equally to this work.

✉ Meltem Huri Baturay
meltem.baturay@atilim.edu.tr

Extended author information available on the last page of the article

1 Introduction

Today, most people connect to the virtual world for recreational, academic, social, business and/or leisure time activities. An attendant risk is that we can also become preoccupied with virtual activities, as mobile devices allow us to stay connected wherever and whenever we wish. Some people have found themselves totally captured with virtual activities, many of which rely on Internet technology. Over time, many individuals have found themselves unconsciously plunged into Internet addiction, so much so that this is now a widely recognized disorder or problem. Various terms have been used for defining Internet addiction in the literature as; Internet overuse, Internet addiction disorder, problematic Internet use, maladaptive Internet use, pathologic Internet use, compulsive Internet use, Internet usage disorder (Bai et al. 2001; Carli et al. 2012; Demetrovics et al. 2008; Kormas et al. 2011; Sinkkonen et al. 2014; Tang et al. 2014; Widyanto and Griffiths 2006). Young (1998b) defines pathologic Internet use as an impulse control disorder, which does not involve an intoxicant. Internet use is reported to be pathological when it starts to effect life functioning areas such as relationships, occupation, school, mental or physical health. The essential characteristic of this disorder is reported to be the inability to control an urge to perform an act that is harmful to oneself or others (DiNicola 2004). Lei and Hongli (2003), on the other hand, define pathologic Internet use as a kind of mental illness related to individuals' surfing online. Extreme Internet use, on the other hand, is accepted to be the cause or stays one step behind of pathologic Internet use (Lei and Hongli 2003).

Wallace (2014) reports that Internet addiction is widespread amongst young people at middle schools, high schools and university campuses where laptops, computers and computer labs are easily accessed. The phenomenon is stated to be a global concern increasing every day since 1% of the general population and 4% of young people exhibit dysfunction in their daily life activities. (Rumpf et al. 2014). As significant an addiction as substance abuse, it could be said to fall into the group of behavioral problem syndromes (Yen et al. 2007) or behavioral control problems (Yao and Zhong 2014). In fact, Internet addiction has been accepted as a noteworthy mental health issue globally since the American Psychiatric Association recommended to handle "Internet Use Disorder" further in Section III of the DSM-5 in 2012 (Yao and Zhong 2014). Internet addiction is additionally defined as either an abnormal condition or a stimulator for other behavioral addictions; or an impulse control disorder; or the result of other psychiatric illnesses (Adiele and Olatokun 2014; Widyanto and Griffiths 2006). Excessive use of the Internet is also reported to be related to social and emotional dysfunction in several areas of daily activities (Yung et al. 2015). Some other studies further suggest it is a health risk (Jiang and Leung 2012). What Suler (2004) described as cyberspace addiction is a disorder leading to a compulsion for gaming, competition and social interaction, or as an extension of work related compulsions.

2 Antecedents

This study investigates different constructs that are believed to either have an impact on Internet addiction or might arise as a result of it. Corresponding hypotheses are also presented below.

2.1 Other addictions

2.1.1 H1: Game addiction increases internet addiction?

Compulsive Internet use lowers life satisfaction and academic performance, and leads to problematic ICT usage of the mobile, online gaming technologies, and Internet (Dhir et al. 2015). Some studies of Internet addiction tend to include video game addiction and online gaming addiction, as among other Internet activities (Rehbein and Mößle 2013). In fact, individuals most frequently use the Internet for online gaming (50.9%) of all Internet users, followed by information services, (46.8%). Game playing is found to be one of the predictors of Internet dependence (Jiang 2014; Siomos et al. 2008). Supporting this finding, Müller et al. (2014) reported in their study that Internet addicts considerably access a variety of gambling, gaming and pornographic sites. Online gaming, on the other hand, acts as a behavioral overlap between both gaming and Internet addiction. Cole and Hooley (2013) stated that even though Internet addiction entails a broader application than gaming via Internet alone, it has been the center of attention of many research studies regarding Internet addiction.

2.2 Negative behaviors

The stereotype of an Internet addict is an individual so involved with Internet based activities that he rejects other kinds of interaction, communication and work apart from those he can access on the Internet, he is often introverted and rejects daily chores even the basic needs of a human being like sleeping, eating or resting. A previous study reported that, severe Internet addicts have higher neuroticism and psychoticism, more stressful life events, lower family functioning, and lower extraversion compared with not-addicted individuals (Yan et al. 2014). Behaviors such as neglecting daily chores, irregularity in sleep patterns and bad relationships will be examined in the following part.

2.2.1 H2: Having a bad relationship with friends predicts internet addiction

The Internet is accused of harming users' psychological well-being, peer, family communications and scholar performance (Young 1998b). It is claimed that vital social or entertaining activities are delayed, given up, neglected or decreased due to Internet use (Ko et al. 2009) particularly with higher personal Internet use (Widyanto and McMurran 2004). Supporting this finding, Young and Rogers (1998) stated that extreme time spent online may increase social isolation. Similarly, Kraut et al.'s (1998) social displacement model hypothesizes that particularly Internet addicted teenagers spend such extreme time and effort on the Internet that they give up studying and delay significant everyday communication with their family and friends, which in turn may create stressful life events with these people. Yang et al. (2014) in their study points out the relationship between Internet addiction and stressful life events. In an experimental clinical study, Cao and Su (2007) found that Internet addicted individuals have higher peer problem scores in neuroticism and psychoticism temperament categories compared to non-addicted individuals, however, the result was not significant.

A discrimination between an abnormal addict and a normal enthusiast would be that a normal Internet user communicates in not only cyberspace worlds but also face-to-face (Suler 2004). The study of Sanders et al. (2000) supported this finding, they compared low and high level Internet users and stated that lower ones were reported to build up and sustain better relationships with their friends. They pointed out that increased use of the Internet was associated with reduced size of local social circle. In another study, users who were recently started using the Internet were surprisingly found to neglect their social lives more than the long term users (Widyanto and McMurran 2004).

Smahel et al. (2012) claimed that there is a two-way reciprocal association between Internet addiction and communication styles, hours spent online, and friendship approaches of individuals regardless of their age and gender. However, they emphasized that is valid for online friendships which may change in F2F relationships. Liu and Kuo (2007) in their study identified the predictors of Internet addiction; they reported that interpersonal relationship, social anxiety, and the parent–child relationship all influence Internet addiction and that as the level of Internet addiction rises so does users experience social anxiety and dissatisfaction with their peer interactions. Griffiths (2000) emphasized the finding from previous studies that Internet addicts devote less time with the people in their lives in order to spend time alone in front of a computer in time.

2.2.2 H3: Neglecting daily chores predicts internet addiction

Suler (2004) defined neglecting one's work and personal obligations as one of the symptoms of Internet addiction. Being more problematic for younger and more recent users, neglect of work is an indicator of Internet addiction; young people are particularly reported to experience more problems related to work neglect (Widyanto and McMurran 2004). Internet addiction may result in a delay or ignorance to do main responsibilities at work, school, and home (Ko et al. 2009). In their experimental study with two groups of school children, 16–18 years old, Nalwa and Anand (2003) found that Internet addicts were reported to delay other work in exchange to spend time online and suffer from poor time management and lack of control. In fact it is such a common cause for neglecting daily chores that Internet addicts tend to show the Internet as an excuse to escape from daily chores (Young 1999).

2.2.3 H4: Having bad relationships with family members predicts internet addiction

Excessive Internet use can create significant impairment in the social, occupational, and daily life of an individual, resulting in continued addictive behavior. Hence a typical Internet addicted youngster is believed to have "little or no social life" and to have bad relationships with his family (Griffiths 2000). They have problems with their families as a result of being Internet addictive; or in some cases individuals who have problems in their families use the Internet excessively as an escape from family conflict (Beard 2005). Thus, being an Internet addictive is either the result or the reason for different cases. There are many studies indicating a recursive association between negative family relationships and Internet addiction.

Fanning and O'Neill (1996) implied that addictive behaviors may be triggered to get rid of an unkind situation in an individual's life in that the addictive individual finds it simpler or as an escape dealing with it instead of coping with the situation. Liu and Kuo (2007) confirm that the predictors, the parent–child relationship, social anxiety, and interpersonal relationship all impact Internet addiction. Confirming this, the study of Park et al. (2007) indicated that parenting attitudes, family communication and cohesion, and family violence experience were related with Internet addiction; and that families have an important role in the period to prevent it. Similarly, Ni et al. (2009) reported in their study that family factors may have a role in the use of the Internet. In another study, high parent-adolescent conflict predicted Internet addiction (Yen et al. 2007). The study by Ko et al. (2014) demonstrated that when adolescents became Internet addicts, their family tasks lessened. Supporting this, Sanders et al. (2000) indicated that lower level Internet users conveyed to indicate better relationships with their mothers than higher-level Internet users; however, these results do not suggest a direction for an influence, since it isn't clear whether poor social ties resulted in excessive Internet use, vice-versa or both.

As an uncommon and extreme example, Young (1998b) claimed that overuse of the Internet caused family problems due to cyber-affairs or extramarital relationships that may weaken real-life social relationships. Besides, as a remedy limiting use of the Internet may not work well, particularly for children, since Yao et al. (2014) warned that parental behaviors, such as their rejection and/or overprotection may increase the Internet addiction risk of their children.

2.2.4 H5: Hindrance of sleep pattern predicts internet addiction

While Internet addicts spend a great deal of time online, it has not been established if they spend more time online during the day or at night. Nalwa and Anand (2003) found that Internet dependents cannot go to sleep due to late-night logons and often delay work to spend time online. Some people are sleepless due to excessive use of the Internet; but for some people the opposite is valid since they have problems falling asleep and prefer spending time on the Internet. In their study, Ferraro et al. (2006) claimed that individuals using the Internet late at night, leaving sleep and disturbing their biological and social rhythms, tend to develop Internet addiction disorder most probably. Besides the risk of developing Internet addiction, night users diminish their individual quality of life and cannot control their time.

2.2.5 H6: Bad relationships with professors predicts internet addiction

Chen and Peng (2008) indicated that low Internet users have healthier relationships with administrative staff; get better grades at school; and experience more learning satisfaction compared to extreme users. Doğan (2013) found that students profiled as Internet addicts are more likely to have bad relations with their professors compared to students who are not. When college students have a negative attitude towards their professors, they also project the same attitudes towards their classes. This may decrease students' motivation and engagement with course related activities, possibly leading them to spend more time on the Internet and furthering their addiction to it.

2.3 Internet activities

2.3.1 H7: Use of the internet for research decreases internet addiction

Ni et al. (2009) found that surfing on the Internet impacted Internet addiction. This finding supports the suggestions in previous studies that extensive use of the Internet increases the risk of being an addict due to gaming, online gambling, watching pornography, and/or socializing on the net. The current study hypothesizes that apart from the aforementioned online activities which are often defined as leisure time activities, individuals also use the Internet for the purpose of researching and undertaking learning or academic work. Such users are not thought likely to become Internet addicts. Such a finding would be significant to the current study which is conducted in an educational setting.

2.3.2 H8: Weekly internet use increases internet addiction

Chou et al. (2005) found that although there are no causal relationships, there is an association between Internet addiction and weekly Internet use. It is claimed that incapability of controlling the amount of time spent online predicts Internet addiction (Suler 2004). The survey administered by Young (1998b) found that Internet addicts in her sample used the Internet for an average of 38 h a week. However, as use of the Internet has extended over time the number has increased; studies that are more recent indicated that use of the Internet for more than 20 h/day predicts the risk of Internet addiction (Ko et al. 2007). However, today an individual may undertake a wide variety of activities via the Internet; thus, mere measurement of time committed on the Internet may not be a sign of Internet addiction. Supporting this, Beard and Wolf (2001) reported Internet use hours as just one of the Internet addiction diagnosis criteria. Chak and Leung (2004) defined Internet addicts as individuals who intensely and frequently use the Internet and they added that some individuals like full-time students are at a high risk of being an Internet addict since they tend to increasingly have free and unlimited Internet access. Wallace (2014), however, notifies that labeling twenty-first century youngsters who are more dependent on Internet connection for studying, playing, communicating, and socializing as Internet addicts would be a mistake.

2.4 Are leisure time activities more likely to generate internet addiction?

It is claimed that when individuals give up all other leisure time activities to follow online activities, there is the risk of Internet addiction (Chou et al. 2005). Leung and Lee (2012) stated that Internet activities, especially social networking sites and online games had a significant and positive relationship with Internet addiction. Sherer (1997) reported that Internet addicts tend to spend more personal and leisure oriented Internet activities. This indicates that leisure time online activities tend to result in Internet addiction compared to other activities such as sending an e-mail or browsing web pages.

2.4.1 H9: Reading as a leisure time activity decreases internet addiction

Johansson and Götestam (2004) stated in their study that types of activities on the Internet like playing games and reading newspapers/magazines impact Internet

addiction. This is however valid for reading online, what happens when reading offline should also be better examined.

2.4.2 H10: Playing merely computer games as a leisure time activity decreases internet addiction?

Griffiths (1991) suggested that computer games are played either for arousal, excitement or as a kind of escape. As Internet access is performed most often via computers, association between computer gaming and Internet addiction may be investigated. Particularly, playing merely computer games as an extensive leisure time activity; thus, whether Internet addiction increases or decreases Internet addiction should be examined.

2.5 What are the consequences of internet addiction?

In particular, extreme use of Internet may have negative effects on the psychosocial development of adolescents (Sinkkonen et al. 2014; Tahiroglu et al. 2008). Particularly, in the beginning, disadvantages are hidden and it gives users merely pleasure; however, when behavioral addiction becomes the rule, the disadvantages start to appear and in the end it causes annoyance and dissatisfaction (Sinkkonen et al. 2014).

In their study reviewing 68 epidemiological studies of Internet addiction, Kuss et al. (2014) classified psychosocial factors that have association with Internet addiction such as; low life satisfaction, low well-being, loneliness, lack of confidants, willingness for online social interaction, undesirable life outcomes, low self-esteem, introversion, low agreeableness, low sensitive constancy, low conscientiousness and resourcefulness, social adaptation, stress, low academic achievement, poor relations with school, leisure boredom, breadth of extracurricular activities, peers and siblings who drink alcohol. Some of these factors are reviewed in the following part.

2.5.1 H11: Internet addiction decreases self-esteem

Young and Rogers (1998) noted that problematic or abusive usage of Internet appears to have a kind of relationship with low self-esteem. Individuals may resort to the Internet as a way of avoidance from their negative emotions and passing through another world in which they do not feel threatened or challenged (Vidyachathoth et al. 2014). In fact, the Internet provides adolescents with activities which enable them feel as if they had higher level of self-esteem and confidence (Armstrong et al. 2000; Ko et al. 2005; Yen et al. 2014). Yen et al. (2014) reported that especially lower self-esteem was significantly related with more extreme Internet addiction signs in teenagers with ADHD.

There are many studies have previously showed that low self-esteem is related with Internet addiction. However, it is still open to discussion whether low self-esteem predicts an addiction or vice-versa. The study of Ghassemzadeh et al. (2008) with 1968 high-school students suggests that Internet addicts have lower self-esteem compared to moderate users. It is thought that there is kind of relationship between self-esteem and Internet addiction, in fact Internet addiction augments

already lowered self-esteem; thus, it is indicated as an important construct in the deterrence of Internet addiction (Yao et al. 2014). Besides, there is another study indicating self-esteem predicts Internet addiction in a negative way (Kurtaran 2008). Armstrong et al. (2000) explained this with the fact that a lower self-esteemed individual is more likely to become an Internet addict owing to lacking social skills and low self-confidence since he would regard the Internet as a means for escape (Armstrong et al. 2000) or he would become an addict to run away, avoid, or deal with negative thoughts and feelings (Young 1999). However, in his study, Caplan (2002) measured generalized problematic Internet use of 386 under-graduate students and found that loneliness and weakened self-esteem are associated with negative outcomes of Internet use at most.

2.5.2 H12: Internet addiction decreases self-confidence

Pathological users were found to gain social confidence online; they found people much friendlier there; they behaved more open, and more as themselves when online. They added that it was easier to make friends in an online environment; they had more fun with these online friends and they could even share their secrets with them (Morahan-Martin and Schumacher 2000). However, these findings are valid only for the online environment. In another study, Internet addicts were found to have weaker social skills and low self-confidence in their daily lives and were using the Internet as a mean of escape (Shotton 1991).

2.5.3 H13: Internet addiction hinders social self-efficacy

Griffiths (2000) claimed that a typical Internet addicted adolescent has "little or no social life". Addicted individuals are frequently evaluated as unsociable individuals with defects in interpersonal communication with others. Internet dependents are so surrounded with it that their life would be boring when they were deprived of the Internet (Nalwa and Anand 2003). On the other hand, Morahan-Martin and Schumacher (2000) found in their study that pathological Internet users had higher social confidence; however, they reported this for the online environment.

2.5.4 H14: Internet addiction triggers loneliness

In the past Shotton (1991) highlighted that computers do not cause individuals to be lonelier; whereas, computer addicts are found to be already socially isolated individuals. In time particularly with the rise and extension of the Internet, some other studies supported this finding while others did not. For example, the study of Loytsker and Aiello (1997) agrees that loneliness causes Internet addiction; where-as, Morahan-Martin (1999) stated that excessive use of the Internet predicts lone-liness. However, Morahan-Martin and Schumacher (2000) later claimed that the direction of the association between loneliness and Internet use is not easy to determine. Today, researchers believe the same and assert both way implications are valid which indicates that the association is recursive. Sinkkonen et al. (2014) stated an individual's loneliness and isolation can impel or facilitate heavy Internet use Kim et al. (2009) also indicated loneliness as the cause and effect of problematic

Internet use. Support for the existence of this recursive cycle between computer/ Internet use and loneliness, Pratarelli et al. (1999) stated that loneliness fosters computer/Internet use, which, in turn, leads to more loneliness which in turn, fosters the computer/Internet use, and so forth.

The study of Ghassemzadeh et al. (2008) with 1968 high-school students suggests that Internet addicts are lonelier and have poorer social skills compared to moderate users. This association is supported by the findings of many studies (Morahan-Martin and Schumacher 2000; Nalwa and Anand 2003; Tokunaga and Rains 2010; Whang et al. 2003). Ni et al. (2009) found that freshmen college students coming from other cities where their university is located tend to be Internet addicts most probably, which may be due to their homesickness and unfamiliarity with their new environment. Besides, this may be due to lack of parental monitoring preventing excessive use.

The model suggested by Caplan (2005) indicated that a preference for online social interaction raises obsessive Internet use, which ends up with negative outcomes. Sanders et al. (2000) exemplifies the negative outcomes of increased Internet use as decreased family communication and a much smaller social circle. Similarly, Kraut et al. (1998) found that excessive Internet use decreases individuals' interaction with family members and diminishes their social circle, while increasing their loneliness.

As an explanation to individuals' preferences for being alone Young and Rodgers (Young and Rodgers 1998 stated that the Internet renders such interactive facilities that these may make an online user feel connected instead of lonely. That is, online social contacts may prevent feelings of loneliness in some cases. However, Yao and Zhong (2014) uttered that online social contacts might not replace offline interactions. Regarding socializing on the Internet, Young (1998a) stated that while dependent users prefer using the Internet more for its social and interactive functions; non-dependents preferred utilizing it more for information gathering. Prisbell (1988) warned that lonely people particularly experience difficulty to start a face-to-face interaction or they are not much willing to do it.

2.5.5 H15: Internet addiction decreases academic self-efficacy

Kubey et al. (2001) emphasized that too much Internet use for leisure was strongly associated correlated with weak academic performance. When adolescents use the Internet more and more, instead of doing their schoolwork, it results in weaker scholar performance (Caplan 2003). This explains that although the Internet has been suggested as a premiere educational and an ideal research tool, there may be a decrease in study habits and grades while an increase at missed classes; in surfing irrelevant web sites and chat room gossip; and playing interactive games instead of doing productive works due to its excessive use (Young 1998b, 1999). It has been found that pathological Internet use is problematic particularly for academic performance and relationship functioning (Morahan-Martin and Schumacher 2000; Sherer 1997). As a result of his empirical qualitative study Chou (2001) found that poor grades is one of the negative outcomes of heavy Internet use. Obsessive Internet users experience lower scholar performance, and ends up with problematic ICT use comprising Internet, mobile, and online gaming (Dhir et al. 2015). Further, poor academic achievement was reported to be significantly associated with and a predictor of problematic Internet use (Huang et al. 2009).

3 Method

3.1 Procedures

This study was designed as a correlational study (Creswell 2012), which allowed the researchers to evaluate the relationships and impacts among independent and dependent variables.

3.2 Purpose of the study

The current study investigates Internet addiction with respect to its implications for social behavioral, and psychological phenomenon but not in a clinical sense. Byun et al. (2009) argued that to date, studies on Internet addiction merely concentrate on antecedents and features that may cause more addiction. Moreover, suggested that Internet addiction requires more systematic, theory-based empirical studies, and there should be efforts to show the causations rather than associations. They concluded that structural equation models are necessary to illuminate the causations between constructs and Internet addiction. The study hypotheses are shown in Fig. 1 and described above in separate sections corresponding to the findings of previous studies.

3.3 Study participants

Data was collected from college students in Turkey, who are able to freely access the Internet at their convenience and who may be vulnerable to becoming addicted to it (Kandell 1998). The study was conducted with 159 undergraduate students. The profile of participants is presented in Table 1.
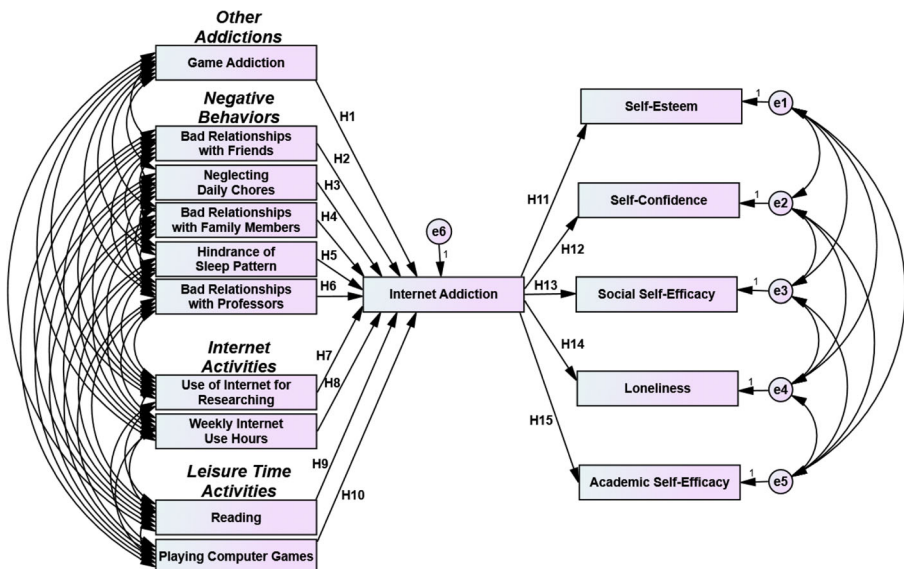

Fig. 1 Hypothesized model

Table 1 Study participants

	f	%
Gender		
- Female	89	56.00
- Male	70	44.00
Class		
- Freshmen	38	23,9
- Sophomore	32	20,1
- Junior	39	24,5
- Senior	50	31.5
Mother education level		
- Primary school or lower	112	70.4
- Secondary school	18	11.3
- High school and higher	29	18.2
Father education level		
- Primary school or lower	76	47.8
- Secondary school	33	20.8
- High school and higher	50	31.4
Socio-economic status		
- Lower than Middle	32	20.1
- Middle and Higher	127	79.9
Most often leisure time activity (computer gaming)		
- No	137	86.2
- Yes	22	13.8
Computer ownership		
- No	4	2.5
- Yes	155	97.5
Computer ownership with internet		
- No	34	21.4
- Yes	125	78.6

The average age of participants were 21.72 (SD = 1.95), and the average grade point average was 2.68 (SD = .50). The average weekly internet use was 25.91 h (SD = 18.37)

3.4 Measures

Data relating to a variety of measures were collected via the study questionnaire pack. There were numerous measures that were not mentioned here because we tried to include them in the model; however, they did not yield value-added to the quality of the model investigated. Once we obtained the best fit model, we started to check significant impacts. Each of the measures remained in the model are explained below as antecedents, Internet addiction as primary measure, and consequences.

3.4.1 Antecedents

Game addiction This measure was collected via yes/no type questionnaire with two different versions for teenagers and college students. For the teenager version (Horzum et al. 2008), there are 21 questions under four sections in Turkish. The questions were prepared in accordance with the previous computer gaming addiction literature. Before the analyses, 36 questions were assembled in a pool. The factors were entitled (1) lack of withdrawal and annoyed by interference, (2) fantasizing games and associating them with real life, (3) hindrance of tasks, and (4) preferring computer gaming to other activities. The college version of the questionnaire was adapted from the teenager version (Çakır et al. 2011). The questionnaire was confirmed whether it worked for college students. The factors were entitled (1) Internet addiction, (2) hindrance of tasks and preferring computer gaming to other activities, and (3) lack of withdrawal and annoyed by interference and fantasizing games and associating them with real life. This version was used in this study due to the college student participants of the current study. The reliability measure Cronbach's α was .85. For the teenager version, face and content validity was ensured by experts. Construct validity was evidenced with explanatory factor analysis (EFA) accounting for 45% of variance and found four factors. For the college version, both explanatory and confirmatory factor analyses (CFA) were utilized. EFA accounted for 54.28% of variance. CFA produced a moderate-fit second-order factor structure. The reliability measure Cronbach's α was .96.

Negative behaviors Under this category, information about bad relationships with friends, neglecting daily chores, bad relationships with family members, hindrance of sleep pattern and bad relationships with professors were collected. These measures were gauged as Yes or No questions. The participants were asked to respond whether use of Internet affects relationship with friends, family, and professor, daily chores, and sleep patterns.

Internet activities *Using the Internet for Research purposes and Weekly Internet Use Hours* were measured. This research measure was dichotomous. It was measured by asking whether the participants use the Internet for research purposes or not. Research means searching for and locating resources for their assignments. Participants were asked to provide an approximation of the number of hours they use the Internet per week and this data was used for the Internet Use Hours measure.

Leisure time activities *Reading* and *Playing Computer Games* were measured under this category. Reading was dichotomous (Yes or No). It was measured by asking whether the participants stated reading is one of the activities they do in their leisure time. Playing computer games was gauged the same way as reading was measured.

Tsai and Lin (2001) suggested measuring individuals' real behaviors on Internet use and insights on the convenience of Internet are more important than measuring emotional answers toward computer networks in predicting teenagers' Internet addiction. For this reason, the antecedent variables explained above are measured as self-assessment of individual's behaviors.

3.4.2 Internet addiction as primary measure

Internet addiction The Turkish Internet Addiction Scale by Günüç (2009) was used for this measure. This scale was one of the most comprehensive one in Turkish. The items in the scale were developed from qualitative open-ended questionnaires. Explanatory factor analysis was performed for construct validity. The items accounted for 47.46% of the variance. There were four factors revealed: (1) withdrawal, (2) controlling difficulty, (3) disorder in functionality, and (4) social isolation. Cronbach's α was used for reliability, and it was found .944.

3.4.3 Consequences

Self-esteem The Short Form of The Coopersmith Self-Esteem Inventory was used for this measure. It includes 25 items with two options, appropriate and not appropriate. The scale was translated and adapted to Turkish by Pişkin (1996). Content validity was ensured by expert review. For reliability, KR20 was .76, and Split-Half was .77.

Self-confidence This measure was collected by the Self-Confidence Scale including 33 items under two sections inner and external self-confidence (Akın 2007). Construct validity was ensured by both explanatory and confirmatory factor analysis. EFA accounted for two factors and 43.6% variance. CFA produced good fit. The correlation between the Coopersmith Self Esteem Inventory and the scale was found .87. Cronbach's α was .83. Test-retest coefficient were .94.

Loneliness UCLA Loneliness Scale by (Russell 1996; Russell et al. 1978) included 20 questions. Reliability of the test was examined by internal consistencies (Cronbach's α ranging from .89 to .94) and test-retest (One year period r = .73) techniques. For validity, convergent and construct validity was ensured via the correlations between other measures of loneliness, such as competence of individual's social relationships and health and happiness. Construct validity was evidenced with confirmatory factor analysis with a fit model of an incorporated in global bipolar loneliness factor. The scale was translated and adapted for use in Turkish by Demir (1989). Cronbach's α was found .96; and test/re-test after 5 weeks correlation coefficient was .94. The validity was ensured by examining association with Beck's Depression Scale and Social Introversion sub-factor of Multi-dimensional Depression Scale. The correlations were found .77 and .82 respectively.

Academic self-efficacy The Turkish adapted version (Yılmaz et al. 2007) of this scale by Jerusalem and Schwarzer (1981) was used for this measure. In the original form of the scale, Cronbach's α was .87. Concurrent validity was examined via correlations between the scale and Self-Esteem and Performance Anxiety Scales; they were found .37 and $-.49$ respectively. In Turkish version, explanatory factor analysis was applied, and it accounted for 41% of total variance under one factor. Cronbach's α was found .79. Moreover, the correlation between the scale and Self-Esteem scale was .435.

3.5 Data collection

Data was collected from students attending a university in Turkey. Data was collected using a questionnaire package prepared by the researchers in Google Docs. Potential study participants were sent a Facebook message that included a link to the questionnaire form, which remained active on Google Docs for 6 weeks. The purpose of the study was briefly explained in the online questionnaire to the students. Participation was voluntary. A total of 159 students completed the questionnaire. Data was analyzed using SPSS 22.0 and AMOS 22.0 software.

3.6 Data analysis

Data was analyzed for structural equation modeling (SEM) using the program SPSS AMOS 22.0. SEM helps researchers to analyze complex associations among variables and build models. Byun et al. (2009) suggested that Internet addiction research should extent its data analysis scope from first generation to second generation analysis, such as SEM. SEM is a multivariate analysis technique to analyze structural relationships between variables classified as measured or observed and latent (Byrne 2013). The technique was chosen to see multiple interrelations and dependencies in a single model. SEM seems to be the most suitable analysis technique compared to other alternative techniques, such as data mining usually requiring big data. Data Mining, comparatively, concentrates less on detecting the specific relations among variables. For instance, finding the nature of the fundamental functions or the specific types of interactive, multivariate associations between variables are not the main purpose of data mining (Berry and Linoff 2000; Han and Kamber 2000; Witten and Frank 2000). In its place, the focus is creating a solution that can produce beneficial predictions. Thus, SEM was specifically chosen to test the hypotheses of the current study.

4 Results

The hypothesized model was tested, and the standardized estimated model is illustrated in Fig. 2.

Fit indices of the model used to estimate the antecedents and consequences of game addiction are presented in Table 2. All fit values meet the criteria mentioned in the literature, indicating the validity of the model.

The model showed that variables game addiction, bad relationships with friends, neglecting daily chores, hindrance of sleep pattern, bad relationships with professors, weekly Internet use hours to increase Internet addiction, whereas bad relationships with family members, use of the Internet for researching, reading and playing computer games for leisure time activities were revealed to decreases Internet addiction. Statistical analysis of each hypothesis is presented in Table 3. Hypotheses H1, H11, H12, H13, H14, and H15 were confirmed significantly, H7, H8, H9, and H10 were confirmed but not significantly. The study sought to confirm whether hypotheses 2–6 were predictors or not. As a result, H3 and H6 were confirmed, while H1, H2, H4 and H5 were not confirmed. Insignificant associations remained in the model due to the quality of the model fit values.
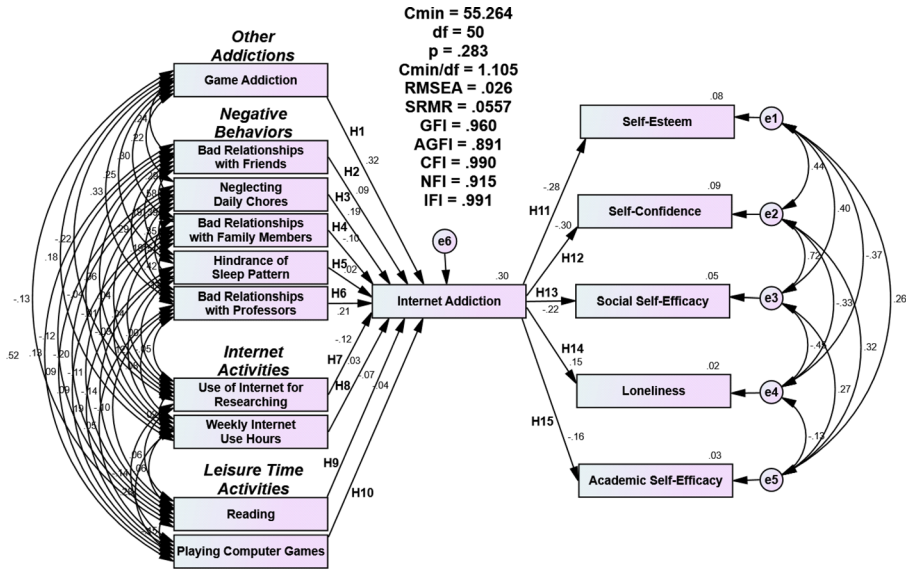
Fig. 2 Internet addiction standardized estimated model

5 Discussion

It was found in the current study that merely playing computer games was not associated with Internet addiction; however, interestingly, when an individual starts playing a game extensively and becomes an addict, it may increase Internet addiction owing to the positive relationship between the game and Internet addiction. A similar

Table 2 Evaluation of model fit indices

Fit index	Model value	Criteria for perfect fit	Resource
χ^2 (50)	55.264 $p = .283$	Low χ^2 value and $p > .05$	Hooper et al. (2008)
χ^2/df	1.105	χ^2/df < 3	Wheaton et al. (1977) Tabachnick and Fidell (2007)
RMSEA	.026	RMSEA < .05	Hu and Bentler (1999) Steiger (2007)
SRMR	.0557	SRMR ≤ .05 – Perfect Fit SRMR ≤ .08 – Good Fit	Byrne (2016) Diamantopoulos and Siguaw (2013) Hu and Bentler (1999) Brown (2014)
GFI	.960	.95 ≤ GFI ≤ 1	Tabachnick and Fidell (2007) Miles and Shevlin (2007)
AGFI	.891	.85 ≤ AGFI ≤ 1	Tabachnick and Fidell (2007)
CFI	.990	.97 ≤ CFI ≤ 1	Hu and Bentler (1999)
IFI	.991	.95 ≤ IFI ≤ 1	Miles and Shevlin (2007)

Table 3 Statistical assessment of hypotheses

	Label in the model	Estimate	S.E.	t
Hypothesis 1: Is game addiction increasing internet addiction?	H1	1.857	.514	3.616**
Hypothesis 2: Is having a bad relationship with friends a predictor of internet addiction?	H2	8.171	7.269	1.124
Hypothesis 3: Is neglecting daily chores a predictor of Internet addiction?	H3	9.813	4.020	2.441*
Hypothesis 4: Is having bad relationships with family members a predictor of Internet addiction?	H4	−9.357	8.482	−1.103
Hypothesis 5: Is hindrance of sleep pattern a predictor of Internet addiction?	H5	.863	3.631	.238
Hypothesis 6: Is having bad relationships with professors a predictor of internet addiction?	H6	21.776	7.793	2.794**
Hypothesis 7: Does use of internet for researching decrease Internet addiction?	H7	−7.057	4.126	−1.710
Hypothesis 8: Does weekly internet use hours increase Internet addiction?	H8	.047	.096	.493
Hypothesis 9: Does reading as a leisure time activity decrease Internet addiction?	H9	−4.859	5.157	−.942
Hypothesis 10: Does playing computer games leisure time activity decrease internet addiction?	H10	−3.099	5.894	−.526
Hypothesis 11: Does internet addiction decrease self-esteem?	H11	−.046	.013	−3.671**
Hypothesis 12: Does internet addiction decrease self-confidence?	H12	−.243	.061	−4.005**
Hypothesis 13: Does internet addiction hinder social self-efficacy?	H13	−.147	.053	−2.791**
Hypothesis 14: Does Internet addiction trigger loneliness?	H14	.044	.022	1.949*
Hypothesis 15: Does internet addiction decrease academic self-efficacy?	H15	−.021	.010	−2.062*

$* p < .05, ** p < .01$

result regarding this positive relationship has been recently found by Günüç (2015). This study emphasized the critical distinction between playing games for leisure and extensive game playing defined as addiction. Individuals can typically play games during their spare time in addition to other activities, like reading as included in the model. However, this becomes a problem when they start playing games at an addiction level and replace other activities with gaming. There may be mediation between playing computer games and Internet addiction via game addiction, which may be enlightened in further studies.

Moreover, the association between game and internet addiction demonstrated that explaining the potential sources of some psychological problems based on only one technology-related-addiction may not be a realistic approach. Technological addictions, e.g., game addiction, online game addiction, smart phone addiction, Facebook addiction, social-networking-sites addiction, etc., should be evaluated in a more comprehensive and

integrated approach for their consequences. They could overlap each other as we indicated with the relationship between game and internet addiction in the current study. Even though there were some efforts to explain technological addictions in the light of other addictions, such as in drug and gambling studies (e.g., Griffiths 2008; Griffiths et al. 2012; Walker 1989), the relationships between diversified technological addictions are not extensively researched in the field; future research should consider their overlapping impacts and investigate those relationships in more details.

The current study also sought to assess the negative behavioral antecedents of Internet addiction. Among them, particularly, neglecting daily chores and having bad relationships with professors were two measures that have been found to have an association with Internet addiction. In previous studies, Internet addicts were found to neglect their responsibilities at school, work and home (Suler 2004; Widyanto and McMurran 2004; Ko et al. 2009; Nalwa and Anand 2003; Young 1999). The present study confirmed these results. College students, the participants of the study, usually have a limited budget. Due to their ability to easily and freely access the Internet on campus, they may prefer to use the Internet rather than performing their daily responsibilities, and this may end up with becoming an Internet addict. It is suggested that whenever peers or professors monitor these kinds of neglecting or negative behaviors on students; they may be alerted about some kind of addiction, most probably Internet addiction which is related. However, it should not be forgotten that neglecting daily chores are not the only indicator of internet addiction, it must be assessed with other indicators that were revealed in this study and with some others in previous studies. After all, if peers or professors think there is an internet addiction issue, they should direct students to the professional guidance offices. Besides, a significant relationship between Internet addiction and a bad relationship with professors has been found. Poor relationships with professors probably diminished these students' interest in their courses, and this correspondingly increased their interest in using the Internet in an extensive manner, which may satisfy them, which is also confirmed by Doğan (2013). Professors should concentrate on designing appealing courses by using motivational design principles (e.g., Keller 1987, 2009) or try exploiting the Internet as a course activity.

The current study indicated that, particularly, use of the Internet for research purposes can decrease Internet addiction, yet not at a significant level. This result is however important, since researching on the Internet is different from surfing to kill time activities indicated as impactful on Internet addiction (Ni et al. 2009). Designing higher education courses leading students to use the Internet for research and/or scholarly work may be a preventative action for Internet addiction. Educational institutions should encourage use of Internet for this aim in their curricula and programs. This is not only a preventive action to control addiction but also a motivational factor for technology whiz individuals to arise their attraction for courses. To exemplify, it is purposeful and may be required to complete a professional task, such as writing assignments, preparing presentations, etc. Among the vast amount of various activities that may cause Internet addiction, any activity lessening Internet addiction and enhancing beneficial use are invaluable.

Weekly Internet use hours negatively associated with Internet addiction in the current study. This may be due to fact that today's youths also connect -the Internet for studying and working. More recent studies indicated that using the Internet for more than 20 h/day is accepted as addiction, compared to past years when 38 h/week was

thought as addiction (Young 1998b). However, as Wallace (2014) pointed out defining this dependency on the Internet as obligatorily mostly and not voluntarily as addiction, would be a mistake. Since use hours of the Internet may change due to the circumstances, it may not be a good predictor of Internet addiction; it should be supported with different additional variables done in the current study. Especially, this notion should be further considered by researchers.

Johansson and Götestam (2004) found that Internet activities like playing online games and reading newspapers on the net trigger Internet addiction. The current study demonstrated that offline reading was a restraining antecedent of Internet addiction; thus offline reading is suggested to prevent Internet addiction. Besides using technology for various aims to make our life more convenient, the traditional techniques should remain to prevent harmful effect of technology on youths. As an important implication of this result, programs like Drop Everything and Read – D.E.A.R. (D.E.A.R n.d.), a celebration program to make reading activity as a priority for people's daily life, may be initiated in high-education institutions. What is specific to the program is that, everybody stops what they are doing and start reading a book.

In this study, the impact of Internet addiction on pyscho-social measures, self-confidence (Shotton 1991), self-esteem (Young and Rogers 1998; Yen et al. 2014; Ghassemzadeh et al. 2008; Yao et al. 2014; Kurtaran 2008; Armstrong et al. 2000), social self-efficacy (Nalwa and Anand 2003; Griffiths 2000), academic self-efficacy (Kubey et al. 2001; Huang et al. 2009), and loneliness (Loytsker and Aiello 1997; Morahan-Martin 1999; Kim et al. 2009; Ghassemzadeh et al. 2008) were examined as well. An ordinary successful, socially and psychologically healthy individual is expected to have average or relatively high self-esteem, self-confidence, social self-efficacy and academic self-efficacy and low level of loneliness. The current study indicated that like other addictions harmful to individuals, Internet addiction has been found to impact the aforementioned measures negatively except for loneliness positively, which is also not appreciated. It shows that when a person is an Internet addict, (s)he may not possibly fulfill responsibilities in his/her academic and daily life. Moreover, they cannot self-manage themselves and sometimes they isolate themselves from the society. This is a serious issue for college students. All members of higher-education institutions should be aware of these detrimental effects of extensive Internet use, and as a precaution they need to develop programs to protect, diagnose and treat students before any problematic Internet use arises.

One of the limitations of the study is the limited sample size since it is relatively small compared to the estimated 3 billion current Internet users around the world (Stats 2014). The study could be repeated with a larger sample size. Internet addiction is a major problem in private and professional life. There is a recursive relationship between Internet addiction and different measures. In this study, some of the measures have been examined as antecedents and consequences. In further studies, besides adding some other measures, the measures of the current study could be recursively re-examined. College students are high risk students that may lead them to become Internet addicts due to convenient access to the Internet. The study can be replicated in different settings and with different participants.

As an implication, peers, professors, administrators and other related professionals should be cautious about any extraordinary behaviors related to the Internet use, specifically, the main prevention starts with peer control; that is, peers should watch

each other for any extensive use of technology. However, if college students are not aware of problematic use of the Internet, professors or institutions should provide the necessary informative seminars or trainings to increase awareness. Professors should embrace educational Internet use in their courses and class activities so that students could not deal with the Internet for merely killing time. Students would also be informed about beneficial use of the Internet. Like peers, professors should also monitor students for any problematic behaviors. Moreover, policy makers and regulators need to continue to address these measures and help to prevent Internet addiction. They may assign centers to inform and guide students regarding the harmful effects of technologies, such as addiction which is the main scope of the study. Moreover, our research may inform the design of remedial procedures for addressing this addiction amongst college students.

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Affiliations

Meltem Huri Baturay [1] · Sacip Toker [2]

Sacip Toker
sacip.toker@atilim.edu.tr

[1]   School of Foreign Languages, Department of Basic English, Atılım University, İncek, Ankara, Turkey

[2]   School of Engineering, Department of Information Systems, Atılım University, İncek, Ankara, Turkey