

Investigating the Impact of Cell-Phone on Fatigue: A Case Study of Iranian Medical Students

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Received April 20, 2021; Revised June 01, 2021; Accepted August 09, 2021

This paper is available on-line at <http://ijoh.tums.ac.ir>

ABSTRACT

Despite all the positive effects of cell phones on communication, the improper use of these devices may lead to fatigue and many other problems, including academic, physical, and social problems. Among different age groups, students are the most affected due to the importance of cell phones in their educational and communications needs. In this study, we seek to investigate the relationship between improper use of cell phones and fatigue in Iranian medical students. In the present descriptive-analytical and cross-sectional study, 400 students were randomly selected from the Iran University of Medical Sciences by cluster sampling. Data collection tools included demographic information questionnaires, harmful cell phone use (COS), and fatigue (Smets). Data were analyzed using SPSS software version 22 based on the frequency tests, mean, standard deviation, and ANOVA with a significance level of 0.05. The mean age of students was 24.1 ± 5.65 . The total population of the study was 56% female and 44%, male. The results revealed that the prevalence of fatigue among students was moderate (56.60%). The status of harmful cell phone use was reported to be moderate (90%). There was a significant relationship between mobile phone use and total fatigue ($p=0.029$), decreased motivation ($p=0.025$), and mental fatigue ($p = 0.001$). Results showed that excessive use of cell phones had an adverse impact on total fatigue, mental fatigue, and motivation. Therefore, it is recommended to design effective interventions to prevent harmful use of cell-phone, student fatigue, and other consequences, including academic failure and reduction of mental health.

KEYWORDS: Mental Health; Fatigue; Students; Traumatic



INTRODUCTION

Due to the significant impact of cell phones on the daily communications of human beings, itof human communities. Nowadays, cell-phones play an inseparable role as it is necessary for every single brought a lot of attention to the personal and social life activity related to our daily life [1]. Due to their unique features, mobile phones have become very popular among teens, especially students. Regardless of the physical presence of students in the classrooms they are often mentally distracted by external events. This problem could challenge the quality and attractiveness of higher education. On the other hand, if the cell phone is in accordance with educational goals, it can have a positive effect on students' learning process [2].

By expansion of cell-phones' application, lots of concerns about the excessive and harmful use of this technology are considered among scholars. Excessive use of this device can lead to many physical and psychological injuries [3]. Therefore, in some cases, excessive use of this device causes academic performance reduction, conditioning, and expulsion from university [3]. Although this technology has many benefits such as saving time and improving the quality of life, its negative aspects cannot be absolutely ignored. Improper use of mobile phones has caused serious social and cultural maleficent in society which should be managed and controlled to minimize these inverse effects on the young generation [4].

The main part of cell phone application among the young generation is harmful whether intentionally or unintentionally. In addition, telecom operators trigger this situation by offering different voice and text messages packages in their TV commercials [5]. Constant exposure to radiofrequency signals from mobile phones and their base stations could adversely affect human health. As a result of this impact, we are witnessing frequent headaches, loss of memory and concentration, the tension in the eardrum and sudden bouts of fatigue, childhood leukemia, brain tumors, eye cataracts, cardiovascular diseases, and disorders of the nervous system [6]. Improper cell phone usage can be one of the causes of fatigue [7-8]. Fatigue is a

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phenomenon with various definitions in different kinds of literature.

Some consider it one-dimensional due to lack of power and energy, while others attribute it to changes in more than one human dimension. Smets et al., defined fatigue as a result of mind, body, activity, and motivation. They believe that the effects of fatigue, depending on its origin, may manifest themselves in one of the general forms, mental, physical, decreased activity, and decreased motivation [9]. Fatigue due to long-term mental work leads to dysfunction in various cognitive tasks. The important point is that mentally tired people often have difficulty maintaining attention and concentration and they are easily confused and distracted, which indicates the effects of mental fatigue on the level of attention [10]. Results showed that a tired person has problems in maintaining attention and focus on work [11].

It can be concluded that improper use of cell phones and fatigue, particularly among the young generation, causes many problems, including academic, physical, and social problems. Thus, considering the lack of researches in this domain, this study was investigated the relationship between harmful cell phone usage and fatigue among Iranian medical students.

METHODS

Study design:

In the present descriptive-analytical and cross-sectional study, we used students of the Iran University of Medical Sciences as a statistical population. Hence, a random sampling method among students of each faculty was used to collect the related data. Among the students of the Iran University of Medical science, 384 students were selected as our sample size based on the folsparinglying formula and taking into account a 95% confidence interval, and 0.03 accuracy. In order to prevent the sample from falling, we collected 400 samples for confidence based on the Equation 1.

$$n = \frac{z^2 \cdot p(1-p)}{d^2} = 400 \quad (1)$$

Where, 95% was confidence level, $d = 0.03$ absolute accuracy, $Z=1.96$ normal distribution table, $P = 0.1$.

Inclusion criteria were participants' conscious satisfaction about the study's content, studying in the faculties of Iran University of Medical Sciences, spending at least one semester in the faculty.

The questionnaire consisted of three parts. In the first part, demographic characteristics and contexts included age, sex, marital status, educational level, residence.

In the second part of the questionnaire, the harmful factors caused by cell phone use (Cos) were asked. This questionnaire was developed by Gennaro et al, and the reliability of this scale was determined by Cronbach's alpha internal consistency method on Spanish female and male students were reported 0.85. This scale has 21 items. The scale is graded based on a six-point Likert (never (0), almost never (1), sometimes (2), often (3), almost always (4), and always (5). Subjects with scores above 75 were rated as excessive users and less than 25 were assigned to be sparingly users [12]. YasemiNejad and Golmohammadian reported a reliability of 0.9 for this questionnaire using the re-test method and Cronbach's alpha [3]. In the third part of the study, Smets's et al.,

standard questionnaire of fatigue was used to measure 5 dimensions of general fatigue, physical fatigue, decreased activity, decreased motivation, and mental fatigue [13].

This questionnaire is able to assess the population of patients, individuals' health, and includes 20 items based on the Likert scale. Of 5 score: (1). Yes is perfectly true to (5). No is completely false. The higher the total score indicates the more tired the person. It should be noted that each dimension had four questions. The reliability coefficient using Cronbach's alpha has been reported to be higher than 0.8 for general, physical, and mental fatigue where more than 0.65 for reduced activity and motivation [9].

After collecting data, the data were analyzed via SPSS software version 22 based on the descriptive tests (frequency, mean, standard deviation) and analytical tests (Anova, t-test, chi-square). The significance level was considered 0.05.

RESULTS

The mean age of students was 24.1 ± 5.65 . Where, 56% were female, 44% male, 78.3% married, and 57.8% live in dormitories (see Table 1). According to the findings of the study, 4 students (1%) used mobile phones sparingly, 363 (90.8%) moderately and 33 (8.2%) used mobile phones excessively (Table 1).

Table 1. Frequency of student demographic characteristics and mobile phone usage (n = 400)

Variable	Categories	Number	Percentage
Gender	Female	225	56.3
	Man	175	43.8
Marital status	Single	313	78.3
	Married	87	21.8
	Bachelor	154	38.5
States education	Masters	90	22.5
	MD	129	32.3
	PhD	27	6.8
Residency	Dormitory	231	57.8
	Rent	77	19.3
	Personal	92	23.1
Mobile phone use	Sparingly	4	1
	Moderately	363	90.8
	Excessively	33	8.2

According to the findings of the study, students' average total fatigue was 56.60. Also, the general fatigue average was 10.80 which was the sparinglyest

among other dimensions, and the physical fatigue average was 11.69, which was the highest average value among the dimensions of fatigue (see Table 2).

Table 2. Score of total fatigue and its dimensions among students

	Average	Standard deviation	Minimum	Maximum
Total fatigue	56.60	7.0	24	78
General fatigue	10.80	1.9	4	19
Physical fatigue	11.69	1.2	4	28
Decreased activity	11.65	2.0	5	17
Decreased motivation	11.1	1.2	4	17
Mental fatigue	11.35	1.8	4	16

There was a significant relationship between the cell-phone usage and total fatigue, motivation decrease, and mental fatigue ($p < 0.05$) (Table 3). Also, there was no significant relationship between the cell-phone usage and the dimensions of general fatigue, physical

fatigue, and decrease activity ($P > 0.05$) (Table 3). The findings of the study showed that there was a significant relationship between gender and mobile phone use ($p < 0.05$) (Table4).

Table 3. The relationship between fatigue and cell-phone use

Cell-phone use	Total Fatigue (M±SD)	General Fatigue (M±SD)	Physical Fatigue (M±SD)	Decreased Activity (M±SD)	Decreased Motivation (M±SD)	Mental Exhaustion (M±SD)
Sparingly	9.3±75.72	87.3±50.13	±½0.15	6/2±75.14	57.0±50.14	1.1±0.15
Moderately	5.9±30.67	58.2±01.12	9/2±06/14	9.2±34.13	4.2±84.14	0.2±13.04
Excessively	7.11±03.63	9.2±71.11	1.3±34.13	01.4±12.56	0.3±13.59	2.63±81.11
P value	0.029	0.434	0.334	0.243	0.025	0.001
F	3.560	0.837	1.100	1.419	3.729	7.22

Table 4. The relationship between different level of cell-phone usage and demographic variables

Variable		Cell-phone usage						P value
		Sparingly		Moderately		Excessively		
		Number	Percentage	Number	Percentage	Number	Percentage	
Gender	Female	3	75	211	58.1	10	68.8	0.010
	Man	1	25	152	41.9	23	31.3	
Marital status	Single	3	75	287	79.1	22	68.8	0.395
	Married	1	25	76	20.9	10	31.3	
	Bachelor	1	25	140	38.6	12	37.5	
Degree	Masters	2	50	83	22.9	5	15.6	0.785
	MD	1	25	116	32	12	5.37	
	PhD	0	0	23	6.3	3	9.4	
Residency	Dormitory	3	75	210	57.9	17	53.1	0.851
	Rent	1	25	70	19.3	6	18.8	
	Personal	0	0	82	22.6	9	28.1	

The findings of the study showed that there was a significant relationship between gender and mental fatigue ($p = 0.033$). There was a significant relationship between marriage and motivation decrease ($p = 0.025$), mental fatigue, and marital status

($p = 0.029$). Also, in examining the relationship between educational degree and fatigue, it was found that there was a significant relationship between degree and total fatigue ($p = 0.015$), general fatigue ($p = 0.035$), and mental fatigue (Table 5).

Table 5. Relationship between different dimensions of fatigue and demographic variables

variable	Total Fatigue	General Fatigue	Physical Fatigue	Decreased Activity	Decreased Motivation	Mental Exhaustion	
Gender	Female	66.99±9.6	11.95±2.6	14.17±3.1	13.27±3.0	14.82±2.5	12.76±0.5
	Man	67.08±9.8	12.09±2.6	13.80±2.6	13.32±2.9	14.65±2.5	13.21±1.9
	P value	0.982	0.597	0.210	0.874	0.489	0.033
Marital Status	Single	66.92±0.10	12.00±2.6	14.02±3.0	13.3±3.1	14.8±2.5	12.84± 0.8
	Married	67.41±8.7	12.05±2.5	13.9±2.5	13.75±2.6	14.21±2.4	13.39±1.9
	P value	0.697	0.857	0.924	0.107	0.025	0.029
Degree	Bachelor	68.25±9.8	12.27±2.6	14.27±3.2	13.60±2.9	14.86±2.6	13.24±2.0
	Masters	67.46±10.51	12.15±2.8	13.90±2.8	13.36±3.0	15.03±2.4	13.01±2.2
	MD	64.93±8.3	11.51±2.4	13.65±2.6	12.85±3.1	14.41±2.45	12.49±1.9
	PhD	67.96±9.4	12.26±2.3	48.2±4.50	13.23±2.8	14.64±0.5	13.30±1.7
	P value	0.015	0.035	0.142	0.213	0.337	0.026

DISCUSSION

Nowadays, cell phones found an important role in modern communication technology, personal, and social life. Thus, it impacts our lives in a global phenomenon. However, some inherent problems of this modern technology may be neglected due to its importance. Hence, many previous studies showed various social, cultural, behavioral, psychological, medical, legal, criminal, etc., problems related to cell-phones misuse [14].

Cell phone usage greatly affects young people's behavior. Continuous use of cell phones interrupts daily activities and disrupts people's performance. Thus, the results of different studies proved that excessive use of mobile phones also causes various symptoms, including physical and mental fatigue. Therefore, the aim of this study was to investigate the relationship between cell-phones usage and fatigue among the Iran University of Medical Sciences Students.

In the current study, a moderate impact of cell-phones use was reported which was in line with the results of Sadoughi's et al., study [15]. In YasemiNejad's study, the average excessive usage of cell-phones was reported to be moderate [16]. In another study conducted by YasemiNejad et al., in Dezful medical science university students, cell-phones usage harmfulness average was higher (62.36) than that in the present study [17]. However, In Hosseini's study, cell-phones usage harmfulness average was sparingly than the present study (43.25)[18]. Moreover, this index in the study of Aliabadi's was 58.08 which was in line with the outcomes of the present study [19]. We used similar assessment tools as abovementioned studies.

Atadokht found that 13% of students use cell-phones sparingly, 5.5% high, and the rest of the students 81.5% use their cell phones at a moderate level [18]. In Golmohammadi's study, the average use was 55.03 [3]. The results of YahyaZadeh's et al., study showed that 9.3% of nursing students had symptoms of overuse such as smartphone addiction [20]. In a study conducted by Aljomaa on Saudi students, the prevalence of smartphone addiction was very high at 48%. However, smartphone addiction in a study

conducted on Korean students by Kee et al., was reported 8.4% [21]. This rate was reported to be between 39% and 44% in India [20]. Smartphone addiction in students varied from the results of previous studies on the cell phones usage. The sparingly percentage of overuse in the present study compared to previous studies may be due to the fact that the tools used were different and, in many cases, did not indicate the type of cell phones usage.

In this study, a significant relationship was observed between the use of cell phones and gender, it could be due to the more cell-phones usage of female students compared to boys. However, in Sadoughi's study, no significant difference was observed between the mean of cell-phones use among male and female students [16].

In YasemiNejad's study, there was a significant difference between the boy and girl students, married and single students from the point of view of excessive mobile phone use as the single individuals use more than single students. In this regard, YasemiNejad concluded that it could be due to having more tendency and opportunity to use work with cell-phones while they don't have to be as a wife, father, and mother. On the other hand, female students have less room for face-to-face social interactions. These characteristics perhaps put them in a situation to be attracted to this device [16]. A review study by Vandana Goswami on cell-phones addiction among young people found that girls use mobile phones more than boys [8]. While in the study of Iqbal on students in Pakistan, there was no significant difference between male and female students in terms of cell-phones usage (number and length of calls), but female students send more text messages per day than male students [22]. Thus, in Iranian society due to women's communication differences, they use mobile phones more than men.

Based on the findings of the present study, students' fatigue was reported as 57.8% which showed moderate fatigue in the studied students. The study of Babapour et al., showed that the average score of overall fatigue was 52.30 and there was no sign of fatigue in students as the level of fatigue was relatively sparingly [23]. In Pourmovahed study, sparingly student fatigue was

reported so that 33.33% of students were slightly tired and 13.33% were very tired and the average score of students' fatigue was in the range of sparingly fatigued [24]. Severe fatigue in nursing students in Spain was 20% [25-26]. The results of a study by Amadaki et al., in Colombia, showed that 83.5% of nursing students suffer from moderate to severe fatigue which was far from the expected level [27]. The rate of fatigue in the studied students of Kohnavard was 37% [28].

The findings of the present study showed that there was a significant relationship between cell-phones usage and general fatigue, motivation decrease, and mental fatigue. That was consistent with the study conducted by Johansson et al., on the significant relationship between cell-phones addictive behavior and perceived fatigue [26].

Vandana Goswami's study also found that people who use cell phones frequently were more vulnerable to sleep disorders, stress, and fatigue [8]. Subba et al., in their study, concluded that cell-phones usage among college students in India would be associated with common mental fatigue symptoms, including poor concentration, academic performance, insomnia, anxiety, and so on [29]. The study of Eyvazlou et al., confirmed the effects of cell-phones usage on mental health [30]. Total fatigue includes subsets of mental fatigue, motivation, general fatigue, and physical activity. Where cell-phones usage causes mental fatigue and motivation which have become significant. Therefore, the relationship between cell-phones usage and total fatigue can be related to mental fatigue and motivation.

The findings of the present study showed that there was a significant relationship between cell-phones usage and motivation reduction, which was consistent with the results of Atadakht et al., who believe that cell-phones usage will reduce academic motivation [31]. Harmful cell-phones usage was negatively related to motivation for academic achievement and performance. It can be concluded that the more mobile and harmful a cell-phones usage, the less motivated it, and the sparser its academic performance.

Findings of this study showed that there was a significant relationship between gender with mental fatigue, marital status with mental fatigue and

motivation decrease, educational level with total fatigue and general fatigue. These results indicate the interaction of demographic variables on the dimensions of fatigue and overall fatigue. The findings of the present study showed that men's mental fatigue was significantly higher than those in women. In the study of PourMovahed et al., a significant relationship between fatigue and gender was reported. The results of these findings were consistent with the study of MoraesAmaducci [27]. Therefore, it can be said that men feel more tired due to more commitment and responsibility in work and life.

In addition, the findings of this study showed that married people feel significantly more mentally tired and less motivated than single students. These results were consistent with the study of kohnavard et al., [28] and married people feel more mentally tired than single students due to having a lot of mental obsession in life and having the role of spouse and parent.

Findings also showed that there was a significant relationship between educational level with total and general fatigue and mental fatigue. So, undergraduate students were significantly more tired than other students at different educational levels. Also in the study of MoraesAmaducci, undergraduate students felt more tired than other students at different educational levels [27]. Therefore, it can be said that undergraduate students feel more tired than other students due to having many courses and unfamiliarity with the university environment, and not being sufficiently adapted to the new environment.

It would be interesting in future studies to use other methods in measuring the amount and type of how to use a mobile phone to get a broader view than the results of the self-reporting method to measure research variables limitations. It also suggested considering other societies, including children and adolescents, in order to make a better and more accurate comparison of people of different ages. From the affecting fatigue factor point of view, it is recommended to do more research to investigate the effect of measures and strategies adopted on student fatigue.

Differences in the results may be due to the use of different assessment tools or due to different cultures

among students in Iran and other countries. Therefore, due to the existence of fatigue among students, more attention should be paid to the underlying factors so that individual, environmental, and social variables should be considered. In general, educational environments were stressful for medical students and could lead to fatigue. Fatigue and its harms can be prevented by identifying its causes and factors. By performing interventions to support and effective guidance and provide essential facilities, prevention of harmful complications of fatigue can be prevented in students.

CONCLUSION

The findings of the present study showed that excessive cell-phones usage can be effective in total fatigue, mental fatigue, and motivation reduction. Therefore, it can be mentioned as a potential way to prevent cell-phone addiction and change behavioral patterns. Therefore, it is recommended to design effective interventions to prevent harmful cell-phones usage, student fatigue, and other consequences such as academic failure and mental health reduction.

ACKNOWLEDGMENTS

The authors hereby express their gratitude and appreciation to all the participants in this project, especially the students of Iran University of Medical Sciences.

CONFLICT OF INTEREST

The authors declare that they have no competing interest.

FINANCIAL SUPPORT

Not applicable.

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