

The Impact of Using Cell Phones After Light-Out on Sleep Quality, Headache, Tiredness, and Distractibility Among Students of a University in North of Iran

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Abstract

Background: Cell phone is a mere fascinating, as well as entertainment object and serves to keep young individuals in constant contact with their peers; and gives them a feeling of autonomy, identity and credibility.

Objectives: Considering the increasing trend of using cell phones, the aim of the current study was to assess the extent to which the students of Mazandaran university of medical sciences use their phones after light-out, and to determine its relationship with sleep quality, headache, tiredness, and distractibility, after elimination of the impact of stressful events.

Materials and Methods: Overall, 358 students from different schools of the university participated in a cross-sectional study with self-report questionnaires (demographic questionnaire, cell phone use questionnaire, Pittsburgh sleep quality index, and social readjustment rating scale). Descriptive indices were used to express data, and the chi-square and logistic regression were used to interpret the results.

Results: Overall, 60% of the students used their cell phones after lights were out. There was a significant relationship between using cell phones late at night and insomnia, low energy, tiredness and headache. Once the impact of stressful events was eliminated, the relationship remained significant only for insomnia. No significant relationship was observed between using cell phones and distractibility.

Conclusions: Students of Mazandaran university of medical sciences used their cell phones extensively after lights were out and the resulting insomnia may have affected their learning, as well as the quality of medical services provided by them.

Keywords: Cell Phones, Headache, Insomnia Disorder, Fatigue, Memory Loss, Life Change Events

1. Background

Telephone and internet constitute major elements of the society in this communication age. The extensive use of cell phones by different individuals in societies necessitates close examination of its impacts on people's health. Using cell phones late at night after lights are out is particularly popular among adolescents and young adults for talking or sending text messages (1). Cell phones are very fascinating for young individuals, as it gives them a feeling of autonomy, identity and credibility (1, 2). Moreover, it is a mere entertainment object and serves to keep them in constant contact with their peers (1, 3, 4). It appears that as contact with peers is observed among the young population of all cultures, the tendency to use cell phones is very similar among the adolescents and the young adults of different cultures (1, 5). In many cases, these contacts simply serve to remind the peers that "I'm thinking of you". It goes so far as to result in many cases of missed calls with the purpose of both conveying the message and avoiding extra costs (6). Another downside

of using cell phones is uncontrolled and extreme use or dependence (nomophobia), and its associated social and behavioral outcomes (7-9). Some studies have indicated that excessive use of cell phones results in tiredness, headache, dizziness, and sleep disorders. Some have even observed that longer periods of using cell phones are associated with more severe symptoms (10). In addition, cell phones may affect the cardiovascular system, the central nervous system, and hormone levels (11), which may in turn lead to fatigue, headache, dizziness, and sleep disturbances.

However, numerous studies conducted by public agencies of communications technology have yielded different results regarding the impact of cell phones on sleep quality of users (10). Huss et al. expressed their doubt about the results of such studies in a systematic review (12). One study by Hutter et al. failed to demonstrate the impact of cell phones on sleep quality (13). On the other hand, another study by Bulck et al. established a relation-

ship between cell phone and individuals' tiredness and sleep (14). It is important to mention that these studies have not addressed the issue of confounding variables.

Considering the above factors, it is necessary to have an accurate understanding of the effects of cell phone on individuals' health, in order to make plans and strategies to overcome the possible detrimental effects and highlight its benefits (15).

2. Objectives

For this purpose, we aimed to determine the effects of cell phones on sleep quality, headache, tiredness, and distractibility of students at Mazandaran university of medical sciences after elimination of the impact of stressful life events.

3. Materials and Methods

The present study was a cross-sectional study conducted on students from different schools of Mazandaran university of medical sciences. Overall, 358 university students were recruited through stratified random sampling. Data were collected using a demographic questionnaire, a cell phone use questionnaire, Pittsburgh sleep quality index (PSQI), and the Social readjustment rating scale. All individuals participated voluntarily in the study. The students first received instructions on each questionnaire in their classrooms, and were then handed out the questionnaires. The students were reassured that their personal information would remain confidential, and they were asked to complete and return the anonymous questionnaires, if they were willing to participate.

The completed questionnaires were collected by a colleague researcher. The SPSS® 13.0 software for windows was used to analyze the data. Descriptive indices were used to express data, and the chi-square and logistic regression were used to interpret the results.

The cell phone use questionnaire was used by Van den Bulck in 2007 (14). It evaluates the use of cell phones by adolescents after lights are out and its relationship with fatigue. In the present study, we used the Persian translation of this questionnaire for students of Mazandaran University of Medical Sciences. The face validity of the Persian version was confirmed by professors at the psychiatry and behavioral sciences research center, and its reliability was verified through test-retest reliability (interval of two weeks) with a subset of 20 students ($P = 0.001$; $r = 0.94$).

The Pittsburgh sleep quality index (PSQI) has been developed to measure sleep quality during the previous month. A post hoc cutoff score on the PSQI produced a sensitivity of 89.6% and a specificity of 86.5% (16, 17). This questionnaire has been previously used in Iranian studies and its validity and reliability have been confirmed (18).

The Social Readjustment Rating Scale was first devised by Holmes and Rahe (19). They made the assumption that each event, whether positive or negative, requires some

sort of adjustment, to devise a checklist of 43 stressful events, which was used in the present study.

4. Results

Overall, 358 students of Mazandaran university of medical sciences participated in this study and completed the questionnaires. The students consisted of 62% females and 38% males.

Furthermore, 55% (197 students) were single, 23% (82 students) married, and 22% (79 students) divorced. Eighty-four students (24%) studied medicine, 77 (22%) studied paramedicine, 39 (11%) studied nursing, 89 (25%) studied health, 38 (11%) studied pharmacy, four (2%) studied dentistry, 12 (4%) studied midwifery, and 15 (5%) studied medicine at the international branch of the university. One hundred and thirty-six students (38%) were aged 20 - 22 years, 122 (34%) were aged 23 - 25 years, 57 (16%) were aged 26 - 28 years, and 43 (12%) were aged 29 - 31 years. Eighty-three percent of the students did not have any other occupation, while 17% worked besides studying.

The mean age of the participants was 25 ± 1.7 years. As Table 1 depicts, students of Mazandaran university of medical sciences used cell phones extensively in the late hours after lights were out. Most students used cell phones after lights were out, at least once a month. During these hours, they most often used their phones for texting rather than talking. More than 10% of the students texted on their cell phone at least once a week during the late hours.

More than half of the participants used their cell phone to send or receive text messages after lights are out. About 20% sent or received text messages at least once a month. Calling others had the lowest relative frequency, which was not very low per se. Thirteen percent of the participants called others late at night, at least one to three times a month, and 7% at least once a week. Thirteen percent of the participants used their cell phone to make calls at least one to three nights per month. Five percent of the students in this study made calls at least several nights a week. Ninety percent of the students, who used their cell phone more than once a week during late hours to call others, made two calls and about 10% made three or more calls after lights were out. A large fraction of the participants used their cell phone immediately after others went to sleep: 64% for text messages and 53% for phone calls. Approximately, 19% of the participants used their cell phone to send or receive text messages from midnight to 3 am, and 12% made phone calls during these hours. Two percent used cell phones for text messages after 3 am and 3% used it in these hours for making calls. Three percent of the participants used their cell phone after 6 am for text messages, and 13% for phone calls. Twelve percent and 19% of the students used their cell phone for text messages and calls at any time, respectively.

We found a significant relationship between using cell phones late at night and tiredness ($P = 0.04$). However, we did not find a significant relationship between using cell

phones at night and sleep quality (based on the questionnaire and PSQI) ($P = 0.23$). However, the relationship between perceived stress and sleep quality was statistically significant ($P = 0.001$) (Tables 2 and 3).

We did not find a significant relationship between using cell phones after lights are out and sleep duration, time of getting up, sleep disturbance, habitual sleep efficiency, subjective sleep quality, use of sleep medications, daytime dysfunction, and poor sleep quality according to the PSQI; nevertheless, there was a significant relationship between

using cell phones late at night and sleep latency (Table 2).

A significant relationship was found between using cell phones after lights are out and losing energy for daily activities, tiredness, headache and insomnia, while no such relationship was found between using cell phones late at night and distractibility (Table 3).

Students who used cell phones during late hours became tired more often; this consisted of both students who used their phone to send and receive text messages, and those who made or received phone calls (Table 4).

Table 1. Frequency of Using Cell phones After Lights are Out by Students of Mazandaran University of Medical Sciences^a

Type of Use	Every Night	More Than Once a Week	Once a Week	1-3 Times a Month	Never
Receiving text messages	48 (13.4)	59 (16.6)	36 (10)	72 (20)	143 (40)
Sending text messages	43 (12)	36 (10)	36 (10)	64 (18)	179 (50)
Receiving phone calls	36 (10)	29 (8)	32 (9)	82 (23)	179 (50)
Calling	18 (5)	18 (5)	25 (7)	46 (13)	251 (70)

^aData are presented as No. (%).

Table 2. Comparing Sleep Quality and Its Components Between Students Who Do and Do not Use Cell Phones After Lights Are Out^a

Components of Pittsburgh Sleep Quality Index	Those Who Use Cell Phones	Those Who Do Not Use Cell Phones	P Value
Sleep latency	12.31 ± 15.40	09.12 ± 11.06	.007
Sleep duration	5.06 ± 0.18	5.18 ± 0.24	.2
Time of going to bed	10.54 ± 0.46	11.12 ± 0.36	.6
Time of getting up	5.23 ± 0.39	5.42 ± 0.43	.1
Sleep disturbance (at least once a week)	56 (15.6)	34 (9.5)	.1
Habitual sleep efficiency	33 (9.24)	22 (6.16)	.38
Subjective sleep quality	17 (4.68)	12 (3.42)	.7
Use of sleep medications (at least once a week)	20 (5.52)	13 (3.68)	.12
Daytime dysfunction (at least once a week)	33 (9.24)	22 (6.16)	.18
Poor sleep quality	31 (8.7)	21 (5.8)	.23

^aData are presented as mean SD or No. (%).

Table 3. The Relationship Between Using Cell Phones After Lights are Out and Headache, Insomnia, Losing Energy, Tiredness, and Distractibility in Students of Mazandaran University of Medical Sciences

Symptoms	OR	95% Confidence Interval		P Value
		Upper	Lower	
Headache	42.22	86.55	20.59	.00
Insomnia	74.58	160.55	34.64	.000
Losing Energy	3.33	5.26	2.10	.03
Tiredness	0.57	0.90	0.36	.01
Distractibility	0.5	1.41	0.18	.1

Table 4. The Relationship Between Using Cell Phones After Lights are Out and Tiredness

Type Cell Phone Use After Lights Are Out	OR	Logistic Regression		P Value
		95% Confidence Interval		
		Upper	Lower	
Sending or receiving text messages	.648	.99	.42	.04
Phone calls	.508	.91	.28	.024
Any use	.57	.90	.36	.01

Table 5. The Relationship Between Using Cell Phones After Lights are Out and Headache, Distractibility, Tiredness, and Losing Energy for Daily Activities After Eliminating the Impact of Intensive Stress

Symptoms	OR	95% Confidence Interval		P Value
		Upper	Lower	
Headache	1.47	4.14	0.52	.45
Tiredness	1.22	4.55	0.32	.76
Losing energy for daily activities	1.01	3.82	0.26	.98
Distractibility	0.71	2.80	0.18	.63
Insomnia	2.4	4.2	1.4	.00

In this study, we used the perceived stress level of 300 as the cutoff point, which is considered as the threshold for psychosomatic disorders by Holmes and Rahe (19). After logistic regression analysis, we concluded that once the impact of this confounding variable is eliminated, there is no significant relationship between using cell phones after lights are out and losing energy for daily activities, tiredness, headache, and distractibility. However, in the presence of perceived stress, we did observe a significant relationship between using cell phones late at night and losing energy, tiredness, and headache. After eliminating this confounding factor, using cell phones after lights are out was still significantly related to insomnia. Furthermore, no significant relationship was observed between using cell phones late at night and distractibility (Table 5).

5. Discussion

At present, there is not much information about the relationship between cell phone use after lights are out and sleep quality, headache, tiredness, and distractibility. Observations of the present study are based on a small group of students of Mazandaran province (in Iran) only, which may not necessarily reflect the problem worldwide. Bulck studied the prevalence of using cell phones at night amongst adolescents, and its impact on tiredness levels over a year. Their findings indicated that using cell phones after lights are out is prevalent among adolescents, and is associated with increasing levels of tiredness, and there is no safe dose or safe time for using cell phones for text messages or phone calls at night (14). Our findings, however, indicated that the tiredness experienced by students is related to their perceived stress levels, and thus our results are relatively different from those of Van den Bulck.

Hutter et al. investigated the influence of cell phones on health and sleep quality in Australia. They conducted a descriptive cross sectional study on 365 individuals for one year and demonstrated a significant relationship between using cell phones and somatic complaints, especially headache. However, they could not find a significant relationship between using cell phones and sleep quality (13). Our findings are consistent with those of the above study with regards to sleep quality yet differ from

them in findings related to headache.

Huss et al. conducted a systematic review of studies dealing with using cell phones and their possible health-related impacts. They studied the impact of exposure to radiofrequency radiation through assessments of electroencephalograms, cardiovascular function, hormone levels, cognitive function, symptoms, and subjective well-being. Their findings indicated the largest number of outcomes in studies funded exclusively by industries, yet these studies were least likely to report a statistically significant result. They concluded that interpretation of findings should take sponsorship into account (12).

The results of most of the above studies are suggestive of some health-related adverse effects of cell phone misuse after lights are out. Nevertheless, it must be noted that none of the previous studies had considered the role of stressful events as an important confounder.

One limitation of our study was the data collection, which was through self-reports. Moreover, it is possible that living conditions of these students (night shifts and studying at night) makes them sleep for shorter durations of time than others and thus encourages their use of cell phones for text messages or phone calls. Another shortcoming of our study was that we did not address the compulsive use of cell phones. Some other studies have indicated cell phone dependence among medical students as an emerging problem of the modern era (7). Some symptoms and signs may be attributed to compulsion and/or to cell phone use dependence, which have not been addressed by the present study. In addition, future studies are suggested to use more precise measures to assess tiredness, headache, and distractibility.

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Authors' Contributions

Mehran Zarghami conceived and designed the evaluation, interpreted the data and revised the manuscript critically for important intellectual content. Alireza Khalilian performed the statistical analysis and revised

the manuscript critically for important intellectual content. Javad Setareh participated in interpretation of the data and revised the manuscript critically for important intellectual content. Golnaz Salehpour collected the data and drafted the manuscript. All authors read and approved the final manuscript.

Declaration of Interests

None declared.

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