Effect of Late-Night Mobile Use on Sleep Quantity and Quality in Medical Students

Manish Lamoria[1], Sushil Sharma[2], Ketaki Poorey[3], Shrishti Bishnoi[4]

[1]Associate Professor, Department of Physiology, Jaipur National University, Institute of Medical Sciences and Research Centre, Jaipur, Rajasthan, India. [2]Tutor, Department of Physiology, Jaipur National University, Institute of Medical Sciences and Research Centre, Jaipur, Rajasthan, India. [3]Assistant Professor, Department of Physiology, Jaipur National University, Institute of Medical Sciences and Research Centre, Jaipur, Rajasthan, India. [4]Final Year Student, Department of Physiology, Jaipur National University, Institute of Medical Sciences and Research Centre, Jaipur, Rajasthan, India.

ABSTRACT

BACKGROUND

Smartphone is friend for human being and due to increasing dependence on media-based interaction on smartphone through various software. Our younger generation is very much dependent on their smartphones. They even take it to bed for late hour uses which is actually very harmful in the long term as it decreases sleeping time and also hampers quality of sleep. The aim of this study is to assess the relationship of late-night cell phone use with duration and quality of sleep among medical students of JNU Institute for Medical Sciences and Research Centre, Jaipur.

METHODS

This study was conducted among 170 medical students of JNUIMSRC, Jaipur. Subject's age, sleep duration, cell phone use after 10 p.m., personal habits and some physiological variables like blood pressure and pulmonary function test were also documented. Pittsburgh Sleep Quality Index questionnaire was used for sleep assessment with 95% confidence interval of odd's ratio to test poor sleep quality among participants who used smartphones at bedtime by using SPSS version 21 to analyse data.

RESULTS

Overall age of subjects falls in the mean of 20.48 ± 1.73 years. Out of a total of 170 students who participated, 139 students reported extensive cell phone use after 10 P.M. apart except short duration calls. Wake-up time among late night mobile users was found to be 7:40 A.M. ± 7.35 minutes, and 6: 36 A.M. ± 9.34 minutes among non-users. Those who use mobile for long stretch of time continuously had higher sleep latency than their peers. There was no significant difference in sleep quality of late-night cell users and non-users by multinomial logistic regression model.

CONCLUSIONS

Late-night cell phone use by adolescents was associated with increased sleep latency and hence also poor sleep quantity. Good quality sleep is the most important part of healthy lifestyle; so, we should discourage late night mobile use among adult students. Long term health monitoring is advisable to see long term effects on health.

KEY WORDS

Late-Night, Medical Students, Cell Phone Use, Sleep

Corresponding Author:
Dr. Ketaki Poorey,
#9A, James Colony,
Sector 3, Vidhyadhar Nagar,
Jaipur- 302039, Rajasthan, India.
E-mail: ketakipoorey@gmail.com

DOI: 10.18410/jebmh/2020/326

How to Cite This Article:
Lamoria M, Sharma S, Poorey K, et al. Effect of late-night mobile use on sleep quantity and quality in medical students. J. Evid. Based Med. Healthc. 2020; 7(31), 1550-1555. DOI: 10.18410/jebmh/2020/326

Submission 08-06-2020,
Peer Review 12-06-2020,
Acceptance 03-07-2020,
Published 03-08-2020.

BACKGROUND

We have enough data till now which suggests that good quality of sleep is essential for our cognitive and physical functionalities.[1,2] Good quality of sleep plays crucial role in life's all aspects.[3] It's very essential in children, adolescents and adults.[4] Studies suggests that lack of sleep increase the risk of physical and mental health, in adult population.[5] Due to more and more studies and ample amount data available at our hand in recent years, adverse health effects of lack of sleep drawn attention of clinicians.[6]

In early 90s' mobile phones start showing up in market with slowly internet is added to it and then the word "smartphone" changed the world recently with its multi functionality capabilities at your fingertips; all this available in your mobile phone which you can carry everywhere you go.[7] Software war started in 2007, software innovation in mobile phone started and smartphones become smarter that lead to market fir smart phones boomed.[8] Smartphones are smart; they can perform multiple task at same time attracted many people. Technology keep on growing since first cell phone introduced, leading to make it more user friendly, attractive and popular.[9,10] Smartphones are now part of our life and we are somehow become dependent on our phones,[9] smartphones specially popular among children and adolescents because of its interactive and quick responsive capabilities,[11] these smartphones are now also common means of communication too.[5] Students are so much addicted to smartphones that they don't want to miss on any updates and take mobile phone to bed at sleeping time also.[12] Taking Smartphone to bed severely disturb sleep due to diversion and alertness of mind caused by mobile phone.

There are very few researches done to find out relation between bedtime mobile usage and how it affects quality of sleep in adults. Al-Khlaiwi and Meo (year) studied association between symptoms like headache, dizziness, and sleep disturbance due to continuous mobile use but didn't touch down on association of these symptoms with the bedtime usage (variable).[13] No regional study has explored this problem and it is still untouched topic in India. Indian smartphone market is world's largest but still we are not studying hazards of its bedtime usages. In Japan nationwide study conducted on 95,680 adolescents subjects by Munezawa et al; it was found that mobile phone use after lights out was associated with symptoms like poor sleep quality, short sleep duration, narcolepsy and insomnia.[14] White et al showed that there is problem using "Mobile Phone Problem Use Scale" it indicate poor sleep quality, but doesn't show sleep length in American college going students.[15] A Swedish study shows that young adult population who are using mobile internet for surfing and uses mobile for late night texting and calling are showing increased risk of disturbance in sleep patterns.[16] In contrast to above all studies Chinese study done on 791 secondary school adolescents showed insignificant relation between bedtime mobile use and sleep disturbance.[17]

All the studies worldwide till date are more focused on adolescents may be due to vulnerability of this age group to addiction but adults are more vulnerable for mobile addiction and they have significantly more prone to excessive bedtime use of mobile phones. As we have seen in recent few years that India has become largest smartphone user but still there is no regional study related to this topic is conducted. Medical students have easy access to mobile phone and free internet connectivity which encouraged increases bedtime use of mobile phone which will eventually disturb their sleep and may causes negative impact on health so we conducted our study in the students of Jaipur National University Institute for Medical Sciences and Research Centre, Jaipur. In case if it's proven that bedtime use of smartphone is having negative impact on sleep quality, we would like to promote healthy sleeping habit and lifestyle changes to promote good quality of sleep.[18]

METHODS

An ethical approval was sought from the institutional ethics committee to conduct the study. This is a cross sectional study conducted over a period of four months from October, 2019 to January, 2020 in Jaipur National University Institute for Medical Sciences and Research Centre, Jaipur. All the medical students from first, second and third MBBS course in Jaipur National University Institute for Medical Sciences and Research Centre, Jaipur.

Inclusion Criteria

All medical students in Jaipur National University Institute for Medical Sciences and Research Centre, Jaipur who were-

- willing to participate in the study.
- absolutely physically well (normotensive and having no abnormality in Electrocardiogram and Spirometry).
- non-smoker, non-alcoholic, and not abusing any drug.

Exclusion Criteria

Medical students in Jaipur National University Institute for Medical Sciences and Research Centre, Jaipur who were-

- not cooperative or not willing to participate in the study.
- showed any abnormality on examination (hypotensive/hypertensive, any abnormality detected in Electrocardiogram or Spirometry, or suffering from any chronic illness).
- smoker, alcoholic, or abusing any drug (sleep quality).

The source population for the survey was all the students from First, Second and Third MBBS course in the selected private medical college. They were sensitized to participate in this anonymous survey. Thus, the total number of source population was 600, of which 526 students were present at the time of various sensitization sessions. All the students were provided all the information regarding study and consent forms in both Hindi and English languages, out of them, 462 students submitted signed consent form.

A pre-structured, pre-tested questionnaire was constructed by the lead researcher and was reviewed by an expert panel for content, validity, and reliability. Questions were derived from previous literature seeking appropriate permission with addition and deletion of few questions based on expert panel's experience. The questionnaire was self-administered wherein it was distributed in classroom and the students were asked to submit the filled questionnaire next day with cooperation from respective departments. The questionnaires were distributed to the students in person, in a compulsory lecture schedule. Out of 462 students, submitted signed informed consent, 311 student's submitted filled questionnaires in consecutive days. On evaluation of filled questionnaires, exclusions were made on the basis of exclusion criteria. The data, obtained from the students under inclusion criteria (N=170), was used to analyse.

Pittsburgh Sleep Quality Index (PSQI)

Sleep quality assessment is widely done by Pittsburgh sleep quality index (PSQI) scale and its unanimously considered as standardized scale for sleep quality studies.[19] Pre validated questionnaire was used. In order to find out feasibility of study and to make sure that questionnaire easily understood by students' small group (consisting 20 students) pilot study was conducted. Question which are not understood easily or ambiguous were changed on basis of feedback received in pilot study. There are 19 self-rated questions and 5 other questions are to be rated by roommate in the Pittsburgh Sleep Quality Index (PSQI) questionnaire. These last 5 question which are rated by roommates are used for clinical information only. Self-rated 19 questions help us to assess factors like quality of sleep, latency and total duration of sleep. It can also assess frequency and severity of any sleep related disorders. We have designed study, to use another set of validated questionnaires to collect data on demographic variables viz. age, sex, weight, height, drug abuse history and any health problems if any present.

Statistical Analysis

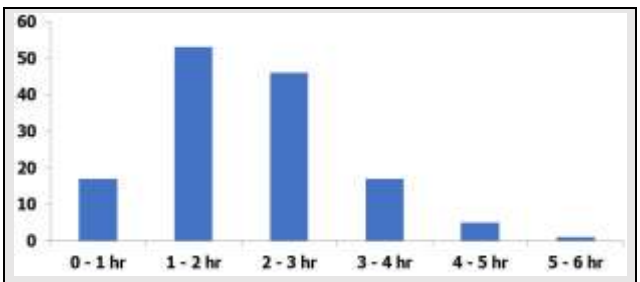
We used 21st version of SPSS software for analysis of data.[20] PSQI score was calculated by using MS Excel worksheet. Previous data was cleaned every time before analysing. We used percentage and numbers to present detailed statistics. In order to study analytical statistics, we used Odd ratios 95% confident interval in late night smartphone users to test risk of poor sleep quality.

RESULTS

Smart Phone Use After 10 pm (Apart from Short Duration Calls)	No. of Students	%
Yes	139	81.76
No	31	18.24

Table 1. Number of Students Using Mobile Phones after 10: 00 P.M.

Out of total 170 students who were taken as sample population, 31 (18.24%) students either did not use mobile phones or used them only for short duration calls whereas 139 (81.76%) students used mobile phones rigorously for various activities apart from short duration calls.



Graph 1. Distribution of Time Spending on Mobile after 10 P.M.

Most of the students (98 out of total 139) used mobile phones between one and three hours. Some of the students (35) used mobiles for either less than an hour or 3-4 hours. Only few students (6) used mobiles for more than four hours.

On comparing mobile phone users (for more than half an hour) with rest of the students (mobile not used after 10 pm or used for less than 30 minutes), it was noted that they took more time (more than 42 minutes) to fall asleep usually and they went to bed very late (mean time 1:12 A.M.) in the night. They wake up late (mean time 7:40 A.M.) in the morning and took sleep of almost 6.5 hours (mean duration 6 hours 35 minutes). On the other hand, they took less time (less than 30 minutes) to fall asleep and usually they went to bed on an average at 11:24 P.M. in the night. They usually got up early (mean time 6:36 am) in the morning and took sleep of almost 7.5 hours (mean duration 7 hours 28 minutes). (Table 2)

Duration of mobile use was directly correlated to the duration of sleep (Table 2). Sleeping time has negative correlation with pulse rate and systolic blood pressure. This correlation was measured in physiological range of pulse (60-90 beats per minute) and systolic blood pressure (100-138 mmHg). No significant correlation was note between sleeping time and diastolic pressure.

Characteristics	Yes (124) Mean ± SD Hours	No (n = 46) Mean ± SD Hours	P - Value	Significance
During the past month, what time have you usually gone to bed at night?	1:12 am ± 28 min.	11:24 pm ± 46 min.	0.00001	All are highly significance
During the past month, how long (in minutes) has it usually takes you to fall asleep each night?	42.27 ± 8.31	29.32 ± 5.86	0.00001	
During the past month, what time have you usually gotten up in the morning?	7:40 am ± 7.35 min.	6:36 am ± 9.24 min.	0.00001	
During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)	6:35 hr. ± 10 min.	7:28 hr. ± 17 min.	0.00001	

Table 2. Comparing Mobile Phone Users and Non-Users after 10 P.M. (Mann-Whitney U-Test)

Variables		N	OR	95% CI	P-Value
Cannot get to sleep within 30 minutes	Not during the past month	90	1.76	(1.38, 3.14)	0.4066
	Less than once a week	39	1.7	(1.41, 3.08)	0.4678
	Once or twice a week	25	1.37	(1.12, 4.81)	0.6926
	Three or more times a week	16	Reference		
Wake up in the middle of the night or early morning	Not during the past month	72	6.15	(3.51. 7.02)	0.0876
	Less than once a week	46	7.74	5.24, 8.52)	0.0576
	Once or twice a week	35	6.4	(4.91, 7.13)	0.0905
	Three or more times a week	17	Reference		
Have to get up to use the bathroom	Not during the past month	74	1.11	(0.72, 2.67)	0.868
	Less than once a week	48	1	(0.65, 1.34)	1
	Once or twice a week	32	1.36	(0.89,3.72)	0.654
	Three or more times a week	16	Reference		
Cannot breathe comfortably	Not during the past month	136	1.67	(1.41, 2.19)	0.6523
	Less than once a week	24	1.48	(1.13, 1.96)	0.6612
	Once or twice a week	5	2.67	(2.09, 3.11)	0.4968
	Three or more times a week	5	Reference		
Cough or snore loudly	Not during the past month	127	2.88	(2.52, 3.53)	0.3307
	Less than once a week	28	2.33	(2.01, 2.98)	0.4631
	Once or twice a week	7	1.17	(0.74, 1.58)	0.9192
	Three or more times a week	8	Reference		
Feel too cold	Not during the past month	120	1.12	(0.88, 1.57)	0.9425
	Less than once a week	27	1.01	(0.65, 1.61)	0.7249
	Once or twice a week	16	0.833	(0.49, 1.22)	0.8577
	Three or more times a week	7	Reference		
Feel too hot	Not during the past month	130	1.71	(1.43, 5.12)	0.6347
	Less than once a week	28	0.87	(0.51, 2.34)	0.9089
	Once or twice a week	7	0.67	(0.33, 2.11)	0.7942
	Three or more times a week	5	Reference		
Have bad dreams	Not during the past month	77	1.75	(1.31, 2.27)	0.4145
	Less than once a week	52	2.471	(1.97, 4.02)	0.1962
	Once or twice a week	24	0.933	(0.60, 2.38)	0.9345
	Three or more times a week	17	Reference		
Have pain	Not during the past month	132	2.02	(1.01, 4.73)	0.5269
	Less than once a week	16	1.67	(1.11, 2.08)	0.68
	Once or twice a week	16	1.15	(0.79, 3.56)	0.9102
	Three or more times a week	6	Reference		

Table 3a. Association between Mobile Phone Users after 10 P.M. and Poor Sleep Quality Using Multinomial Logistic Regression Model

Variables		N	OR	95% CI	P-Value
During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?	Not during the past month	150	1.61	(1.28, 2.12)	0.6751
	Less than once a week	12	0.36	(0.13, 2.67)	0.5085
	Once or twice a week	3	2	(1.39, 3.47)	0.676
	Three or more times a week	5	Reference		
During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?	Not during the past month	130	1.24	(0.94, 1.61)	0.8547
	Less than once a week	25	0.95	(0.63, 1.31)	0.9654
	Once or twice a week	11	0.3	(0.11, 0.63)	0.44
	Three or more times a week	4	Reference		
Loud snoring	Not during the past month	155	1.12	(0.58, 2.51)	0.9258
	Less than once a week	8	1	(0.7, 1.37)	1
	Once or twice a week	3	1.5	(1.02, 2.89)	0.8096
	Three or more times a week	4	Reference		
Long pauses between breaths while asleep	Not during the past month	146	2.71	(1.58, 5.47)	0.4188
	Less than once a week	19	0.9	(0.58, 1.31)	0.9435
	Once or twice a week	3	1.5	(1.17, 1.93)	0.711
	Three or more times a week	2	Reference		
Legs twitching or jerking while you sleep	Not during the past month	145	2.56	(1.71, 5.97)	0.4834
	Less than once a week	16	2.12	(1.31, 4.59)	0.6024
	Once or twice a week	7	2.14	(1.25, 5.68)	0.314
	Three or more times a week	2	Reference		
Episodes of disorientation or confusion during sleep	Not during the past month	138	1.23	(0.94, 1.71)	0.1996
	Less than once a week	16	2.17	(1.79, 2.83)	0.5759
	Once or twice a week	13	1.5	(1.12, 1.96)	0.157
	Three or more times a week	3	Reference		
Other restlessness while you sleep, please describe:	Not during the past month	158	2.24	(1.98, 2.76)	0.4761
	Less than once a week	4	1	(0.68, 1.35)	1
	Once or twice a week	6	1.47	(1.13, 1.83)	0.3683
	Three or more times a week	2	Reference		
During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?	No Problem at all	63	4.6	(2.17, 7.12)	0.1624
	Only a very slight problem	74	2.207	(1.51, 4.86)	0.4708
	Somewhat of a problem	24	2.67	(1.71, 5.23)	0.3981
	A very Big Problem	9	Reference		

Table 3b. Association between Mobile Phone Users after 10 P.M. and Poor Sleep Quality Using Multinomial Logistic Regression Model

Variable	Correlation with Sleeping Time (r)	T - Test	P - Value	Significance
Pulse Rate	0.1266	1.655	0.04995	Significant
Systolic Blood Pressure	0.18	2.32	0.01069	
Diastolic Blood Pressure	0.071	0.91	0.1811	Non-Significant

Table 4. Association between Sleeping Time with Pulse Pressure and Blood Pressure

DISCUSSION

Objective of conducting this study was to find out whether there is any relation between late night mobile use (after 10 P.M.) particularly in medical students of Jaipur with quality and quantity of sleep. Medical students are always thought to be stressed and getting good quality sleep is always helpful. On analysis of data collected from students of JNUIMSRC, Jaipur it was found that there was no direct association found between late night (after 10 P.M.) and

poor sleep quality but at the same time it was found that it shows increased sleep latency and later wake-up time. It's implied that increased sleep latency and increased wake up time eventually result in disturbing sleep quality.

Young generation in present time somehow convinced that it's mandatory to use social media continuously so that they won't miss on any updates. They unknowingly made it ritual to use social media on their smartphone before sleep in bed. It was suggested by Fobian et al[21] that bedtime media use by adolescents can lower overall sleep quality by affecting sleep onset, offset and efficiency. Another study by Lemola et al,[22] suggested social media use on smartphone can lead to disturbed sleep and it can lead to depression in long term. Insomnia was also reported in another study done in America on 3139 adolescents due to use of smartphone at bedtime.[23]

As we all must have also experienced that when we connect with world over internet we are exposed to good and bad content. Sometimes we come across things which can upset us and can create stress which will ultimately impair our sleep.[14] Sleep disturbance is noticeable in late night users who have used smartphone after 10 P.M. It was consistently observed that their sleep related parameters changes and increases sleep latency and they have difficulty in waking up time in morning compared to those don't use smart. Though there is no significant evidence of decrease sleep quality. A study conducted in United Kingdom showed that the late-night use of smartphone reduced Total Sleep Duration (TSD) for significant amount up to 21 min.[24] Similarly one more study in United Kingdom (UK), showed that smartphone use caused decrease in sleep duration around 45 min.[25]

As per PSQI questionnaire, data collected and evaluated shows that smartphone use after 10 P.M. leads to decreases sleep duration and increased heart rate and systolic blood pressure which clearly indicates increased sympathetic activity which in long-term can make these individuals more prone to heart related disease. Using smartphone after 10 P.M. in night has negative effect on sleep parameters; it also has negative impact on respiratory and cardiovascular health of a person.

Limitations

Firstly, cross-sectional design of study is a limitation in itself. We are not able to evaluate the effect of late-night smartphone use with sleep quality deterioration. Secondly the study is limited to particular group of people who are studying in medical college with very limited sample size. Lastly questioners were self-administered, which can lead to bias but due to time and manpower constraints, we were not able to organise personal interviews. After so many limitations we have conducted study in order to contribute knowledge on this important behavioural change which can further inspire other researchers to look further in sleep complexities.

CONCLUSIONS

Late night use of smartphone phone after 10 pm and taking smartphone to bed at bedtime can expose to some major risks like cardiovascular diseases and immune system malfunctioning in the future. Sleep deprivation can be a major risk factor in these diseases which needs to be explored further and molecular level changes should be evaluated in the future.

This is a cross-sectional study. We could not determine the mortality. More studies should be conducted with larger sample to evaluate the mortality.

Financial or Other Competing Interests: None.

REFERENCES

[1] Dewald JF, Meijer AM, Oort FJ, et al. The influence of sleep quality, sleep duration and sleepiness on school performance in children and adolescents: a meta-analytic review. Sleep Med Rev 2010;14(3):179-189.
[2] Neinstein LS. Adolescent health care: a practical guide. 5th edn. Philadelphia: Lippincott Williams & Wilkins 2008.
[3] Curcio G, Ferrara M, De Gennaro L. Sleep loss, learning capacity and academic performance. Sleep Med Rev 2006;10(5):323-337.
[4] Ahrberg K, Dresler M, Niedermaier S, et al. The interaction between sleep quality and academic performance. J Psychiatr Res 2012;46(12):1618-1622.
[5] Munezawa T, Kaneita Y, Osaki Y, et al. The association between use of mobile phones after lights out and sleep disturbances among Japanese adolescents: a nationwide cross-sectional survey. Sleep 2011;34(8):1013-1020.
[6] Adams SK, Daly JF, Williford DN. Adolescent sleep and cellular phone use: recent trends and implications for research. Health Serv Insights 2013;6:99-103.
[7] Budmar P. Why Japanese smartphones never went global? PC World 2012 (cited 2016). http://www.pcworld.idg.com.au/article/430254/why_japanese_smartphones_never_went_global/.
[8] Mather J. iMania 2007 (cited 2016). https://web.archive.org/web/20070303032701/http://www.rrj.ca/online/658/.
[9] Ahmed I, Qazi TF, Perji KA. Mobile phone to youngsters: necessity or addiction. Afr J Bus Manag 2011;5(32):12512-12519.
[10] Khan MM. Adverse effects of excessive mobile phone use. Int J Occup Med Environ Health 2008;21(4):289-293.
[11] Divan HA, Kheifets L, Obel C, et al. Cell phone use and behavioural problems in young children. J Epidemiol Community Health 2012;66(5):524-529.

[12] Van den Bulck J. Text messaging as a cause of sleep interruption in adolescents, evidence from a cross-sectional study. J Sleep Res 2003;12:263.
[13] Al-Khlaiwi T, Meo SA. Association of mobile phone radiation with fatigue, headache, dizziness, tension and sleep disturbance in Saudi population. Saudi Med J 2004;25(6):732-736.
[14] Exelmans L, Van den Bulck J. Bedtime mobile phone use and sleep in adults. Soc Sci Med 2016;148:93-101.
[15] White A, Buboltz WC, Igou F. Mobile phone use and sleep quality and length in college students. Int J Humanit Soc Sci 2011;1(18):51-58.
[16] Thomée S, Eklöf M, Gustafsson E, et al. Prevalence of perceived stress, symptoms of depression and sleep disturbances in relation to information and communication technology (ICT) use among young adults – an explorative prospective study. Comput Human Behav 2007;23(3):1300-1321.
[17] Mak YW, Wu CST, Hui DWS, et al. Association between screen viewing duration and sleep duration, sleep quality and excessive daytime sleepiness among adolescents in Hong Kong. Int J Environ Res Public Health 2014;11(11):11201-11219.
[18] Kakinuma M, Takahashi M, Kato N, et al. Effect of brief sleep hygiene education for workers of an information technology company. Ind Health 2010;48(6):758-765.
[19] Suleiman KH, Yates BC, Berger AM, et al. Translating the Pittsburgh sleep quality index into Arabic. West J Nurs Res 2010;32(2):250-268.
[20] IBM Corp. IBM SPSS Statistics for Macintosh. Version 21.0 edn. Armonk, NY: IBM Corp, Released 2012.
[21] Fobian AD, Avis K, Schwebel DC. Impact of media use on ado-lescent sleep efficiency. J Dev Behav Pediatr 2016;37(1):9-14.
[22] Lemola S, Perkinson-Gloor N, Brand S, et al. Adolescents' electronic media use at night, sleep disturbance and depressive symptoms in the smartphone age. J Youth Adolesc 2015;44(2):405-418.
[23] Polos PG, Bhat S, Gupta D, et al. The impact of Sleep Time-Related Information and Communication Technology (STRICT) on sleep patterns and daytime functioning in American adolescents. J Adolesc 2015;44:232-244.
[24] Arora T, Hussain S, Lam HKB, et al. Exploring the complex pathways among specific types of technology, self-reported sleep duration and body mass index in UK adolescents. Int J Obes (Lond) 2013;37(9):1254-1260.
[25] Calamaro CJ, Mason TBA, Ratcliffe SJ. Adolescents living the 24/7 lifestyle: effects of caffeine and technology on sleep duration and daytime functioning. Pediatrics 2009;123(6):e1005-e1010.