

Sleep Duration, Subjective Sleep Disturbances and Associated Factors Among University Students in Korea

Objective of this study was to look into sleep patterns of university students in association with their lifestyle, specifically to examine mean sleep duration, prevalence of sleep disturbances and their correlates. This study also aimed to examine a possible association of sleep patterns of young adults with new media like computers and videos, which were supposed to have a great influence on their lifestyle. Self-reported sleep data were derived from questionnaires administered to a total of 1,414 students of one university located in Chulabuk-do, Korea. Statistical methods such as t-test, analyses of variance, chi-square test and multivariate logistic regression were used for analysis. The mean sleep duration of the respondents was 6.7 ± 1.3 hr. Of the respondents, 30.2% reported having insufficient sleep. About one third of them pointed to visual media including computers as the primary reason. The proportion of those having some types of sleep disturbances was 36.2%. The risk of subjective sleep disturbances was significantly lower among those perceiving themselves healthy than among those perceiving themselves unhealthy (OR=0.44; 95% CI: 0.34-0.57).

Key Words : Sleep; Sleep Disorders; Health Behavior; Life Style

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INTRODUCTION

Sleep occupies almost a third of our life and thus is an important aspect of our life. It is essential to physical and mental growth and stability. Deprivation of sleep not only weakens physical and mental functions, lowers work productivity, but also could cause mental problems such as depression. Thus, deprivation of sleep has enormous effects on society as well as individuals. For example, it was reported that annual social costs of daytime sleepiness due to various sleep problems were estimated to be \$15 billion in the United States (1).

Over a decade, we have seen a rapid diffusion of computers and the proliferation of late-night cinemas and video rooms in this country. Development of these new media has been changing culture and lifestyle of young adults including university students. Due to these cultural changes, sleep patterns of the young adults tend to become irregular and many of them experience sleep deficiency, which could have detrimental effects on daytime activities including study.

Compared with other health-related behaviors like smoking and drinking, it seems that sleep problems, particularly of young adults, have been understated so far in Korea. There are only a few studies on sleep patterns of Korean people. For example, a national survey carried out in 1998 showed that mean sleep duration of 10,773 adults aged 20

or over was 6.9 hr and 33.5% of them reported having insufficient sleep (2). Another national survey carried out in 1999 showed that mean sleep duration of 42,973 subjects aged 10 or over amounted to 7 hr 47 min (3). These two recent national surveys provide nothing but information about sleep duration by each of socio-demographic variables. In a study on sleep patterns of the general adult population in Seoul, Choi et al. (4) examined not only mean sleep duration but also sleep latency and prevalence of sleep disturbances. However, they did not investigate correlates of sleep disturbances such as lifestyle and did not take into consideration the impact of the recent cultural changes among younger generation on sleep patterns. A study looking into sleep patterns of medical students examined an association of sleep patterns only with personality of medical students, not with their lifestyle (5).

Therefore, this study aimed to look into sleep patterns of university students in association with their lifestyle. Specific objectives were to examine mean sleep duration and prevalence of sleep disturbances among university students, and also to study their association with socio-demographic characteristics, health-related behaviors and perceived health status. In particular, this study was to examine a potential effect of new media like computers and videos on sleep patterns of young adults.

DATA AND METHODS

Self-reported sleep data were derived from questionnaires administered to students of one university located in Chulabuk-do, Korea in June 2000. A total of 1,414 students participated in an in-class survey and completed questionnaires which consisted of 30 items, including information about socio-demographic characteristics, health-related behaviors such as smoking, drinking and exercises, perceived health status, sleep duration and perceived quality of sleep of the subjects. Here, sleep duration was measured by asking "On the average, how much sleep do you get each night?" Subjects were asked to give responses in hr and min. In terms of perceived quality of sleep, subjects were asked if they had 'severe', 'moderate' or 'no' sleep disturbances. It took around 10 min to complete the questionnaire.

The distribution of sleep duration by some socio-demographic variables, health-related behaviors, perceived health status and perceived quality of sleep was analyzed by displaying means (standard deviations) and tests for statistical significance. Analyses of variance (ANOVAs) were used to test the statistical significance of each variable with regard to sleep duration. To examine the associations between perceived quality of sleep and each of the potential determinants, chi-square test was used. Besides, multiple logistic regression analysis was used to estimate and test the unique association of each of the variables with subjective sleep disturbances, controlling for all the others in the model. The multivariate model included those variables related to subjective sleep disturbances in the univariate tests.

RESULTS

Socio-demographic characteristics of respondents

The socio-demographic characteristics of the respondents are described in Table 1. The age of the respondents ranged from 17 to 41 yr. Of them, 53.4% were female and 55.5% were in their freshman year. And 39.6% were studying humanities and social sciences while 37.5% studying science and engineering. In terms of residential type, 52.5% were living with parents or relatives while 46.9% living alone with or without being catered.

Health-related behaviors of respondents

Table 2 describes the health-related behaviors such as smoking, drinking, drinking coffee and exercises as well as perceived health status of the respondents by sex. Of the male respondents, 44.5% did not smoke while 93.1% of the female respondents did not ($p < 0.001$). Besides, 21.5% of the female did not drink alcohol at all while 12.7% of

Table 1. Socio-demographic characteristics of respondents (n=1,414)

Characteristics	Percentage (%)
Sex	
Male	46.6
Female	53.4
Age (yr)	
-19	49.8
20-24	43.2
25-29	6.1
30-	0.9
Year	
Freshman	55.5
Sophomore	26.2
Junior	12.3
Senior	6.0
Major	
Humanities & social sciences	39.6
Science & engineering	37.5
Education	10.5
Health sciences	3.8
Arts & sports	8.6
Residential type	
Living with parents or relatives	52.5
Living alone with or without being catered	46.9
Others	0.6

the male did not ($p < 0.001$). The proportion of those drinking three or more cups of coffee per day was higher among male respondents than among female ones ($p < 0.05$). Of the female respondents, 47.1% never or rarely did exercises, compared with 14.4% of the male respondents ($p < 0.001$). On the other hand, more male students perceived their health good while more female students perceived their health poor ($p < 0.001$).

Duration and perceived quality of sleep

The mean sleep duration of the respondents was 6.7 ± 1.3 hr. Of them, 18.4% reported sleeping less than 6 hr in the night. Besides, the average time for respondents to go to bed was 00:56 A.M. Even, 26.4% of them went to bed at 2:00 A.M. or later.

Mean hours of sleep by some socio-demographic characteristics, health-related behaviors and perceived health status are shown in Tables 3 and 4. Male students reported sleeping slightly longer than females ($p < 0.01$). Mean sleep duration decreased with age, but this was not statistically significant. Mean hours of sleep were also significantly different by major ($p < 0.05$). In terms of health-related behaviors, mean hours of sleep were significantly different by coffee intake ($p < 0.01$). However, sleep duration was not significantly different by other health-related behaviors such as smoking, drinking, and exercises. Those who perceived themselves unhealthy slept significantly less than those per-

Table 2. Health-related behaviors and perceived health status by sex

(Unit: %)

Characteristics	Male (n=659)	Female (n=755)	Total (n=1,414)
Smoking* (number of cigarettes per day)			
0	44.5	93.1	70.4
1-10	22.5	4.7	13.0
11-20	29.1	1.5	14.4
21+	4.0	0.8	2.2
Drinking† (number of days for drinking during a week)			
0	12.7	21.5	17.3
1	51.9	60.7	56.5
2-3	27.3	15.4	21.0
4-5	4.2	1.4	2.7
6-7	4.0	1.1	2.5
Coffee intake‡ (number of cups of coffee per day)			
0	31.0	31.2	31.1
1-2	59.8	63.9	62.0
3-4	6.7	4.2	5.3
5+	2.4	0.8	1.5
Exercises§			
Never or rarely	14.4	47.1	31.9
Irregularly	69.5	47.2	57.6
Regularly	16.1	5.7	10.5
Perceived health status			
Good	39.3	29.2	33.9
Fair	42.0	49.6	46.1
Poor	18.7	21.2	20.0

* $p < 0.001$ by chi-square test; † $p < 0.001$ by chi-square test; ‡ $p < 0.05$ by chi-square test; § $p < 0.001$ by chi-square test; || $p < 0.001$ by chi-square test

Table 3. Hours of sleep by sex, age and major

Characteristics	Hours of sleep at night Mean (SD)
Sex*	
Male	6.8 (1.5)
Female	6.6 (1.2)
Age† (yr)	
<19	6.7 (1.4)
20-24	6.7 (1.4)
25-29	6.5 (1.3)
30-	6.4 (0.9)
Major‡	
Humanities & social sciences	6.7 (1.3)
Science & engineering	6.7 (1.5)
Education	6.5 (1.2)
Health sciences	7.2 (1.2)
Arts & sports	6.8 (1.6)

* $p < 0.01$ by t-test; †not significant by ANOVA; ‡ $p < 0.05$ by ANOVA

ceiving themselves healthy ($p < 0.05$).

On the other hand, 30.2% of the respondents reported having insufficient sleep while 29.1% reported having sufficient sleep. Of those having insufficient sleep, about one third reported that visual media including computers were the primary reason for their insufficient sleep. Particularly, 60% of the insufficient sleep due to the visual media was attributed to computers. There was no difference between

male and female students with regard to self-reported sufficiency of sleep. Self-reported insufficiency of sleep was associated with more frequent drinking ($p < 0.001$). That is, the more frequently the respondents drank, the higher the proportion of those reporting insufficient sleep was. Besides, the majority of those perceiving themselves unhealthy reported having insufficient sleep in the night ($p < 0.001$).

Subjective sleep disturbances were found to be common. According to Table 5, those having some types of subjective sleep disturbances accounted for 36.2% of the respondents, with 6.5% having severe sleep disturbances compared to 29.7% having moderate sleep disturbances. Subjective sleep disturbances were more common among female respondents (37.7%) than among male ones (34.6%), but this difference was not statistically significant. Subjective sleep disturbances were associated with heavier smoking ($p < 0.05$), more frequent drinking ($p < 0.001$), more frequent coffee intake ($p < 0.1$) and poor perceived health ($p < 0.001$). That is, heavy smokers, those drinking alcohol frequently and those drinking several cups of coffee a day were more likely to experience sleep disturbances. And a larger proportion of those perceiving their health poor complained of some types of sleep disturbances.

Relationships between sleep duration and a couple of subjective aspects of sleep are described in Table 6. Mean sleep duration of those reporting sufficient sleep was signifi-

Table 4. Hours of sleep by health-related behaviors and perceived health status

Characteristics	Hours of sleep at night Mean (SD)
Smoking* (number of cigarettes per day)	
0	6.7 (1.3)
1-10	6.8 (1.5)
11-20	6.7 (1.5)
21+	7.2 (2.3)
Drinking [†] (number of days for drinking during a week)	
0	6.6 (1.2)
1	6.7 (1.3)
2-3	6.8 (1.6)
4-5	6.7 (1.8)
6-7	6.9 (2.2)
Coffee intake [‡] (number of cups of coffee per day)	
0	6.9 (1.4)
1-2	6.6 (1.3)
3-4	6.7 (1.7)
5+	7.1 (2.2)
Exercises [§]	
Never or rarely	6.8 (1.4)
Irregularly	6.7 (1.3)
Regularly	6.6 (1.4)
Perceived health status	
Good	6.8 (1.3)
Fair	6.8 (1.3)
Poor	6.5 (1.6)

*not significant by ANOVA; [†]not significant by ANOVA; [‡] $p < 0.01$ by ANOVA; [§]not significant by ANOVA; ^{||} $p < 0.05$ by ANOVA

Table 5. Prevalence of subjective sleep disturbances by sex (Unit: %)

Type of subjective sleep disturbances	Sex*		Total
	Male	Female	
Severe	2.9 (6.3)	3.6 (6.7)	6.5
Moderate	13.2 (28.3)	16.6 (31.0)	29.7
No	30.4 (65.4)	33.3 (62.3)	63.8
Total	46.6 (100.0)	53.4 (100.0)	100.0

*No significant difference was found by chi-square test

cantly longer than that of those reporting insufficient sleep ($p < 0.001$). In addition, there was a small but significant difference in mean sleep duration between those reporting severe sleep disturbances and those reporting no sleep disturbances ($p < 0.01$). Moreover, there was a strong correlation between self-reported insufficiency of sleep and subjective sleep disturbances. It was found that a larger proportion of those reporting subjective sleep disturbances did not get sufficient sleep in the night ($p < 0.001$).

Multiple logistic model of subjective sleep disturbances

Multiple logistic regression analysis was used to estimate

Table 6. Hours of sleep by subjective aspects of sleep

Category	Hours of sleep at night Mean (SD)
Self-reported sufficiency of sleep*	
Sufficient	7.4 (1.3)
Insufficient	6.0 (1.3)
Subjective sleep disturbances [†]	
Severe	6.3 (1.6)
Moderate	6.6 (1.4)
No	6.8 (1.3)

* $p < 0.001$ by ANOVA test; [†] $p < 0.01$ by ANOVA test

Table 7. Multiple logistic regression analysis of subjective sleep disturbances

Characteristics	Odds ratio	95% confidence interval	
		Lower	Upper
Age	1.020	0.974	1.067
Sex (male)			
Female	1.181	0.899	1.551
Smoking (none)			
Smoking	1.044	0.772	1.413
Alcohol drinking (none)			
Drinking	1.258	0.917	1.725
Coffee intake (≤ 1 cup)			
≥ 2 cups	1.165	0.863	1.572
Perceived health status (poor)			
Good	0.439	0.340	0.567

the association of subjective sleep disturbances with each of the suspected risk factors, controlling for all the others. The results are shown in Table 7. The multiple logistic model of subjective sleep disturbances using 6 variables could reject the global null hypothesis ($\beta = 0$) with chi-square=49.5 (d.f.=6; $p < 0.001$). The risk of subjective sleep disturbances was significantly lower among those perceiving themselves healthy than among those perceiving themselves unhealthy (OR=0.44; 95% CI: 0.34-0.57). Old age (OR=1.02; 95% CI: 0.97-1.07), being female (OR=1.18; 95% CI: 0.90-1.55), smoking (OR=1.04; 95% CI: 0.77-1.41), drinking (OR=1.26; 95% CI: 0.92-1.73) and coffee intake (OR=1.17; 95% CI: 0.86-1.57) were associated, though not statistically significant, with the risk of subjective sleep disturbances.

DISCUSSION

The interpretation of the findings must take into account the limitations of the study, primarily the reliance on self-reports about sleep patterns of the respondents. Further methodological refinement on self-reported measures of sleep patterns is needed.

The subjects included in this study tended to sleep

slightly shorter than the subjects aged 20 or over included in the 1998 national survey, while less of the former reported having insufficient sleep than the latter. Compared to the 1999 national survey, of which the subjects were aged 10 or over, mean sleep duration of this study's subjects, 93% of whom were less than 25 yr old, was significantly short.

It is generally known that sleep problems tend to increase with age (6, 7). Since the study population was young adults attending a university, effects of age on sleep disturbances could not be found. Like in many studies showing that sleep disturbances are found more frequently among women than men (7-12), it was found in this study that the female students slept slightly shorter and reported more sleep disturbances than their male counterparts.

Unlike some studies showing a positive relationship between smoking and sleep disturbances (13-15), this study revealed only a weak relationship between the two. The same was true of the relationship between drinking and sleep disturbances. In contrast, the fact that health status is an important predictor of sleep disturbances was confirmed in this study as in other studies (6, 7, 16, 17).

Sleep deficiency or sleep disturbances are known to have serious consequences in various ways. It was reported that excessive daytime sleepiness due to sleep deficiency was associated with increased risks for accidents, decreased productivity and difficulties in interpersonal relationships (18). Particularly, it was reported that insomnia caused problems such as impaired concentration, impaired memory, decreased ability to accomplish daily tasks and decreased enjoyment of interpersonal relationships (19). This study also showed that sleep disturbances were highly associated with impaired concentration at class ($p < 0.001$). In reality, 43.6% of those with subjective sleep disturbances reported impaired concentration at class. Besides, of those having insufficient sleep in the night, 23.6% reported that they dozed off at class.

Consequences of sleep deficiency or disturbances go beyond this level. Actually, it was reported that sleep disturbance was a significant correlate of depression (20-22) and was even associated with an increased risk of mortality (23). In these days of new media like computers and videos being spread rapidly and widely, the potential impact of the observed short and poor nocturnal sleep on work productivity and health among young adults deserves further study.

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