Full length article

# Smartphone addiction among university students in the light of some variables

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ABSTRACT

We explored the frequency and indices of smartphone addiction in a group of King Saud University students and investigated whether there were differences in smartphone addiction based on gender, social status, educational level, monthly income and hours of daily use. We developed a questionnaire probing smartphone addiction consisting of five dimensions: 1) overuse of smartphone, 2) the psychological-social dimension, 3) the health dimension, 4) preoccupation with smartphones, and 5) the technological dimension. After being validated, the questionnaire was administered to 416 students, both male and female, at King Saud University. Results revealed that addiction percentage among participants was 48%. The order of smartphone addiction indices were as follows: overuse of smartphone, the technological dimension, the psychological-social dimension, preoccupation with smartphones, and the health dimension. Significant gender differences were found in the degree of addiction on the whole questionnaire and all of its dimensions with the exception of the technological dimension in favor of males. Significant differences by social status were found in favor of the unmarried. Bachelor degree students were found to have the highest degree of addiction. Significant differences by hours of daily use were also detected in favor of participants using the smartphone for more than 4 h a day. As to the monthly income dimension, significant differences were found on the health dimension in favor of participants with lower monthly income.

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## 1. Introduction

The 21st century has witnessed ever-increasing technological advances leaving an imprint on all aspects of life. One of these advances is the smartphone and its numerous applications or apps offering quick access to the Internet and social media through various apps such as WhatsApp, Facebook, Twitter and Skype. The smartphone has also facilitated the transmission of SMSs and fax, and navigating the Internet. Furthermore, the smartphone includes entertainment such as games, the Cam, video, Bluetooth, multimedia, radio, youtube, movies, GPS, and other applications (Abo-Jedi, 2008).

One of the most important advantages of the smartphone is easy wireless access to electronic mail, instant messages and multimedia, and the possibility of using Office Applications after

downloading additional apps from the site of the smartphone producer or from Play Store. It also has a complete keyboard that enables users to write e-mails easily. The Gulf markets, like other world markets, introduce smart devices on a daily basis. In addition, all age groups show an interest in owning such devices. More and more people are purchasing smart devices for their numerous and varied services. For some people, the smartphone has become a substitute for the computer. For others, it has become the most effective means of entertainment, amusement and pastime. As a result of its popularity, the use of the smartphone has become an indicator of economic status and possession of a smartphone is associated with several psychological and social concepts such as the popularity implied by achieving a large number of friends or followers. However, some argue that the smartphone has more disadvantages than advantages. The disadvantages relate to the way the smartphone is used, especially by teenagers (Attamimi, 2011). There is empirical evidence that most smartphone addicts are teenagers whose shyness and lack of confidence encourage them to rely on smartphones in order to communicate with others

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without face-to-face encounters (Walsh, White, & Young, 2007).

Recently, there has been a great increase in the number of smartphone users spendingconsiderable sums of money to own the latest upgrades, versions and apps. Users have become so attached to their smartphone that they feel they cannot function without it and their use and preoccupation with the smartphone results in the neglect of other assignments and tasks. This irrational overuse is described as smartphone addiction and psychologists define this as an obsession. This addiction is likely to be among the most prevalent of all addictions. Smartphone addicts are expected to live in isolation. This addiction can also affect individuals economically and psychologically (Walsh et al., 2007).

## 2. Statement of the problem

School and university students are among the age groups most targeted by communication technologies. They are also the most interested in possessing smartphones on which they spend time and dedicate much of their thinking. The competition between smartphone companies to produce low priced smart devices has led to a significant increase in the number of students possessing smartphones, which, in turn, increases the likelihood of smartphone addition among students (Abo-Jedi, 2008).

The positive effects of smartphones include the facilitating and enhancing of communication and information sharing among researchers and students as well as the sharing of valuable experiences among countries through the various applications that they include. However, recently negative effects of smartphone addiction have also emerged and these have not received adequate research emphasis. This motivated the researchers to explore the negative effects taking into consideration several variables. Furthermore, as staff members we have become aware of the obsession that university students have with smartphones and that the negative effects of smartphone addiction are increasingly frequent. Smartphone addiction is expected to continue and this increase is expected to be accompanied by more negative effects. In this respect, some research found a correlation between smartphone addiction and self-disclosure, anxiety, depression and academic performance. Investigation of the effects of smartphone addiction on students' behavior, academic performance, health, psychology and social life is the objective of our present study. More specifically, the study addressed the following questions:

1. How frequent is smartphone addiction among participants?
2. What are the most significant indicators of smartphone addiction among participants?
3. Are there statistically significant differences in smartphone addiction attributable to gender?
4. Are there statistically significant differences in smartphone addiction attributable to social status?
5. Are there statistically significant differences in smartphone addiction attributable to educational level?
6. Are there statistically significant differences in smartphone addiction attributable to hours of daily use?
7. Are there statistically significant differences in smartphone addiction attributable to monthly income?

## 3. Literature review

### 3.1. Smartphone addiction

Technology addiction dates back to Internet addiction first identified in 1995 by American physician Ivan Goldberg and to the paper published by Young (1996) with the title "Internet addiction:

The emergence of a new clinical disorder." A smartphone includes the same technology and is expected to have the same or an even greater effect than the Internet. The more individuals use the smartphone, the more they become dependent on it and begin to experience associated problems (Hong, Chiu, & Huang, 2012). The diagnostic criteria of smartphone addiction were derived from criteria of material abuse according to the Diagnostic and Statistical Manual (DSM IV) (American Psychiatric Association, 1994). The same criteria used for diagnosing both Internet and Smartphone addictions consider these dependencies a disorder. People with this disorder have difficulty controlling their smartphone use and therefore encounter social, psychological and health problems (Heron & Shapira, 2004).

The number of adolescent smartphone users (15–24 years) in the US, Canada, Britain, Germany and Italy reached 103 million. And the percentage of school and university adolescents possessing smartphones reached 87% (International Telecommunication Union (ITU) 2004). Klyoko and Hitoml (2005) found that 49% of high school students owned smartphones that they use more than 10 times a day to establish friendships and check email. Nighttime smartphone use resulted in their getting up late and those students report they cannot live without smartphones. In another study conducted in the US, 65% of the participants (N = 1061) reported that they could not live without smartphones (Wajcman, Bittman, Jones, Johnstone, & Brown, 2007). 68.8% of Belarusian university students were convinced on the harmful effects of mobile phone (Szpakow, Stryzhak, & Prokopowicz, 2011).

### 3.2. Theories explaining technology and smartphone addiction

There are several theories that explain technology and smartphone addiction. Behaviorism viewed it as a learned behavior that is subject to the stimulus-response-reinforcement principle. Thus, like any other learned behavior, smartphone addiction can be modified. The psychodynamic theory conceived of smartphone addiction as a response to avoid frustrations and to achieve pleasure and forgetfulness. The socio-cultural trend considers smartphone addiction a result of a society's culture. The cognitive theory attributes smartphone addiction to distorted ideas and schemata. Finally, there is an integrative view that smartphone addiction results from a combination of personal, cultural, social, environmental and emotional factors (Davis, 2001; Duran, 2003).

### 3.3. Smartphone addiction and its effect on psychological and physical health

Smartphone addiction is common with individuals feeling an urgent need to keep in touch with others at all times. This underscores the need to raise awareness of the negative effects of smartphone overuse on sleep, health, concentration and comprehension as well as provide information on the consequences of smartphone overuse that may lead to withdrawal, depression, and destroy social relationships (Hiscock, 2004; James & Drennan, 2005; Richard, 2001).

Smartphone overuse and the psychological symptoms associated with it constitute a form of behavioral addiction known as smartphone addiction (Phillips & Bianchi, 2005). With regard to addiction, Torrecillas (2007) asserts that chemical addiction and smartphone addiction differ in that the latter does not have direct physical effects but rather principally manifests in psychological effects. Smartphone addicts tend to neglect work and study, separate themselves from friends and family, and remain attached to the smartphone while over depending on it to communicate with others. Torrecillas also found that 40% of adolescents and adults use smartphones for more than 4 h a day to make calls and send and

receive SMSs. Those individuals felt disturbed and upset when they could not reply to all calls and SMSs directed to them. Finally, the researchers asserted that smartphone addicts tend to be completely upset when deprived of their smartphones for some time regardless of the reason for this deprivation, and that switching off the smartphone results in worry, depression, anger and an inability to sleep.

Yu-Kang, Chun-Tuan, You, & Zhao-Hong (2014). The results suggest that compulsive usage of smartphone and technostress are positively related to psychological traits including locus of control, social interaction anxiety, materialism and the need for touch.

### 3.4. The effect of smartphone addiction on academic performance

Supplementary studies highlighted the negative effects of Smartphone addiction among university students. They identified the nature of this type of addiction by indicating its symptoms, classifying its levels and developing tools to measure it (Hafidha, Abdelmajid, & Naeema, 2015).

Acelajado (2004) wrote about the role that technology plays in all aspects of modern life and students' exposure to a large amount of varied and global information. Exposure to such vast amounts of information may result in an inability to distinguish between valid and invalid information. Educators are therefore required to include critical and creative thinking skills in the curriculum in order to assist their students toward selective decisions when faced with the onslaught of information they are continually exposed to.

Despite the importance of the smartphone and its applications facilitating communication, cooperation and creativity, it is still viewed as an unacceptable instructional tool in American high schools. The problem does not relate to the smartphone itself but rather the irrational use of the smartphone that needs to be modified (Geary, 2008). According to Ishii (2010), smartphone overuse by students may have negative effects on their academic performance. Students overusing the smartphone study for shorter periods and are likely to be victims of crimes. Lepp, Barkle, and Karpinski (2014); Javid, Malik, and Gujjar (2011) found that the student cell phone increased use may negatively impact academic performance, mental health, and subjective well-being or happiness.

Tindell and Bohlander (2012) reported that the majority of university students use the smartphone in classrooms. In this respect, some studies revealed a negative relationship between smartphone use and university students' achievement (e.g., Chen & Lever, 2004; Lepp, Barkle, & Karpinski, 2015). Studies also revealed that university students view the smartphone as entertainment and with time use becomes habitual. Hong et al. (2012) found a positive relationship between anxiety and smartphone use, and a negative relationship between its use and self-esteem.

### 3.5. The effect of smartphone addiction on daily behavior and general life

Pennay (2006) found that smartphone use while driving cars weakens concentration, which, in turn, causes accidents. Some researchers confirm that overuse of smartphones (e.g., Ehrenberg, Juckes, White, & Walsh, 2008) leads to smartphone addiction. This overuse has been empirically supported to have negative health effects (Toda, Monden, & Kubo, 2006). Louis (2005) reported that the amount of time spent in face-to-face interactions with friends is a strong predictor of the social use of the smartphone.

The increasing use of the smartphone has been accompanied by increasing negative effects. One of these negative effects is the harmful reflection on health that results from exposure to rays and wireless waves. This can cause cancer, brain tumors, nervous disturbances, poor concentration, and problems with the function of the iris and the immune system. It also has harmful effects on the eardrum, the wrist, the neck and the joints. Fatigue and sleep disorders are other negative effects (Alasdair & Philips, 2011).

Maya & Nizar (2016) showed that smartphone addiction risk was positively related to perceived stress, but the latter was negatively related to satisfaction with life. Additionally, a smartphone addiction risk was negatively related to academic performance, but the latter was positively related to satisfaction with life.

Smartphone overuse also has damaging effects on students' academic performance because of such practices as use during lectures, sharing with classmates the latest tones, songs and youtube videos. This diverts attention from and communication with their instructors and interferes with their performance, learning tasks and completing assignments (Attamimi, 2011). Students using the smartphone can also develop bad behaviors such as sharing inappropriate photos and videos during lectures. Furthermore, some students have resorted to stealing in order to secure money for smartphone use. Finally, students can use the smartphone to cheat on exams (Walsh, White, Hyde, & Watson, 2008).

A study by Campbell (2005) identified both appropriate and inappropriate ways young people use the smartphone. On one hand, it groups young people together apart from interference by adults. On the other hand, it can lead to rejection and exclusion of individuals who do not have smartphones and hacking for blackmail, which can lead to depression, anxiety and suicide.

As to use patterns, Assabawy (2006) found statistically significant differences in cellphone use in favor of males (16–25 years) as well as unmarried users and high income users. The study also reported several negative effects that smartphone overuse has on the social and family life of users.

Abo-Jedi (2008) found that 26% of Jordanian university students are smartphone addicts and that the number of female addicts is twice the number of male addicts. The study also found a significant correlation between smartphone addiction and self-disclosure. A study by Jodda (2009) revealed that a smartphone culture is being shaped among Arab young people. The elements of this culture include material aspects of devices and technologies, patterns of use, frequency of use and the effects on values, attitudes and the social structure.

Richard (2001) revealed that one is more likely to develop brain cancer as a result of more than 10 years of smartphone use. Long time users of smartphones are more likely to have a tumor in the nerve that links the ear to the brain. They may also suffer from stress, disturbed sleep, work and study problems, negligence of friends and responsibilities, withdrawal, irritation, and poor body activity.

A study by Woodbury (2009) revealed that the smartphone is basically used with family members and friends. It also showed that students did not view the smartphone as a good tool for doing assignments or for getting learning materials. However, 87% of the subjects saw it as a tool that enhances cooperation with colleagues.

As to the gender differences in smartphone use, studies revealed that females are more dependent on the smartphone than males (Billieux, Linden, & &Rochat, 2008). Smartphone overuse was found to cause social isolation, lack of privacy, inability to carry out multiple tasks, as well as negative health effects (Hatch, 2011). Although many researchers have shown gender differences in Smartphone addictive use(Choliz, 2012; Devis-Devis, Peiro-Velert, BeltranCarrillo, & Tomas, 2009; Walsh, White, Stephen, & Young, 2011). Others have proved that gender and Smartphone use are not significantly related (Chung, 2011; Prezza, Pacilli, & Dinelli, 2004).

Castells, Ardevol, Qiu, and Sey (2004) and Zulkefly and Baharudin (2009) found that students from higher income families spent more time and money on their mobile phone, while

Brown, Campbell, and Ling (2011) found that lower income students used their mobile phones more. However, other researchers, such as (Chakraborty, 2006; James & Drennan, 2005) revealed that both groups were similar in their usage regardless of their income.

Attamimi (2011) reported that 20% of Emirati students use a BlackBerry in class and its use is more frequent among males than females. It was also found that 46% of students use a BlackBerry for 1–3 h a day. Half of the subjects reported 4 h of use or more a day. No significant gender differences in pattern of use were found.

An international study was conducted by the GSMA (2011) in collaboration with the Cellphone Community Research Institute to explore the increasing use of cellphones by children between 8 and 18 years all over the world. It was found that 12% of children own smartphones and use them more frequently than their parents. Computer use was found to be less frequent than smartphone use with the frequency of computer use in three of the countries included in the study (Japan, India, Paraguay and Egypt) at less than 6%. Neither household income nor parents' education had a notable effect on possession and use of smartphones. It was also revealed that the largest proportion (68%) of children used the cellphone to play games. The second most popular use was the Cam (51%), followed by music players (44%) and video players (28%). Forty percent of the children reported using the cellphone to surf the Internet.

It was found in a study by Divan, Kheifets, Obel, and Olsen (2012) that children using the cellphone are more likely to display behavioral problems such as nervousness, temperament, mental distraction and indolence. These problems worsen if the child begins using the cellphone at an early age. Abo-Arrab and Al-Qosairi (2014) reported that, from a parental perspective, the most common behavioral problems resulting from smartphone use are social problems followed by educational problems and psychological problems respectively. The researchers found gender differences in smartphone use in favor of males. Differences were also found in favor of users between 8 and 12 years and in favor of users who use the smartphone for more than 3 h daily. Similarly, Al-Jamal (2014) reported that, from the perspective of educational counselors and school directors, the most negative effects on students' behavior relate to psychological aspects followed by health, behavioral and social aspects.

In brief, the concept of smartphone addiction refers to the uncontrollable overuse of the smartphone and the preoccupation with it resulting in obsession. This addiction undoubtedly affects all aspects of life: health, physical, psychological, social and familial (Abo-Jedi, 2008). In the present study, smartphone addiction is measured by scores on the smartphone use questionnaire with its five dimensions: 1) overuse, 2) the psychological-social dimension, 3) the health dimension, 4) preoccupation with smartphones, and 5) the technological dimension.

The significance of our study stems from the fact that the number of smartphone users is greatly increasing, which means that more and more individuals are expected to become smartphone addicts. However, research in this area is not adequate in either a regional or international scale. We, therefore, attempt to tap this growing field of interest and expect to provide researchers and educators with theoretical framework on smartphone addiction. We also hope to illuminate psychological counseling and therapy by elucidating the characteristics of smartphone addicts and the relationship between smartphone addiction and several variables. Another expected contribution of our study is the identification of the frequency of smartphone addiction among university students. This may provide insights for preventive and remedial planning in order to enhance students' wise and positive use of the smartphone. Finally, the instrument we developed for the present study can be used in future research probing the frequency of smartphone addiction, its negative effects and relation to other variables.

## 4. Method and participants

The comparative descriptive method was used in the present study as it was the most suitable for the research problem and its variables. Students using smartphones and attending King Saud University in Bachelor, Graduate, M.A and Ph. D programs constituted the population for our study. A cohort of 416 male and female students participated in the study. Table 1 shows the distribution of participants according to variables.

### 4.1. Questionnaire development

We developed a smartphone addiction questionnaire based on a survey of relevant literature and similar questionnaires (e.g., Abo-Jedi, 2008; Alasdair& Philips, 2011; Campbell, 2005; Kwon et al., 2013; Torrecillas, 2007; Walsh & White, 2007; Young, 1998; Young & de Abreu, 2011). In the light of this survey, we identified questionnaire dimensions and wrote items for each dimension. The preliminary version of the questionnaire had 88 items under 5 dimensions which are overuse of smartphone, the technological dimension, the psychological-social dimension, preoccupation with smartphones, the health dimension. These dimensions set out from the theoretical frame which adopted by the researchers and the literature review, and the definition of the addiction in the Manual (DSM IV) (American Psychiatric Association, 1994), and The criteria used for diagnosing both Internet and Smartphone addictions consider the dependencies a disorder (Heron & Shapira, 2004).

### 4.2. Questionnaire validity and reliability

To establish the validity of the questionnaire, it was presented to 12 referees being experienced specialists in psychology, psychological counseling, measurement and evaluation. They provided valuable feedback concerning the clarity of items, the integrity of the wording and the inclusion of items under dimensions. Based on this feedback, some items were reworded and 8 items were excluded leaving the questionnaire with 80 items. The 80 items represented five dimensions: 1) overuse of smartphone (11 items), 2) the technological dimension (13 items), 3) the psychological-social dimension (25 items), 4) preoccupation with smartphones (17 items), and, 5) the health dimension (14 items).

The internal consistency of the questionnaire was also established by computing correlations between 1) items and the dimensions they belong to (correlation coefficients ranged from 0.88 to 0.96.), 2) items and the whole questionnaire (correlation coefficients ranged from 0.32 to 0.91), and 3) dimensions (correlation coefficients ranged from 0.54 to 0.91). All correlations were significant.

The reliability of the questionnaire was established by the test-retest method. For this purpose, the questionnaire was administered to a pilot sample of 60 students (male and female) different from the main sample. The questionnaire was administered twice to the pilot sample with an interval of 2 weeks. Pearson Moment Correlation Coefficient was then computed. This yielded correlation coefficients between 0.89 and 0.92. In addition, the questionnaire's internal consistency was established by the Cronbach's Alpha method. Alpha correlation coefficients for questionnaire dimensions ranged from 0.84 to 0.94. The reliability coefficient of the whole questionnaire was 0.97. All coefficients were therefore significant indicating that the questionnaire was quite reliable.

**Table 1**
The distribution of participants according to variables.

| Variable | Levels | Frequency | Percentage |
|---|---|---|---|
| Gender | Males | 212 | 50.96% |
| | Females | 204 | 49.38% |
| Social status | Single | 339 | 81.5% |
| | Married | 75 | 18.5% |
| Educational level | Bachelor | 344 | 82.69% |
| | M.A | 72 | 17.31% |
| Family monthly income | Less than 10,000 riyals | 140 | 33.74% |
| | From 11,000 to 20,000 riyals | 178 | 42.89 |
| | More than 20,000 | 97 | 23.37% |
| Daily use hours | Less than 2 h | 37 | 8.9% |
| | From 2 to 4 h | 110 | 26.44% |
| | More than 4 h | 269 | 64.7% |

## 4.3. Data collection procedures

Participants responded to the questionnaire based on a 5-point Likert scale ranging from 5 ("always or almost always true of me") to 1 ("never or almost never true of me"). Thus, the highest score obtainable on the questionnaire is 400 and the lowest score is 80. Based on the recommendation of measurement and evaluation specialists and some studies which used the same scoring method (Abo-Jedi, 2008; Al-Jamal, 2014; Torrecillas, 2007). The median was used as a basis for characterizing smartphone addicts. That is, a participant whose score is higher than the median is considered an addict. The procedure was as follows: the rating points were summed (i.e., 1 + 2+3 + 4+5) yielding 3, which was then multiplied by the number of questionnaire items (i.e., 80) yielding 240. In other words, participants scoring 240 and higher are considered smartphone addicts.

The questionnaire was administered to the participants in the second semester of the academic year 2014–2015. Before completing the questionnaire, participants were informed of the study's objectives and the way to respond to questionnaire items. Completed questionnaires were then collected, checked for integrity and sorted according to study variables.

## 4.4. Data analysis

Data were statistically analyzed using the SPSS program. Percentages, means and standard deviations were used to answer the first and the second research questions. Independent samples *t*-test was used to answer the third, fourth and fifth questions. Finally, one-way analysis of variance (ANOVA) and Bonferroni test were used to explore the significance of differences among means. This last statistic answered the sixth and seventh research questions.

## 5. Results

**Results for the first question: How frequent is smartphone addiction among participants?**

To answer our first question, we used the median as the basis for identifying participants who are smartphone addicts. Based on this, 200 participants out of the total number of participants (i.e., 416) were categorized as smartphone addicts. That is, 48% of the participants were smartphone addicts.

**Results for the second question: What are the most significant indicators of smartphone addiction among participants?**

To find an answer to our second question, means and standard deviations of participants' responses were computed. The order of questionnaire dimensions based on means was also used. Table 2 shows the means, standard deviations and order of questionnaire dimensions.

Data in Table 2 reveals that smartphone overuse came first with

**Table 2**
Means, standard deviations and order of dimensions of the smartphone addiction questionnaire.

| No. | Order | Dimension | M | SD |
|---|---|---|---|---|
| 1 | 1 | Overuse of smartphone | 3.20 | 0.79 |
| 2 | 3 | Psychological-social dimension | 2.93 | 0.86 |
| 3 | 5 | Health dimension | 2.51 | 0.92 |
| 4 | 4 | Preoccupation with smartphones | 2.86 | 0.81 |
| 5 | 2 | Technological dimension | 3.17 | 0.82 |
| The Whole Questionnaire | | | 2.92 | 0.80 |

a mean of 3.20, followed by the technological dimension (M = 3.17), the psychological-social dimension (M = 2.93), preoccupation with smartphones (M = 2.86), and the health dimension (M = 2.51). The general mean of the questionnaire was 2.92.

**Results for the third question: Are there statistically significant differences in smartphone addiction attributable to gender?**

In order to answer this question, means, standard deviations and *t*-test for independent samples were computed exploring the differences in smartphone addiction by gender. Table 3 shows these statistics.

It is evident from Table 3 that there are statistically significant gender differences in smartphone addiction on the whole questionnaire and most of its dimensions in favor of males. The mean scores of male participants were higher than those of female participants on smartphone overuse (M = 36.32 vs. 33.96), the psychological-social dimension (M = 76.56 vs. 69.72), the health dimension (M = 37.66 vs. 32.47), preoccupation with smartphones (M = 51.07 vs. 46.00), and the whole questionnaire (M = 3.0461 vs. 2.7803). No significant difference was found between males and females on the technological dimension.

**Results for the fourth question: Are there statistically significant differences in smartphone addiction attributable to social status?**

To answer our fourth question, we computed means, standard deviations and *t*-test in order to explore differences in smartphone addiction by social status. Table 4 shows these statistics.

As listed in Table 4, there are statistically significant differences in smartphone addiction on the whole questionnaire and most of its dimensions by social status in favor of single participants. Single participants outperformed married participants on overuse (M = 35.78 vs. 32.17), the psychological-social dimension (M = 74.48 vs. 66.92), preoccupation with smartphones (M = 49.54 vs. 44.16), the technological dimension (M = 42.13 vs. 36.67), and the whole questionnaire (M = 2.97 vs. 2.66). Only the health dimension did not show significant differences between unmarried and married participants.

**Results for the fifth question: Are there statistically significant differences in smartphone addiction attributable to educational level?**

**Table 3**
The values of *t*-test for differences in smartphone addiction by gender.

| Dimension | Gender | N | M | SD | *t*-value | Sig. |
|---|---|---|---|---|---|---|
| Smartphone overuse | Male | 212 | 36.32 | 9.11 | 2.767 | 0.006* |
| | Female | 204 | 33.96 | 8.82 | | |
| Psychological-social dimension | Male | 212 | 76.56 | 22.41 | 3.290 | 0.001* |
| | Female | 204 | 69.72 | 19.876 | | |
| Health dimension | Male | 212 | 37.66 | 13.59 | 4.192 | 0.000* |
| | Female | 204 | 32.47 | 11.53 | | |
| Preoccupation with smartphones | Male | 212 | 51.07 | 14.57 | 3.827 | 0.000* |
| | Female | 204 | 46.00 | 12.28 | | |
| Technological dimension | Male | 212 | 42.08 | 11.40 | 1.735 | 0.08 |
| | Female | 204 | 40.27 | 9.72 | | |
| The whole questionnaire | Male | 212 | 3.0461 | 0.83 | 3.524 | 0.000* |
| | Female | 204 | 2.7803 | 0.70 | | |

**Table 4**
The values of *t*-test for differences in smartphone addiction by social status.

| Dimension | Gender | N | M | SD | *t*-value | Sig. |
|---|---|---|---|---|---|---|
| Smartphone overuse | Single | 339 | 35.78 | 8.70 | 3.276 | 0.001* |
| | Married | 75 | 32.17 | 8.62 | | |
| Psychological-social dimension | Single | 339 | 74.48 | 21.47 | 2.87 | 0.005* |
| | Married | 75 | 66.92 | 20.44 | | |
| Health dimension | Single | 339 | 35.62 | 12.96 | 1.84 | 0.074 |
| | Married | 75 | 32.68 | 12.40 | | |
| Preoccupation with smartphones | Single | 339 | 49.54 | 13.76 | 3.24 | 0.002* |
| | Married | 75 | 44.16 | 12.81 | | |
| Technological dimension | Single | 339 | 42.13 | 10.47 | 4.16 | 0.000* |
| | Married | 75 | 36.67 | 10.24 | | |
| The whole questionnaire | Single | 339 | 2.97 | 0.77 | 3.168 | 0.002* |
| | Married | 75 | 2.66 | 0.75 | | |

To answer this question, means, standard deviations and *t*-test were computed to explore differences in smartphone addiction by educational level. This data is shown in Table 5.

As shown in Table 5, participants in a bachelor program outperformed participants in a graduate program for smartphone addiction on the whole questionnaire and all of its dimensions. The mean scores for smartphone overuse, the psychological-social dimension, the health dimension, preoccupation with smartphones, the technological dimension, and the whole questionnaire are 35.87 vs. 31.79, 74.65 vs. 66.28, 35.81 vs. 31.78, 49.55 vs. 43.99, 42.24 vs. 36.22, and 2.98 vs. 2.63 respectively.

**Results for the sixth question: Are there statistically significant differences in smartphone addiction attributable to hours of daily use?**

To answer this question, ANOVA was computed to explore differences in smartphone addiction by hours of daily use. This data is shown in Table 6.

Data in Table 6 reveals that there are differences in smartphone addiction by the hours of smartphone use in a day. To determine the statistical significance of these differences, Bonferroni test was used. Table 7 presents these findings.

It is notable in Table 7 that there were differences in smartphone addiction by daily use hours in favor of the participants who use the smartphone for more than 4 h a day. This applied to all dimensions and the whole questionnaire. The mean scores for dimensions and the whole questionnaire are 37.64, 78.04, 37.33, 51.62, 43.67, and 3.1037. Those means are higher than the means for the two categories: 1) less than 2 h of use a day, and 2) from 2 to 4 h of smartphone use a day. Also there are statistically significant differences between the two categories "less than 2 h" and "from 2 to 4 h" on the two dimensions of "smartphone overuse" (M = 31.84 vs. 27.03) and "the technological dimension" (M = 38.22 vs. 32.05) in favor of the category of 2–4 h of smartphone use per day.

**Results for the seventh question: Are there statistically significant differences in smartphone addiction attributable to monthly income?**

**Table 5**
The values of *t*-test for differences in smartphone addiction by educational level.

| Dimension | Gender | N | M | SD | *t*-value | Sig. |
|---|---|---|---|---|---|---|
| Smartphone overuse | Bachelor | 344 | 35.87 | 8.61 | 3.635 | 0.000* |
| | Graduate | 72 | 31.79 | 8.89 | | |
| Psychological-social dimension | Bachelor | 344 | 74.65 | 21.39 | 3.125 | 0.002* |
| | Graduate | 72 | 66.28 | 20.53 | | |
| Health dimension | Bachelor | 344 | 35.81 | 12.95 | 2.55 | 0.004* |
| | Graduate | 72 | 31.78 | 12.05 | | |
| Preoccupation with smartphones | Bachelor | 344 | 49.55 | 13.752 | 3.341 | 0.001* |
| | Graduate | 72 | 43.99 | 12.65 | | |
| Technological dimension | Bachelor | 344 | 42.24 | 10.32 | 4.461 | 0.000* |
| | Graduate | 72 | 36.22 | 10.78 | | |
| The whole questionnaire | Bachelor | 344 | 2.98 | 0.77 | 3.55 | 0.000* |
| | Graduate | 72 | 2.63 | 0.76 | | |

**Table 6**
ANOVA for differences in smartphone addiction by hours of daily use.

| Dimension | Source of Variance | Sum of Squares | df | Mean squares | f-value | Sig. |
|---|---|---|---|---|---|---|
| Smartphone overuse | Between Groups | 5321.117 | 2 | 2660.559 | 41.170 | 0.000* |
| | Within Groups | 26689.767 | 413 | 64.624 | | |
| | Total | 32010.885 | 415 | | | |
| Psychological-social dimension | Between Groups | 20074.875 | 2 | 10037.437 | 24.253 | 0.000* |
| | Within Groups | 170928.164 | 413 | 413.870 | | |
| | Total | 191003.038 | 415 | | | |
| Health dimension | Between Groups | 3761.375 | 2 | 1880.688 | 11.948 | 0.000* |
| | Within Groups | 65007.086 | 413 | 157.402 | | |
| | Total | 68768.462 | 415 | | | |
| Preoccupation with smartphones | Between Groups | 7756.301 | 2 | 3878.151 | 22.777 | 0.000* |
| | Within Groups | 70318.583 | 413 | 170.263 | | |
| | Total | 78074.885 | 415 | | | |
| Technological dimension | Between Groups | 5713.019 | 2 | 2856.509 | 28.620 | 0.000* |
| | Within Groups | 41220.209 | 413 | 99.807 | | |
| | Total | 46933.228 | 415 | | | |
| Whole questionnaire | Between Groups | 29.689 | 2 | 14.935 | 27.747 | 0.000* |
| | Within Groups | 222.295 | 413 | 0.538 | | |
| | Total | 252.164 | 415 | | | |

**Table 7**
Bonferroni test values for the significance of differences in smartphone addiction by hours of daily use.

| Dependent variable | Daily use hours | M | Less than 2 Hs | From 2 to 4 Hs | More than 4 Hs |
|---|---|---|---|---|---|
| Smartphone overuse | Less than 2 Hs | 27.03 | – | 4.809* | 10.616* |
| | From 2 to 4 Hs | 31.84 | – | – | 5.807* |
| | More than 4 Hs | 37.64 | – | – | – |
| Psychological-social dimension | Less than 2 Hs | 57.57 | – | 9.069 | 20.470* |
| | From 2 to 4 Hs | 66.64 | – | – | 11.401* |
| | More than 4 Hs | 78.04 | – | – | – |
| Health dimension | Less than 2 Hs | 30.35 | – | 0.949 | 6.980* |
| | From 2 to 4 Hs | 31.30 | – | – | 6.031* |
| | More than 4 Hs | 37.33 | – | – | – |
| Preoccupation with smartphones | Less than 2 Hs | 39.11 | – | 5.256 | 12.509* |
| | From 2 to 4 Hs | 44.36 | – | – | 7.253* |
| | More than 4 Hs | 51.62 | – | – | – |
| Technological dimension | Less than 2 Hs | 32.05 | – | 6.164* | 11.615* |
| | From 2 to 4 Hs | 38.22 | – | – | 5.451* |
| | More than 4 Hs | 43.67 | – | – | – |
| Whole questionnaire | Less than 2 Hs | 2.3264 | – | 0.32808 | 0.77737* |
| | From 2 to 4 Hs | 2.6544 | – | – | 0.44929* |
| | More than 4 Hs | 3.1037 | – | – | – |

In order to answer this question, we computed ANOVA to explore differences in smartphone addiction by monthly income. Table 8 shows this data.

Data in Table 8 reveals that there are differences in smartphone addiction by monthly income. To determine the statistical significance of these differences, Bonferroni test was used. Table 9

**Table 8**
ANOVA for the differences in smartphone addiction by monthly income.

| Dimension | Source of Variance | Sum of squares | df | Mean squares | f-value | Sig. |
|---|---|---|---|---|---|---|
| Smartphone overuse | Between Groups | 28.539 | 2 | 14.269 | 0.184 | 0.832 |
| | Within Groups | 31955.620 | 412 | 77.562 | | |
| | Total | 31984.159 | 414 | | | |
| Psychological-social dimension | Between Groups | 820.702 | 2 | 410.351 | 0.889 | 0.412 |
| | Within Groups | 190143.780 | 412 | 461.514 | | |
| | Total | 190964.482 | 414 | | | |
| Health dimension | Between Groups | 1655.648 | 2 | 827.824 | 5.085 | 0.007* |
| | Within Groups | 67078.101 | 412 | 162.811 | | |
| | Total | 68733.749 | 414 | | | |
| Preoccupation with smartphones | Between Groups | 335.474 | 2 | 167.737 | 0.889 | 0.412 |
| | Within Groups | 77719.885 | 412 | 188.640 | | |
| | Total | 78055.359 | 414 | | | |
| Technological dimension | Between Groups | 274.265 | 2 | 137.132 | 1.211 | 0.299 |
| | Within Groups | 46658.926 | 412 | 113.250 | | |
| | Total | 46933.190 | 414 | | | |
| Whole questionnaire | Between Groups | | 2 | 0.783 | | |
| | Within Groups | | 412 | 0.608 | 1.287 | 0.277 |
| | Total | | 414 | | | |

presents these findings.

Evidenced in Table 9, there are statistically significant differences in smartphone addiction by monthly income on the health dimension in favor of participants whose monthly income is less than 10,000R. The mean of this category (M = 37.90) is higher than the means of the 11,0000 to 20,000 (M = 33.71) and the more than 20,000 (M = 33.61) categories.

## 6. Discussion

We explored the frequency and indices of smartphone addiction in a group of King Saud University students and investigated whether there were differences in smartphone addiction based on gender, social status, educational level, monthly income and hours of daily use. Results revealed that the percentage of smartphone addiction among King Saud University students is 48%. This percentage is higher than its counterpart in some Arabic studies (e.g., Abo-Jedi, 2008). However, it is similar to international percentages (e.g., Szpakow et al., 2011; Torrecillas, 2007; Wajcman et al., 2007). This finding can be attributed to a fascination with technology and voracity for possessing smartphones in the Arab world as a sign of keeping up with global modernization. Smartphone use in the Arab world expands for other possible reasons including that smartphones are inexpensive, accessible, easy to use and smaller in size than other computing devices. With smartphones and their various applications, one can easily navigate the Internet. All of these merits result in the smartphone being indispensable. It is easy to become attached to a smartphone. This agrees with Lepp et al. (2015) view that students see their smartphone as an amusement tool and with time its use becomes habitual.

Results also reveal that the most significant indicators of smartphone addiction were overuse of smartphone, the technological dimension, the psychological-social dimension, preoccupation with smartphones, and the health dimension respectively. The degree of smartphone addiction proved to be high concerning overuse and the technological dimensions and moderate concerning the other dimensions. This translates to students spending considerable time using their smartphone and a dependence on the several technological applications they provide. Students have come to depend on a smartphone to do even the simplest daily tasks. This overdependence can result in negative physical, psychological, social, familial and educational effects. This is consistent with most studies researching smartphone addiction (e.g., Abo-Arrab & Al-Qosairi, 2014; Alasdair & Philips, 2011; Al-Jamal, 2014; Campbell, 2005; GSMA, 2011; Javid et al., 2011; Lepp et al., 2014). This finding also concurs with the study conducted by Walsh et al. (2007) that reported a large increase in the number of smartphone users, and increased spending to obtain the latest devices and apps, as well as an inability to do without smartphones, increased hours of use, and preoccupation with smartphones. This indicates that smartphone addiction is expected to grow in the future and to become one of the most prevailing types of addiction.

Gender differences on the whole smartphone addiction questionnaire and most of its dimensions were found in favor of male participants. That is, males use smartphones more often than females and tend to be more preoccupied with smartphones. For this reason, males are more likely to be negatively affected by smartphones. This finding is in line with the studies of Assabawy (2006), Devis-Devis et al. (2009), Walsh et al. (2011), Choliz (2012), and Abo-Arrab and Al-Qosairi (2014). However, this finding is inconsistent with Abo-Jedi (2008) study where the percentage of female addicts was found to be double the percentage of male addicts and Billieux et al. (2008) study where females were reported to use smartphones more often than males. The only dimension that did not show gender differences in smartphone addiction is the technological dimension. This finding seems logical given that both genders use smartphones to do the same tasks with the same applications, as they study at the same university. It seems that smartphone apps attract both genders that use them for social communication and academic assignments. This finding is consistent with the study of Prezza et al. (2004), Chung (2011), and Attamimi (2011), where no gender differences were found regarding frequency of use.

We found that social status affected smartphone addiction and single participants scored higher than married participants on the whole smartphone addiction questionnaire and all of its dimensions, except for the health dimension. Absence of significant differences in the health dimension indicates that health effects of smartphone addiction on both married and unmarried individuals are the same. The reason for this may be that all persons use the same practices and the same posture with smartphone use. This finding is in line with studies that reported negative health effects of smartphone addiction regardless of social status (e.g., Alasdair & Philips, 2011; Al-Jamal, 2014; Hatch, 2011). We noted that single participants scored significantly higher than married participants on the other four dimensions of smartphone addiction which can be interpreted in the light of the fact that they are younger in age. Single participants are mostly students in a bachelor program, meaning they are adolescents and tend to be more obsessed with smartphones and more enthusiastic regarding the latest devices and apps. The obsession of the younger generation with smartphones may be due to several factors including imitation, social pride, the desire to keep up with fashion, having much free time, a search for emotional relationships through different apps, and interest in entertainment apps and games. For these reasons, adolescents use smartphones for long hours. This finding concurs with studies reporting that most smartphone addicts are adolescents (e.g., International Telecommunication Union (ITU), 2004). In his investigation of smartphone addiction among adolescents, Torrecillas (2007) reported that a smartphone addict feels distressed when deprived of their smartphone for some time regardless of the reason for this deprivation. He adds that switching off the smartphone results in anxiety, depression, anger and an inability to sleep for the adolescent. This is consistent with the study of Assabawy (2006).

Unlike single adolescents, married adults have commitments and responsibilities relevant to job, family and social duties resulting in less free time for smartphone use. These adults often use the smartphone for specific purposes, e.g., search for information. Marriage provides a form of psychological stability and thus married persons tend to be more rational with smartphone use than are adolescents.

**Table 9**
Bonferroni test values for the significance of differences in smartphone addiction by monthly income.

| Dependent variable | Monthly income | M | Less than 10,000R | 11,000–20,000R | More than 20,000R |
|---|---|---|---|---|---|
| Technological dimension | Less than 10,000R | 37.90 | – | 4.187* | 4.292* |
| | 11,000–20,000R | 33.71 | – | – | 0.105 |
| | More than 20,000R | 33.61 | – | – | – |

As to the relationship between smartphone addiction and educational level, bachelor program participants scored significantly higher than M.A program participants on the whole questionnaire and all the five dimensions. These results are consistent with the finding concerning the relationship between smartphone addiction and social status. Bachelor program students (mostly unmarried adolescents) have more free time and less social and familial commitments than do M.A program students (mostly married adults). This indicates that bachelor program students (young people in general) are more likely to be smartphone addicts than are M.A program students (adults in general). Again this is consistent with studies that reported higher smartphone addiction among adolescents in comparison with other age groups (e.g., International Telecommunication Union (ITU) (2004; Phillips & Bianchi, 2005; Assabawy, 2006; Wajcman et al., 2007; Ishii, 2010; Attamimi, 2011; Hatch, 2011; Divan et al., 2012; Maya & Nizar, 2016).

Data revealed significant differences in smartphone addiction in favor of participants who use smartphones for more than 4 h a day. This applied to the whole questionnaire and all the five dimensions. That is, the longer the time individuals spend on the smartphone, the more likely they are to be smartphone addicts. Overuse creates a habit. This is in line with the findings for our first research question that overuse is the strongest indicator of smartphone addiction. Several other studies reported that individuals using smartphones for longer time periods are more likely to be smartphone addicts (e.g., Abo-Arrab & Al-Qosairi, 2014; Abo-Jedi, 2008; Abo-Zeid, 2011; Alasdair & Philips, 2011; Attamimi, 2011; Ishii, 2010; Richard, 2001; Torrecillas, 2007).

Participants with a monthly income lower than 10,000 SR scored higher than the other two income categories on the health dimension. That is, low income individuals are more susceptible to negative health effects of smartphone addiction. A possible reason for this is that low income individuals overuse smartphones as a sort of compensation and for self-assertion. They may have a desire to present an unrealistic impression about their economic status by possessing the latest devices and applications and using smartphones for long periods. They do this not to appear inferior to their colleagues with higher economic status. These individuals may find in prolonged use of smartphones a means of escape from depressions and financial pressures that they may be subject to in their daily life. Since low income individuals use smartphone for longer periods than do high income individuals, they are more likely to be subject to negative health effects of smartphone addiction, this consistent with study of Brown (2011). However, this finding is inconsistent with Castells et al. (2004) study and Zulkefly and Baharudin (2009) study where students from higher income families spent more time and money on their mobile phone.

No significant differences were found between the three categories of monthly income on the other dimensions of smartphone addiction or the whole questionnaire. This shows that participants, regardless of their economic status, are similar in the degree of smartphone addiction. This seems logical since they study at the same university and use smartphone applications for the same or similar purposes. This same finding was reached in the study of the Chakraborty (2006), James and Drennan (2005) and GSMA (2011), where no significant differences were found in smartphone use owing to economic status. This finding is inconsistent though with the study of Assabawy (2006) where significant differences were found in smartphone use in favor of individuals with high income.

## 7. Limitations

There are many limitations which can influence the result of this research. Participants of the current study were from king Saud university in Saudi Arabia which limits the generalizability of the results on other societies outside the middle east region. Based on the findings of the present study, we offer a recommendations to develop counseling programs and symposia where experts can raise the awareness of university students, especially single and undergraduate programs students of how to use smartphones and avoid the negative effects resulting from addiction. Future researches will be needed to explore smartphone addiction at other populations such as school students and employees at companies and institutions. We also encourage the investigation of the relationship between smartphone addiction and psychological variables like psychological isolation, anxiety, depression, social skills, personality patterns, academic achievement and traffic accidents. It would also be advantageous to conduct an experimental study that aims to develop a remedial program to help smartphone addicts overcome addiction as well as conduct research to predict factors affecting smartphone addiction among university and school students. Finally, it would be worthwhile investigating the factor structure of the smartphone addiction questionnaire used in the present study.

## References

Abo-Arrab, M., & Al-Qosairi, E. (2014). The problem behaviors resulting from smartphone use by children from the perspective of parents in the light of some variables. *The International Journal for Educational Research, 35*, 170–192 (In Arabic).

Abo-Jedi, A. (2008). Cellphone addiction and its relation to self-closure in a sample of Jordanian university and Amman private university students. *The Jordanian Journal for Educational Sciences, 4*, 137–150 (In Arabic).

Acelajado, M. J. (2004). *Theimpact of using technology on students' achievement, attitude, and anxiety in mathematics* (pp. 1–20). Available at: http://www.icmeorganisers.dk/tsg15/Acelajado.pdf.

Al-Jamal, S. (2014). The negative effects of smartphones on students' behaviors from the perspective of school counselors and directors in the south of Khalil. *The Journal of Al-Qods Open University, 4*, 60–90 (In Arabic).

Alasdair, A., & Philips, J. (2011) Children and mobile phones. The content of this article can be freely used with appropriate citation www.powerwatch.org.uk or www.emfields.org, 1–8.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders (DSM IV)* (4th ed.) Washington, DC.

Assabawy, H. (2006). Social effects of cellphones (a field study in Mosul City). *Mosulian Studies, 14*, 77–105 (In Arabic).

Attamimi, A. (2011). The reasons for the prevalence of BlackBerry cellphones and the resulting educational effects from the perspective of secondary school students in Abo-Dhabi. In *A paper presented at the conference on the negative effects of cellphones on secondary school students, UAE* (pp. 105–130) (In Arabic).

Billieux, J., Linden, M., & Rochat, L. (2008). .The role of impulsivity in actual and problematic use of the mobile phone. *Applied Cognitive Psychology, 22*, 1195–1210.

Brown, K., Campbell, S. W., & Ling, R. (2011). Mobile phones bridging the digital divide for teens in the US? *Future Internet*, 144–158. http://dx.doi.org/10.3390/fi3020144.

Campbell, S. W. (2005). The impact of the mobile phone on young people's social life. In *Paper presented to the Social Change in the 21st Century Conference, Centre for Social Change Research, Queensland University of Technology, 28 October 2005*.

Castells, M., Ardevol, M., Qiu, J., & Sey, A. (2004). The mobile communication society: a cross cultural analysis of available evidence on the social use of wireless communication technology. In *A research report prepared for the International Workshop on Wireless Communication Policies and Prospects: A Global Perspective, held at the Annenberg School for Communication, University of Southern California, Los Angeles*.

Chakraborty, S. (2006). *Mobile phone use patterns amongst university students: A comparative study between India and USA*. Unpublished Master's thesis. North Carolina, USA: University of North Carolina.

Chen, Y., & Lever, K. (2004). *Relationships among mobile phones, social networks, and academic achievement: A comparison of US and Taiwanese college students*. School of Communication, Information, and Library Studies. Dissertation abstract.

Choliz, M. (2012). Mobile-phone addiction in adolescence: the test of mobile-phone dependence (TMD). *Progress in Health Sciences, 2*(1), 33–44.

Chung, N. (2011). Korean adolescent girls additive use of mobile phones to maintain interpersonal. *Social Behavior and Personality, 39*(1), 1349—1358.

Davis, R. (2001). A cognitive behavioral model of pathological internet use. *Computers in Human Behavior, 17*, 187—191.

Devis-Devis, J., Peiro-Velert, C., BeltranCarrillo, V. J., & Tomas, J. M. (2009). Screen media time use of 12-16 year-old Spanish school adolescents: effects of personal and socioeconomic factors, season and type of day. *Journal of Adolescence, 32*(2), 213—231. http://dx.doi.org/10.1016/j.adolescence.2008.04.004.

Divan, H. A., Kheifets, L., Obel, C., & Olsen, J. (2012). Cell phone use and behavioral problems in young children. *J. Epidemiol Community Health, 66*, 524—539.

Duran, M. (2003). *Internet addiction disorder.* Retrieved at 8/42016 http://allpsych.com/journal/internetaddiction/.

Ehrenberg, A., Juckes, S., White, K. M., & Walsh, S. P. (2008). Personality and self-esteem as predictors of young people's technology use. *Cyber Psychology and Behavior, 11*, 739—741.

Geary, M. (2008). Supporting cell phone use in the classroom. *Florida Educational Leadership Fall, 2*(4), 29—32.

GSMA. (2011). *Children's use of cellphones: An international comparative study.* NITTDOCOMO. Available on line http://www.gsma.com/publicpolicy/wp-content/uploads/2012/06/DOCOMO_Report2810_EXECSUM_Ar.pdf.

Hafidha, S., Abdelmajid, B., & Naeema, H. (2015). Smartphone addiction among university undergraduates: a literature review. *Journal of Scientific Research & Reports, 4*(3), 210—225. http://dx.doi.org/10.9734/JSRR/2015/12245.

Hatch, S. (2011). Cloud computing — understanding the technology before getting clouded. In *Proceedings of 2011 First IRAST International Conference on Data Engineering and Internet Technology.*

Heron, D., & Shapira, N. (2004). Time to log off: new diagnostic criteria for problematic internet use. *Current Psychiatry Online, 2*(4).

Hiscock, D. (2004). Cell phones in class: this, too, shall pass? *Community College Week, 16*, 4—5.

Hong, Chiu, S., & Huang, H. (2012). A model of the relationship between psychological characteristics, mobile phone addiction and use of mobile phones by Taiwanese university female students. *Computers in Human Behavior, 28*, 2152—2159. http://dx.doi.org/10.1016/j.chb.2012.06.020.

International Telecommunication Union (ITU). (2004). *Mobile phones and youth: A look at the US student market.* At: http://www.itu.int/osg/spu/ni/futuremobile/Youth.pdf.

Ishii, K. (2010). Examining the adverse effects of mobile phone use among Japanese adolescents. *Keio Communication Review, 33*, 69—83.

James, D., & Drennan, J. (2005). Exploring addictive consumption of mobile phone. *Journal of Adolescence, 27*(1), 87—96.

Javid, M., Malik, M. A., & Gujjar, A. A. (2011). Mobile phone culture and its psychological impacts on students' learning at the university level. *Language in India, 11*(2), 416—422.

Jodda, A. (2009). *The social effects of cellphone use by university students.* Egypt: Ain Shams University.

Klyoko, K., & Hitoml, S. (2005). Impact of the mobile phone on junior high-school students' friendships in the Tokyo metropolitan area. *Cyber Psychology & Behavior, 8*, 215—231.

Kwon, M., Lee, J.-Y., Won, W.-Y., Park, J.-W., Min, J.-A., Hahn, C., et al. (2013). Development and validation of a smartphone addiction scale (SAS). *PLoS One, 8*(2), e56936. http://dx.doi.org/10.1371/journal.pone.0056936.

Lepp, A., Barkle, J., & Karpinski, A. (2015). *Relationship between cell phone use and academic performance in a sample of US college students.* SAGE Open. Published 19 February 2015 http://doi:10.1177/2158244015573169.

Lepp, A., Barkle, J., & Karpinski, A. (2014). The relationship between cell phone use, academic performance, anxiety, and Satisfaction with Life in college students. *Computers in Human Behavior, 31*, 343—350. http://dx.doi.org/10.1016/j.chb.2013.10.049.

Louis, L. (2005). Leisure boredom, sensation seeking, self-esteem, and addiction symptoms as predictors of social use, features use, and improper use of mobile phones. *Media and Communication, 12*, 213—241.

Maya, S., & Nazir, S. (2016). Relationships among smartphone addiction, stress, academic performance, and satisfaction with life. *Computers in Human Behavior, 57*, 321—325. http://dx.doi.org/10.1016/j.chb.2015.12.045.

Pennay, D. (2006). *Community attitudes to road safety: Community attitudes survey wave 18, 2005 (No. CR 227).* Canberra: Australian Transport Safety Bureau.

Phillips, J., & Bianchi, A. (2005). Psychological predictors of problem mobile phone use. *Cyber Psychology & Behavior, 8*, 39—51.

Prezza, M., Pacilli, M. G., & Dinelli, S. (2004). Loneliness and new technologies in a group of Roman adolescents. *Computers in Human Behavior, 20*(5), 691—709.

Richard, A. (2001). *Internet addiction.* York University Press.

Szpakow, A., Stryzhak, A., & Prokopowicz, W. (2011). Evaluation of threat of mobile phone — addiction among Belarusian University students. *Progress in Health Sciences, 1*(2), 96—101.

Tindell, D. R., & Bohlander, R. W. (2012). The use and abuse of cell phones and text messaging in the classroom: a survey of college students. *College Teaching, 60*, 1—9.

Toda, M., Monden, K., & Kubo, K. (2006). Mobile phone dependence and health-related lifestyle of university students. *Social Behavior & Personality, 34*, 1277—1284.

Torrecillas, L. (2007). Mobile phone addiction in teenagers may cause server psychological disorder. *Medical Studies, 14*, 11—13.

Wajcman, J., Bittman, M., Jones, P., Johnstone, L., & Brown, J. (2007). The impact of the mobile phone on work/life balance. Australian Research Council, Preliminary Report *Research School of Social Sciences*, P1—P27.

Walsh, S. P., & White, K. M. (2007). Me, my mobile and I: the role of self and prototypical identity influences in the prediction of mobile phone behavior. *Journal of Applied Social Psychology, 37*, 2405—2434.

Walsh, S. P., White, K. M., Hyde, M. K., & Watson, B. (2008). Dialing and driving: factors influencing intentions to use a mobile phone while driving. *Accident Analysis and Prevention, 40*, 1893—1900.

Walsh, S. P., White, K. M., Stephen, C., & Young, R. M. (2011). Keeping in constant touch: the predictors of young Australians' mobile phone involvement. *Computers in Human Behavior, 24*, 333—342.

Walsh, S., White, K., & Young, R. (2007). Over-connected? Qualitative exploration of the relationship between Australian youth and their mobile phones. *Adolescence Journal, 15*, 122—135.

Woodbury, D. N. (2009). *A survey of undergraduates' use and attitudes of cell phones for instruction, learning, and collaboration.* A Master's Paper for the M.S.In I.S degree. April, 2009. 36 pages. Advisor: Jane Greenberg.

Young, K. S. (1996). Internet addiction: the emergence of new clinical disorder. In *Paper presented at the 104th annual meeting of psychological association.*

Young, K. S. (1998). Internet addiction: the emergence of a new clinical disorder. *Cyber Psychology and Behavior, 1*(3), 237—244.

Young, K. S., & de Abreu, C. N. (2011). *Internet addiction: A handbook and guide to evaluation and treatment.* Hoboken, New Jersey: John Wiley & Son.

Zulkefly, S., & Baharudin, R. (2009). Mobile phone use amongst students in a university in Malaysia: its correlates and relationship to psychological health. *European Journal of Scientific Research, 37*(2), 206—218.