

The Effect of Smartphone Usage at Bedtime and its Relationship with Insomnia and Academic Performance among Majmaah University Students

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ABSTRACT

Introduction: Smartphone surely has become an indispensable technical companion for the humans, nowadays most of the routine activities are highly dependent upon using the smartphones, especially the educational activities. Smartphone owns most of our time due to fast and ease of access that it offers. Unfortunately, uncontrolled use of these devices may reflect passively on human and student's health.

Objective: The purpose of this study was to find out whether smartphone usage at bedtime effects the sleep quality and academic performance of Majmaah university students.

Methodology: This analytical cross-sectional study was conducted among the students of Majmaah University, Saudi Arabia studying in the various colleges from February – April 2020. The data was collected by a self-prepared questionnaire from 373 participants using consecutive sampling method. Results: We found that 96.5% of the participants were using smartphones at bedtime, 45% of those using smartphones at bedtime had poor sleep quality, and the top purpose of using the smartphone was for social interaction, followed by study purpose, then the games, and finally for watching films. Also, 80% of those with a GPA below 2.5 were having difficulty in initiation the sleep, and 47.5% of those who had difficulty in initiation the sleep found that this difficulty is affecting their academic performance.

Conclusion: Our study found that the usage of smartphone at bedtime is highly prevalent among the students of Majmaah university, Using the smartphone at bedtime has affected the sleep of the students and increased the chances of getting insomnia and poor sleep quality which is affecting their academic performance. This relationship is attributed to the blue light coming from smartphone primary as well as other factors such as thinking about what is going on in the social media or video games arena.

Key words: Smartphones, University students, Insomnia, Academic Performance

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INTRODUCTION

Nowadays using smartphones has become quite common. In 2020, the number of smartphone users in Saudi Arabia reached up to 20 million [1]. People are using smartphones everywhere while driving, walking, and relaxing on the bed,

almost during the whole day time. Smartphones therefore have become a major part of life for most of the people around the world. They are using it for watching programs, study through it, or doing their work and using it as means of communication. According to the Connected Consumer Survey of 2015, smartphone users in Saudi Arabia has increased from 60% in 2012 to 86% in 2015, and 92% of people under the age of 25 use a smartphone; compared to the 71% in the United States of America, 84% in South Korea, and 54% in Japan [2]. A study

conducted at King Saud University in Riyadh in 2015 stated that out of 2367 participant is 27.2% spent more than 8 hours per day using their smartphones, 75% percent of them used at least 4 phone applications per day, primarily for social networking and watching news. As a result, 43% of the participant's had decrease sleeping hours. This indicates that large number of people in Saudi Arabia nowadays are addicted to smartphone and they are spending about one third of their day in using smartphones for different purposes, ignoring that the smartphone addiction has a negative impact on levels of energy, eating behaviors, body weight, sleep, exercise activities, and academic performance [3].

Insomnia disorder is a condition characterized by difficulty in initiating the sleep at bedtime, have enough time for sleeping or early-morning awakens. It is having nocturnal and diurnal symptoms which affect the sleep quality, level of energy, mood and health status, work performance and quality of life. It can be diagnosed if sleep difficulties are present for ≥ 3 nights per week and last for > 3 months [4,5]. Fahdah et al. reported that 98% of students owned smartphones, 92.4% of them used it at bedtime, 80.5% used it the purpose of social media, third of them used it for 16 to 30 minutes daily, and 41.7% have poor sleep quality [6]. This shows that using smartphone is very common at bedtime in our society and large number of those who use smart phone at bedtime have poor sleep quality and have increased risk of insomnia, depending on duration of using smart phone at bedtime the risk will increase. At the Technical University of Denmark in 2013, after studying 979 undergraduate students, they found the average sleep duration was 7.6 hours, which ranging from 4 hours to 11.5 hours. Majority of the participants (75%) used their smartphones at bedtime, 76.5% used it for texting messages, 21.7% for calls, and 1.8% for Facebook program. Also, 41% of the participants sleep disturbance, 36% of these 41% had 1 to 3 nights interrupted sleep over 16 days, while, the other 6% experienced 4 or more nights, which was slightly higher in female in compare to male [7]. As we see in this study that about half of the participants having interrupted sleep, which indicate that there is a relationship between smart phone usage (especially at bedtime) with

insomnia which affect the sleep quality. Thomée et al, when they studied a young student with the age of 20 to 24 years, they found a risk of mental health problems, including depression and insomnia related to smartphone usage for 1-year follow up [8]. As we see in the previous studies that there is a relationship between smartphone usage and insomnia, however there are not so many published studies that studied this relationship. Therefore, we planned this study to observe the effect of smartphone usage at bedtime and study its relationship with insomnia and academic performance among students studying at Majmaah University, Saudi Arabia.

METHODOLOGY

This cross-sectional study was conducted at Majmaah University which located in Majmaah city, Saudi Arabia. The inclusion criteria were students of all ages studying the Majmaah University, whereas the exclusion criteria were students with diseases or on any medicines that can affect their sleep quality. The data was collected from students studying in different colleges (College of Medicine, College of Engineering, College of Applied Medical Sciences, and College of Education) using consecutive sampling method. Level of precision formula was used to calculate the sample size, by placing the following values ($z=1.96$, $p=0.41$, $1-p=0.59$, $d=0.05$) in the formula the required sample size required was 373. A closed-ended questionnaire was used for data collection, twenty-six questions were divided into two parts, the first part included personal data of the participants which include Age, Gender, Marital Status, College, Academic year, GPA and BMI. The second part included the main questions and was used to assess the effect of smartphones on their sleeping and this included the time when they sleep and if it effective when they are using their smartphones or not. The data was entered and analyzed using IBM SPSS 26. Mean+SD is reported for quantitative variables and qualitative variables are expressed as frequencies and percentages. Pearson Chi- Square and Fisher Exact test were applied to observe associations between the qualitative variables. A p-value of less than 0.05 was considered as statistically significant. The study was approved by the ethical review committee of Majmaah University

(MUREC-Dec.10/COM-2019/13-3). Informed consent from the participants was sought and confidentiality was maintained.

RESULTS

The data was collected from all 373 participants ageing between 18–26 years with the mean age of 22.17 ± 0.734 years. Most of them were males 83.6% (n=312) while females were 16.4% (n=61). Regarding the marital status, most of them were single 95.7% (n=357) while 1.3% (n=9) were married and 2.9% (n=11) were divorced. The BMI of majority of the participants 31.6% (n=118) ranged from (18.5-24.9), those who did not know about their BMI were 21.4% (n=80), and 9.4% (n=35) of them had the BMI of >40. Most of the participants were from the College of Medicine 53.4% (n=199), 26% (n=97) were from College of Engineering, 15.3% (n=57) were from educational college, 3.2% (n=12) from nursing college and 2.1% (n=8) from the physiotherapy college.

Bulk of our participants were studying in fourth year 25.7% (n=96), followed by third year 23.6% (n=88) students, second and fifth year were same 16.4% (n=61) respectively. The GPA in most participants 22.3% (n=83) ranged from 4 to 4.5, followed by 21.7% (n=81) that ranged from 3.5-4, and 14.2% (n=53) had GPA in the range of 2.5-3. Results are presented in Table 1. In our study, smartphone was being used for various purposes, we found that most students 45.8% (n=171) were using phone for all purposes, the rest focused on using the social media 28.2% (n=105), for playing games 9.4% (n=35), for studying purposed 9.7% (n=36) and for watching movies 4.6% (n=17) (Figure 1).

Results presented in Table 2 shows the total number of participants who had difficulty in initiating sleep after using smartphone were 45% (n=168), while 55% (n=205) did not had any difficulty in sleeping. Majority of those who having difficulty in sleeping mainly complaint about; insomnia 24.9% (n=93), headache 10.2% (n=38), hypersomnia 7.5% (n=28). A greater proportion of participants were using their smartphone before sleep and they do not have difficulty in starting sleep 54.4% (n=169) compared to those participants who had difficulty in starting sleep 45.6% (n=164). No significant association was observed

Table 1: Socio-demographic characteristics and Educational data.

| Variables | N (%) | Variables | N (%) |
|-----------------------|------------|----------------------|------------|
| Age | | College | |
| Less than 20 | 25 (6.7) | Medicine | 199 (53.6) |
| 20 | 44 (11.8) | Nursing | 12 (3.2) |
| 21 | 75 (20.1) | Physiotherapy | 8 (2.1) |
| 22 | 73 (19.6) | Educational | 57 (15.3) |
| 23 | 87 (23.3) | Engineering | 97 (26.0) |
| More than 24 | 69 (18.5) | | |
| BMI | | Academic year | |
| <18.5 | 24 (6.4) | 1 | 48 (12.9) |
| 18.5-24.9 | 118 (31.6) | 2 | 61 (16.4) |
| 25-29.9 | 69 (18.0) | 3 | 88 (23.6) |
| 30-34.9 | 33 (8.8) | 4 | 96 (25.7) |
| 35-39.9 | 14 (3.8) | 5 | 61 (16.4) |
| >40 | 35 (9.4) | 6 | 19 (5.1) |
| Do not know | 80 (21.4) | | |
| Marital status | | GPA | |
| Married | 5 (1.3) | <2.5 | 10 (2.7) |
| Single | 357 (95.7) | 2.5-3.0 | 53 (14.2) |
| Divorced | 11 (2.9) | 3.0-3.5 | 80 (21.4) |
| | | 3.5-4.0 | 81 (21.7) |
| | | 4.0-4.5 | 83 (22.3) |
| | | 4.5-5.0 | 66 (17.7) |

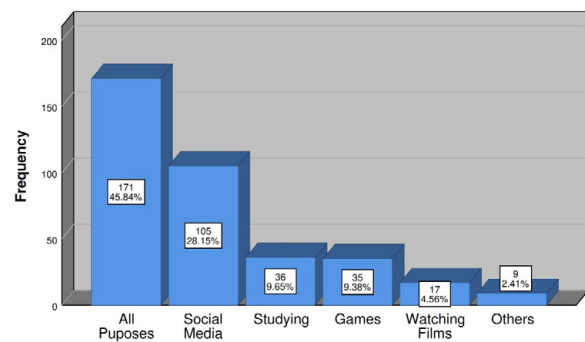


Figure 1: The Purpose of using the smartphone.

Table 2: Usage and kind of difficulty after using the smartphone.

| Statements | N (%) |
|--|------------|
| Do you have difficulty in starting sleep after using smartphone? | |
| Yes | 168 (45.0) |
| No | 205 (55.0) |
| The kind of difficulty being faced after using the smart phones | |
| Insomnia | 93 (24.9) |
| Headache | 38 (10.2) |
| Hypersomnia (sleep during daytime) | 28 (7.5) |
| Others | 9 (2.4) |

between difficulty in starting sleep and using the smartphone before sleep, p=0.398. Most of the students 96.5% (n=360) were using their smartphones at bedtime, while 3.4% (n=13) did not used it at bedtime. Most of the participants 40.3% (n=145) showed that they sleep within 15 min of using the phones immediately, only few of them 6.1% (n=11) slept within 1 hour, and about 10.3% (n=22) of them slept 2 hours after using their smartphones. Again, no significance

association was observed between using of smartphone before sleep and the sleep initiating time p-value=0.825. Those who were using smartphone at bedtime slept less than 5 hours at night, only 0.8% (n=3) of them slept for more than 10 hours. Compared to the participants who did not used smartphone at bedtime 30.8% (n=4) of them slept less than 5 hours at night, and 38.5% (n=5) slept 7 hours at night, however, the association between bedtime smartphone usage and the amount of sleep at night in hours was not statistically significant p-value=0.581. Results are presented in Table 3.

Results presented in Table 4 shows that students with GPA less than 2.5, 80% (n=8) of them were having difficulty in initiating the sleep, while students with GPA (2.5- 3) 58.5% (n=31) of no difficulty, those with GPA between (3-3.5) 51.2% (n=41) of them experienced difficulties, on other side 60% (n=40) of those participants with GPA (4.5-5) denied that they faced any kind of difficulty. We noticed that students with a higher

GPA are less likely to have difficulty in initiating the sleep as compared to ones with lower GPA, this difference was again not statistically significant (p-value=0.186).

DISCUSSION

We have found that the prevalence of smartphone usage at bedtime was 96.5% among the students of Majmaah university which is higher compared to local study done at King Saud University in 2016 by Fahdah et al. which showed that 92.6% students were using smartphone at bedtime [6], and higher than another study which stated that 87% of the participants have the habit of using their mobile at bedtime [9]. The results of our study are awfully close to a study conducted at technical institute in southern Taiwan that reported that over 95% of Taiwanese College students reported habitual usage of smartphone at bedtime [10]. Also, we found that the prevalence of having difficulty in starting sleep after using smartphone at bedtime is 45% which is relatively close to a local study done by Fahdah et al. which reported that 41% of the participants had poor sleep quality [6], however, our study reported prevalence is less in comparison to a study done by at technical institute in southern Taiwan which shows that 54% of participants have poor sleep quality [10]. The commonest purpose of using the smartphone was for social media, followed by study usage, then game usage and finally for watching movies. Most of the students (80%) with GPA below 2.5 had difficulty in initiation the sleep, and 47.5% of them stated that this difficulty is affecting their academic performance.

All these studies showed that using smartphone at bedtime is highly prevalent and associated with poor sleep quality in about half of the smartphone users. When we looked at the kind of difficulties, we found that insomnia accounted for 24.9% of the students, headache in 10.2%, hypersomnia in 7.5%, and others in 2.4%. Jamal et al. conduct a study in Taibah University, and their findings are close to ours, they found that 45.8% of the participant had long term memory impairments, 31.7% had prolonged sleep, 30% had insomnia, 22.5% had chronic headache, and 22.5% had concentration problems [11]. Purpose of using smartphone in our study was as follow, social media was the highest purpose

Table 3: Reflections of smartphone usage at bedtime on quality of sleep.

| Statements | Use of smartphone before sleep | | p-value |
|---|--------------------------------|----------|---------|
| | Yes N (%) | No N (%) | |
| Having difficulty in starting sleep | | | 0.398 |
| Yes | 164 (45.6) | 4 (30.8) | |
| No | 196 (54.4) | 9 (69.2) | |
| Time tack to sleep after smartphone use | | | 0.825 |
| ≤15 min | 145 (40.3) | 4 (30.8) | |
| 30 min | 94 (26.1) | 4 (30.8) | |
| 45 min | 37 (10.3) | 1 (7.7) | |
| 1 hr | 22 (6.1) | 0 (0.0) | |
| 1.5 hr | 11 (3.1) | 1 (7.7) | |
| 2 hrs | 14 (3.9) | 1 (7.7) | |
| >2 hrs | 37 (10.3) | 2 (15.4) | |
| Hours of sleep at night | | | 0.581 |
| ≤5 | 139 (38.6) | 4 (30.8) | |
| 6 | 85 (23.6) | 2 (15.4) | |
| 7 | 68 (18.9) | 5 (38.5) | |
| 8 | 48 (13.3) | 1 (7.7) | |
| 9 | 10 (2.8) | 1 (7.7) | |
| ≥10 | 10 (2.8) | 0 (0.0) | |

Table 4: Starting sleep difficulties vs GPA and academic performance.

| Statements | Use of smartphone before sleep | | p-value |
|------------|--------------------------------|-----------|---------|
| | Yes N (%) | No N (%) | |
| GPA | | | 0.186 |
| <2.5 | 8 (80) | 2 (20) | |
| 2.5-3.0 | 22 (41.5) | 31 (58.5) | |
| 3.0-3.5 | 41 (51.2) | 39 (48.8) | |
| 3.5-4.0 | 35 (43.2) | 46 (56.8) | |
| 4.0-4.5 | 36 (43.4) | 47 (56.6) | |
| 4.5-5.0 | 26 (39.4) | 40 (60.6) | |

in 74% of the students, studying in 55.5%, games in 55.2%, and watching movies in 50.4%.

As we see in our study as well as the other studies [3,12]. The academic achievement had been found to be adversely affecting the smartphones users, and total cell phone usage had a significant negative impact on GPA [13]. In our study 47.5% of the students, correlate their academic achievement with the insomnia. Using the smartphones and computers at the bedroom, instead of watching television, game consoles, DVD players, or listening to the music, may be associated with poor sleep habits among adults [14]. High bedtime mobile phone usage was associated with low academic performance [15]. There is association between using smartphone at night and time spent on mobile phones with decrease study habits, difficulty in concentration, increase in missed classes, and going late for classes [16]. Smartphone usage at bedtime affects sleep quality and reduce the academic performance of the students. Poor sleep quality is significantly associated with the frequently sleeping with the smartphone beside you, and woken up by calls/messages, which were directly associated with students' class attendance and performance [17].

Over-use of the smartphones especially at bedtime, can lead to shorter sleep hours, which eventually worse the health status. Usually, the smartphones had a short-wave light, which can delay the circadian clock phase, and suppress the synthesis of melatonin [18]. Melatonin is a hormone in our body secreted from the brain, which plays an important role in initiating and maintaining the sleep by providing a dark signal. The production and release of melatonin is increasing when it is dark/night and decreasing when it is light/morning [19]. So, suppression of melatonin synthesis because of smartphone light is the most likely cause of the association between smartphone and insomnia.

CONCLUSION

Our study found that the usage of smartphone at bedtime is highly prevalent among the students of Majmaah university, Using the smartphone at bedtime has affected the sleep of the students and increased the chances of getting insomnia and poor sleep quality which is affecting their academic performance. This relationship

is attributed to the blue light coming from smartphone primary as well as other factors such as thinking about what is going on in the social media or video games arena.

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