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Original article

Sleep quality and more common sleep-related problems in medical students

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Abstract

Background and purpose: The aim of this paper is to conduct a survey based on a questionnaire that would characterize nighttime and daytime habits in medical students; to estimate how subjective sleep quality is associated with nighttime and daytime habits and sleep problems in students; to estimate how academic progress and workload is associated with subjective sleep quality, nighttime and daytime habits and sleep problems in students; and to estimate the prevalence of self-reported sleep problems in Estonian medical students.

Patients and methods: The study group included 413 medical students of the University of Tartu, aged 19–33 years. The self-reported Sleep and Daytime Habits Questionnaire (S&DHQ) covered demographic characteristics (4 questions) and sleep and daytime habits (24 questions). Of the latter, 18 multiple-choice questions provided answers expressed as discontinuous variables on a nominal scale, 4 questions provided answers expressed as continuous variables on an interval scale, and 2 questions provided answers expressed as quality characterization on a five-point scale. The supplement includes information about lifestyle and academic progress on a four-point scale.

Results: The S & DHQ could be used to study sleep problems in young medical students. The subjective sleep quality of students was as follows: excellent-29%; good—40%; satisfactory—24%; poor 6%; very poor—1%. Sleep quality is associated with academic progress ($R=0.174$; $P<0.001$), leisure activity ($R=0.210$; $P<0.001$), and living conditions ($R=0.195$; $P<0.001$). Sleep quality is not associated with students' daily ($R=0.021$; $P>0.05$) or nightly workload ($R=0.0664$; $P>0.05$). Daytime sleepiness poses a significant problem for students and is associated both with sleep disorders and work while studying.

Conclusions: The study demonstrates that complaints about sleep problems are common in young medical students.

Keywords: Sleep and daytime habits questionnaire; Young medical students; Daytime sleepiness; Work while studying

1. Introduction

Sleep disorders, especially insomnia and excessive daytime sleepiness, are common complaints [1,2]. They are associated with an increased prevalence of various somatic diseases and/or psychiatric disorders as well as social problems [3–5]. Previous general population studies have estimated that the prevalence of sleep disorders ranges between 15 and 42% and may reach 62% in various elderly populations [6–8]. The considerably large variation in the prevalence of sleep disturbances is due to methodological differences in the definition and characterization of the disorder and target population. Many studies have demonstrated risk factors for sleep disturbances, such as age, sex, socioeconomic status, life habits, and psychological factors [9,10]. However, the same method for measuring the prevalence of sleep disturbances in young adults in three European countries did not reveal any significant variation of insomnia [11]. The Basic Nordic Sleep Questionnaire has been used mainly to discover the complaints of sleep apnea and insomnia [12]. Roth et al. in 2002 used the Global Sleep Assessment Questionnaire for sleep disorders in the general primary care population [13]. The Paediatric Sleep Questionnaire has been developed for sleep-disordered breathing

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and behavioural problems in children and adolescents [14]. Here we document the results of a survey based on a self-reported sleep quality questionnaire on nighttime and daytime habits with a supplement about lifestyle and academic progress among young medical students. The aims of the study were as follows: (1) to develop a questionnaire that would characterize nighttime and daytime habits in young medical students; (2) to estimate how demographic characteristics, lifestyle and academic progress, and subjective sleep quality are linked with sleep problems in young medical students; and (3) to estimate the prevalence of self-reported sleep problems in Estonian students.

2. Methods

2.1. Study area and study subjects

Tartu is the second largest city of Estonia. The University of Tartu has 17,500 students, including about 2200 medical students. This study covers all medical students from the first to the sixth year who attended lectures between October 15 and November 15, 2003. During that period we handed out the questionnaire to 515 students who attended the obligatory morning lectures. Four hundred thirteen students returned the questionnaire. The subjects included 318 (77%) females and 95 (23%) males, aged 19–33 (mean age 21.3 ± 2.5), with a body mass index (BMI) of 16–36 kg/m^2 (21.5 ± 2.8). The subjects included full-time or part-time workers 115 (28%); 82 (20%) students worked full or part-time during the night.

2.2. Questionnaire on sleep and daytime habits (QS&DH)

Our questionnaire was based on the 'Questionnaire on sleep and daytime symptoms' [11], which included 18 questions and was used in three European countries together with the Health Survey programme. We added questions about parasomnias, sleep, and daytime habits, lifestyle, and academic progress. The questionnaire includes demographic characteristics (4 questions), sleep and daytime habits (24 questions), and lifestyle and academic progress (5 questions). The demographic characteristics included age, gender, weight, and height.

Most questions concerned the whole week. One question concerned weekdays only. Four questions provided answers expressed as continuous variables on an interval scale. In these questions the subjects were asked to estimate the average time during the weekdays when they went to bed, the average time needed for falling asleep, the average length of daytime naps, and the average number of nocturnal awakenings during weekdays and weekends.

Two quality-associated questions rated sleep on a five-point scale as 1, excellent; 2, good; 3, satisfactory; 4, poor; 5, very poor. The subjects were asked to evaluate their usual sleep quality on whole week and their sleep quality on the night before an exam. Eighteen multiple-choice questions provided answers expressed as discontinuous variables on a nominal scale. In the case of the multiple-choice questions the subjects were asked to estimate the frequency of different symptoms/habits during the whole week on a five-point scale: 1, never; 2, less than once a week; 3, 1–2 nights a week; 4, 3–4 nights a week; 5, almost nightly/daily.

The supplement includes information about lifestyle and academic progress on a four-point scale. Three questions rated academic progress, leisure activity, and living conditions as 1, excellent; 2, good; 3, satisfactory or 4, unsatisfactory. Two questions about daytime and nighttime work enabled us to categorize workload as 1, not at all; 2, sometimes; 3, part-time or 4, full-time. Students also reported their height and weight, from which BMI was calculated.

2.3. Statistics

Statistical analysis was performed with the help of the Statistica 6.0 software package (StatSoft Inc., Tulsa, OK). Relationships between sleep quality, nighttime and daytime habits, and sleep problems were studied using the Spearman Rank Order Correlations. Frequency tables were used to study the frequency of sleep problems and nighttime and daytime habits among the subjects.

3. Results

3.1. Night and daytime habits and sleep problems

3.1.1. Sleep quality

The question about the sleep quality of students on a five-point scale showed the following distribution of sleep quality: excellent—120 (29%); good—165 (40%); satisfactory—99 (24%); poor—24 (6%); very poor—4 (1%).

According to the Spearman Rank Order Correlation (Table 1), the subjective sleep quality was not associated with students' age or BMI. Sleep quality was related to all indicators of difficulties initiating and maintaining sleep, morning tiredness and sleepiness during the day. Among parasomnias only nightmares and nocturnal eating were associated with sleep quality. Possible sleep-affecting habits such as the habitual time of going to bed and drinking coffee in the evening were not associated with sleep quality. Sleep quality was associated with academic progress ($R = 0.174$; $P < 0.001$), leisure activity ($R = 0.210$; $P < 0.001$), and living conditions ($R = 0.195$; $P < 0.001$). Sleep quality was not linked with students' daily ($R = 0.021$; $P > 0.05$) or nightly workload ($R = 0.0664$; $P > 0.05$).

3.1.2. Academic progress

The question about academic progress of students on a four-point scale showed the following: excellent—41

Table 1
Spearman Rank Order Correlation between sleep quality, age, BMI, nighttime and daytime habits and sleep problems

Nighttime and daytime habits and sleep problems	Sleep quality		Age		BMI	
	R	*P*-level	*R*	*P*-level	*R*	*P*-level
1. Time of going to bed	0.052	>0.05	0.010	>0.05	0.067	>0.05
2. Sleep latency	0.379	<0.001	0.051	>0.05	−0.009	>0.05
3. Nocturnal awakenings	0.307	<0.001	0.128	<0.01	0.046	>0.05
4. Duration of daytime naps	−0.035	>0.05	0.010	>0.05	0.089	>0.05
5. Sleep quality			−0.012	>0.05	0.089	>0.05
6. Sleep quality on the night before an exam	0.276	<0.001	0.115	<0.05	0.013	>0.05
7. Unusual time for going to bed	−0.009	>0.05	0.051	>0.05	0.175	<0.001
8. Difficulty in getting to sleep at night	0.474	<0.001	−0.006	>0.05	0.051	>0.05
9. Drinking coffee late at night	0.059	>0.05	−0.82	>0.05	0.033	>0.05
10. Use of sleeping pills	0.208	<0.001	0.137	<0.01	0.962	<0.05
11. Waking up due to noise	0.255	<0.001	0.042	>0.05	0.009	>0.05
12. Waking up because of nightmares	0.246	<0.001	0.108	<0.05	0.001	>0.05
13. Waking up because of sleep talking	−0.21	>0.05	−0.083	>0.05	0.023	>0.05
14. Waking up because of sleepwalking	−0.035	>0.05	−0.049	>0.05	−0.031	>0.05
15. Waking up because of nocturnal eating	0.102	<0.05	0.025	>0.05	0.062	>0.05
16. Waking up because of the restless leg syndrome	0.203	<0.001	0.003	>0.05	0.088	>0.05
17. Snoring	−0.004	>0.05	0.127	<0.01	0.163	<0.001
18. Nocturnal bruxism	0.045	>0.05	0.083		0.049	>0.05
19. Early morning awakening	0.245	<0.001	0.046	>0.05	0.039	>0.05
20. Tired feeling in the morning	0.150	<0.01	0.047	>0.05	0.091	>0.05
21. Daytime sleepiness	0.195	<0.001	0.011	>0.05	0.097	<0.05
22. Daytime sleepiness during the lectures	0.114	<0.05	−0.100	<0.05	0.076	>0.05
23. Daytime sleepiness during free time	0.177	<0.001	0.090	>0.05	0.115	<0.05
24. Daytime naps	0.077	>0.05	0.217	<0.001	0.106	<0.05

The correlation is statistically significant if $P<0.05$; (<0.05; <0.01; <0.001).

(10%); good—256 (62%); satisfactory—107 (26%); unsatisfactory—8 (2%). According to the Spearman Rank Order Correlation, the academic progress of students was associated with waking up due to noise ($R=0.117$; $P<0.05$), waking up because of nightmares ($R=0.097$; $P<0.05$), feeling tired in the morning ($R=0.107$; $P<0.05$), waking up in the early morning ($R=0.123$; $P<0.05$), daytime sleepiness ($R=0.121$, $P<0.05$), daytime sleepiness during classes ($R=0.104$; $P<0.05$), and sleep quality ($R=0.174$; $P<0.001$). No correlation was observed between academic progress and other nighttime and daytime habits.

3.1.3. Leisure activity

Leisure activity on a four-point scale was excellent=43 (10%); good=157 (38%); satisfactory=169 (41%); unsatisfactory=45 (11%). According to the Spearman Rank Order Correlation, the leisure activity of students was linked with difficulty getting to sleep at night ($R=0.174$; $P<0.001$), waking up due to noise ($R=0.115$; $P<0.05$), sleep quality on the night before an exam ($R=0.172$; $P<0.01$), use of sleeping pills ($R=0.121$; $P<0.05$), nocturnal awakenings ($R=0.206$; $P<0.001$), waking up because of nightmares ($R=0.107$; $P<0.05$), feeling tired in the morning ($R=0.132$; $P<0.01$), daytime sleepiness in free time ($R=0.118$; $P<0.05$), and sleep quality ($R=0.210$; $P<0.001$). There was no correlation between leisure activity and other nighttime and daytime habits.

3.1.4. Living conditions

The question about living conditions of students on a four-point scale showed the following: excellent—115 (27%); good—210 (51%); satisfactory—82 (20%); unsatisfactory—8 (2%). According to the Spearman Rank Order Correlation, the living conditions of students were associated with waking up due to noise ($R=0.195$; $P<0.001$), drinking coffee late at night ($R=0.102$; $P<0.05$), early morning awakening ($R=0.107$; $P<0.05$), duration of daytime naps ($R=$-0.140; $P<0.01$), and sleep quality ($R=0.195$; $P<0.001$). There was no correlation between living conditions and other nighttime and daytime habits.

3.1.5. Work while studying

The question about the workload of students on a four-point scale showed the following: 202 (49%) students did not work at all; 95 (23%) students worked sometimes; 91 (22%) students worked part-time and 24 (6%) students worked full-time. According to the Spearman Rank Order Correlation, the workload of students was associated with going to bed late at night ($R=0.111$; $P<0.05$), drinking coffee late at night ($R=0.108$; $P<0.05$), waking up because of sleepwalking ($R=0.101$; $P<0.05$), snoring ($R=0.147$; $P<0.01$), feeling tired in the morning ($R=0.116$; $P<0.05$),

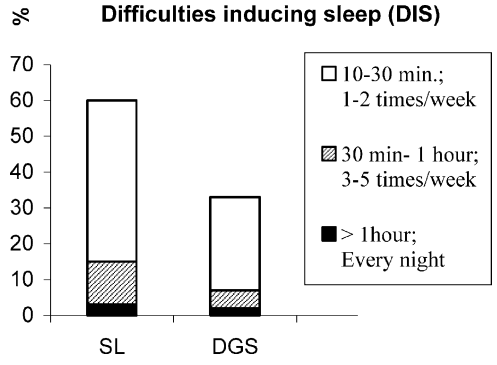

Fig. 1. The symptoms of difficulties inducing sleep (DIS): sleep latency (SL: time it takes to induce sleep); how many times per week one has difficulty getting to sleep at night (DGS).

daytime sleepiness during classes ($R=0.128$; $P<0.01$), daytime sleepiness in free time ($R=0.0977$; $P<0.05$), daytime naps ($R=0.166$; $P<0.001$), and duration of daytime naps ($R=0.490$; $P<0.01$). There was no correlation between the workload and other nighttime and daytime habits.

3.1.6. Nighttime work while studying

The question about the nighttime workload of students on a four-point scale showed the following: 280 (68%) students did not work at night, 50 (12%) students worked sometimes, 45 (11%) students worked part-time and 37 (9%) worked full-time. According to the Spearman Rank Order Correlation, the nighttime workload of students was associated with the time of going to bed ($R=0.158$; $P<0.001$), going to bed late at night (unusual time) ($R=0.100$; $P<0.05$), drinking coffee late at night ($R=0153$; $P<0.01$), use of sleeping pills ($R=0.101$; $P<0.05$), waking up because of sleepwalking ($R=0.113$; $0<0.05$), feeling tired in the morning ($R=0.175$; $P<0.001$), daytime sleepiness ($R=0.108$; $P<0.05$), daytime sleepiness during classes ($R=0.179$; $P<0.001$), daytime sleepiness in free time ($R=0968$; $P<0.05$), and daytime naps ($R=0.144$; $P<0.01$). There was no correlation between the nighttime workload and other nighttime and daytime habits.

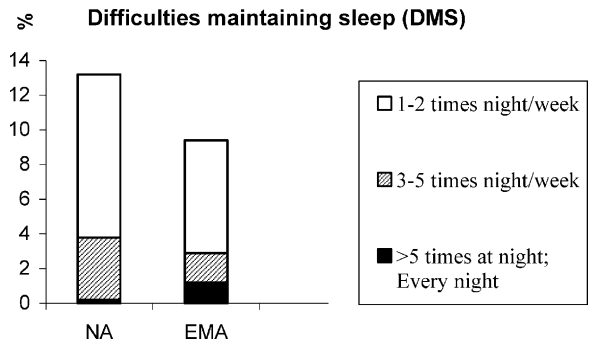

Fig. 2. Difficulties maintaining sleep (DMS): nocturnal awakenings (NA); early morning awakenings (EMA).

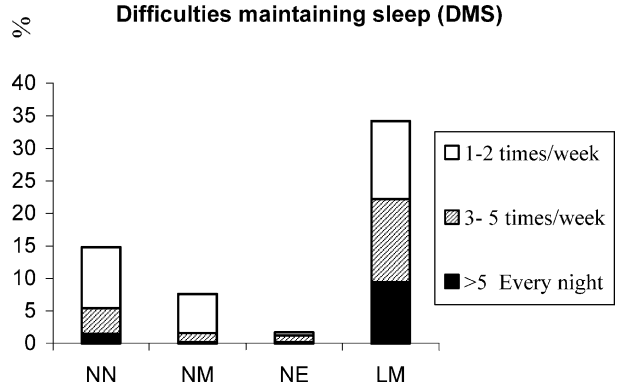

Fig. 3. The prevalence of sleep disturbance symptoms associated with difficulties maintaining sleep: waking up due to noise at night (NN); waking up because of nightmares (NM); waking up because of nocturnal eating habits (NE); and leg movements or disagreeable symptoms (LM).

3.1.7. Prevalence of sleep disturbance symptoms

Figs. 1–6 show the prevalence of sleep disturbance symptoms by (S&DHQ).

4. Discussion

The S&DHQ with the supplement can be used for studying sleep problems in young medical students. One-third of young medical students evaluate their sleep quality on a five-point scale as satisfactory, poor, or very poor. Sleep quality was associated with academic progress, leisure activity, and living conditions but was not associated with students daytime or nighttime workloads.

Students' quality of sleep is related to some complaints concerning insomnia, such as difficulty in inducing and maintaining sleep and daytime sleepiness. Sleep quality was linked with such parasomnias as nightmares and the nocturnal eating symptom but was unrelated to sleep-walking, sleep-talking, bruxism, and primary snoring.

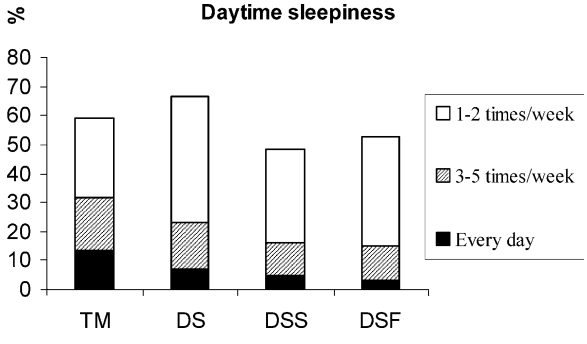

Fig. 4. The prevalence of complaints about sleepiness: tiredness in the morning (TM), daytime sleepiness (DS), daytime sleepiness during classes (DSS), and daytime sleepiness in free time (DSF).

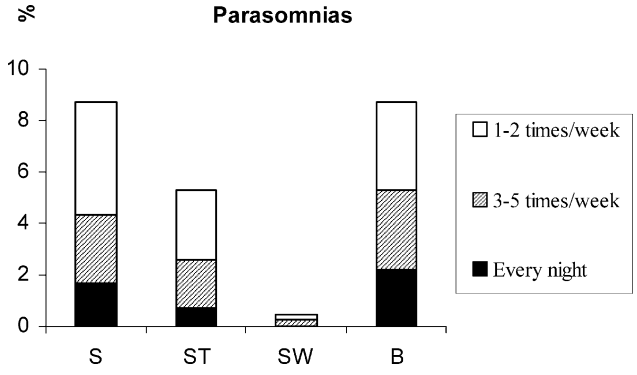

Fig. 5. The prevalence of parasomnias such as snoring (S), sleep-talking (ST), sleepwalking (SW), and sleep bruxism (SB).

Sleep quality was associated with the use of sleeping pills but not with drinking coffee late in the evening or time of going to bed. However, students' daytime and nighttime workload bring about daytime sleepiness, feeling tired in the morning, and daytime naps. On the other hand, an increased BMI is related to daytime sleepiness, daytime naps, and snoring. Owens et al. found that elementary school children were seriously affected by daytime sleepiness [15]. According to our study daytime sleepiness is related to sleep quality, workload, and BMI. Low evaluation of leisure activity was linked with daytime sleepiness and the other insomnia complaints. These relations, however, could have been caused by anxiety or symptoms of depression. Consequently, daytime sleepiness is a serious problem that can be caused by various factors and is linked with academic progress and leisure activity.

This study demonstrates that complaints about sleep problems are common in young medical students. According to Janson et al. [11], the prevalence of habitual DIS was between 6 and 9% in young adults in three European countries. These results were similar in our study (7%). The prevalence of DGS, including 3–5 times per week, was $>30\%$ according to our study and $<20\%$ according

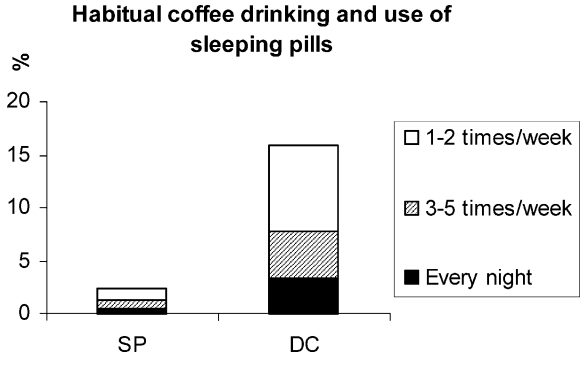

Fig. 6. The prevalence of use of sleeping pills and habits of drinking coffee late in the evening.

Janson's study [11]. However, similar to our study, a US study of 11–14 years-old revealed that the sleep latency onset was more than 10 min in 60% of cases [16]. Vigneau et al., who studied French secondary-school adolescents aged 15–23, demonstrated that 26.1% had difficulty in falling asleep [17]. Difficulties in inducing and maintaining sleep are common in young medical students in comparison with young adults who are not students. We demonstrated that some sleeping problems are related to students' living conditions.

According to our study, restless leg syndrome, sleep bruxism, and snoring showed high prevalence. Restless leg syndrome is estimated to occur in 5–15% of the general population [7,18]. The prevalence of habitual leg restlessness was 22% in our study. The prevalence of sleep bruxism has been reported in 6–20% of the general population [6,7,19]. In our study, the prevalence of bruxism and snoring are both 9%. Similar to Thorpy [6,7], we reported prevalence of nightmares (8%), sleep-talking ($<9.9\%$) and sleepwalking ($<0.5\%$). Furthermore, in our study, the prevalence of nightmares is linked with academic progress.

In conclusion, our questionnaire was based on the 'Questionnaire on sleep and daytime symptoms'[11]. We added questions about parasomnias, sleep and daytime habits, students' lifestyle, and academic progress. The study demonstrates that sleep quality is associated with academic progress, leisure activity, and living conditions but is not associated with students' workload. Daytime sleepiness is a significant problem for students and is linked with sleep disorders and work while studying. We found that some sleep problems were common in young medical students in comparison with the general population or subjects who were not students.

Acknowledgements

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Appendix. Questionnaire on Sleep and Daytime Habits (S&DHQ)

Guidelines: the questionnaire includes several different types of questions about sleep and daytime habits. The questions should be answered by circling a number that rates *when*, *what, how, and how long* some habit occurred during the previous months on both weekdays and weekends. Only the first question includes information about weekdays. Most questions should be answered by circling a number that rates *how often* something occurred during the week. The supplement includes information about lifestyle and academic progress in the current year.

1. *When do you go to bed on weekdays?*
   before 20:00 | 20:00–21:00 | 21:00–22:00 | 22:00–23:00
   23:0–024:00 | 24:00–01:00 | 01:00–02:00 | after 02:00
2. *How long does it take you to fall asleep usually?*
   5 minutes | 5–10 minutes | 10–30 minutes | 30 minutes | more than 1 hour
3. *How many times do you wake up during the night?*
   0 | 1–2 | 3–4 | 5–6 | more than 7
4. *If you take daytime naps, how long are they?*

   5–10 minutes | 15–30 minutes | 30 minutes - 1 hour | more than 1 hour | more than 2 hours

1. *How do you evaluate your sleep quality*?
   excellent | good | satisfactory | poor | very poor
2. *How do you evaluate your sleep quality before an exam?*
   excellent | good | satisfactory | poor | very poor

How often during the week:

1: never or almost never
2: less than once a week
3: once or twice a week
4: 3–5 nights/days a week
5: almost every day or night

3. *Do you go to bed at an unusual time (later than usually) at night?* 1 2 3 4 5
4. *Do you have difficulty in getting to sleep at night?* 1 2 3 4 5
5. *Do you drink coffee late in the evening?* 1 2 3 4 5
6. *Do you use sleeping pills?* 1 2 3 4 5
7. *Do you wake up because of noise?* 1 2 3 4 5
8. *Do you wake up because of nightmares?* 1 2 3 4 5
9. *Do you wake up because of talking during sleep?* 1 2 3 4 5
10. *Do you wake up because of walking during sleep?* 1 2 3 4 5
11. *Do you wake up because of nocturnal eating habits?* 1 2 3 4 5
12. *Do you wake up because of leg movements or disagreeable leg sensations?* 1 2 3 4 5
13. *Do you snore?* 1 2 3 4 5
14. *Do you grind your teeth while asleep?* 1 2 3 4 5
15. *Do you wake up too early and have difficulty in getting to sleep again?* 1 2 3 4 5
16. *Do you feel tired when waking up?* 1 2 3 4 5
17. *Do you feel daytime sleepiness?* 1 2 3 4 5
18. *Do you feel excessive sleepiness during the lectures?* 1 2 3 4 5
19. *Do you feel excessive sleepiness in your free time?* 1 2 3 4 5
20. *Do you take daytime naps?* 1 2 3 4 5

Supplement

1. *How do you evaluate your academic progress?*
   excellent | good | satisfactory | unsatisfactory
2. *How do you evaluate your leisure activity?*
   excellent | good | satisfactory | unsatisfactory
3. *How do you evaluate your living conditions?*
   excellent | good | satisfactory | unsatisfactory
4. *Do you work while studying?*
   not at all | sometimes | part-time | full-time
5. *Do you work at night?*
   not at all | sometimes | part-time | full-time

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