

Original Research**Survey on sleep conditions, lifestyle-related habits, and mental health
among students at a health science university**Toshiaki Sato ¹⁾, Yuki Kawakatsu ¹⁾, Miki Takahata ¹⁾,Shinji Satake ¹⁾, Daisuke Kudo ²⁾ and Aaron M. Eakman ³⁾

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ABSTRACT

Objective: This study aimed to investigate the sleep status of students at Yamagata Prefectural University of Health Sciences, identify lifestyle and mental health items related to sleep quality, and determine whether these items could be used for future lifestyle guidance.

Methods: In total, 369 students (50 males and 319 females) agreed to participate in this study. The survey assessed lifestyle-related variables, including grade level, gender, age, sleep duration, commuting time to university, participation in club activities, and part-time employment status. Sleep-related measures included insomnia symptom severity (ISI-J), sleep quality (PSQI-J), sleepiness (J-ESS), dysfunctional beliefs about sleep (DBAS-J), chronotype preference (MEQ-J), sleep hygiene (SHPS-J), symptoms of anxiety (JGAD-7) and depression (JCES-D), and engagement in meaningful activities (EMAS-J). The survey items were sex- and grade-disaggregated. For each survey, the percentage of students above the cutoff value was determined.

Results: Gender-related differences were observed in DBAS-J and MEQ-J. JGAD-7 and JCES-D were more common in third-graders than in first- and second-graders. Third-graders had higher ISI-J than second- and fourth-graders, whereas PSQI-J was better in second-graders than in third-graders. EMAS-J was lower among fourth-graders than among second-graders. The percentages of students above the cutoff value were 9.8% for ISI-J, 36.3% for PSQI-J, 34.0% for J-ESS, 45.0% for DBAS-J, 5.1% for JGAD-7, and 27.1% for JCES-D. MEQ-J results indicated that 21% of the students reported morning chronotype, 63% reported intermediate chronotype, and 16% reported night chronotype.

Conclusions: The results of this survey can be used to guide students in developing and maintaining a healthy lifestyle. For providing effective support, sleep-related factors and grade of students must be considered.

Keywords: Sleep, University students, Lifestyle, Mental health

INTRODUCTION

Sleep is a biological need necessary for optimal development and health. Chronic sleep deprivation negatively affects human performance and mental health. According to the Organization for Economic Cooperation and Development (OECD), the average sleeping time of Japanese citizens is the lowest in the world (compared with 38 OECD member countries). Economic losses due to sleep disorders are estimated to amount to ¥15 trillion/year (approximately 3% of

the GDP).^{1,2}

College students have more control and greater responsibility for managing their daily routine than junior and senior high school students. Many factors can cause significant fluctuations in the rhythm of their lives, including their studies, club activities, part-time jobs, and internet use via smartphones and computers. Reports have suggested that these factors cause students to lose sleep, leading to poor academic

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performance and adverse physical and mental health effects.³⁻⁷

Many studies have focused on sleep duration and sleep-wake rhythms.⁸⁻¹⁰ However, few studies have addressed sleep quality, living conditions, and sleep-related beliefs and behaviors. At Yamagata Prefectural University of Health Sciences, students are expected to attend regular on-campus lectures and practical training and many clinical and field training programs at national hospitals and facilities. Students commute from their homes for clinical/field training, and in the case of distant hospitals, they often rent apartments or other facilities in the vicinity; thus, clinical practice is often conducted in a new living environment. Therefore, the rhythm of students' lives is frequently disrupted, often affecting their sleep quality and duration.

Studies on students' sleep have been conducted at general universities. However, medical universities are characterized by many off-campus clinical practices, and studies are required to identify factors associated with sleep quality in this environment.^{11,12}

To this end, in September 2021, we conducted surveys on lifestyle, sleep status, and mental health for the entire university. Based on the results of these surveys, we aimed to understand the sleep status of university students and use the results as a resource for future sleep improvement methods.

The objectives of this survey were as follows:

- 1) to examine the proportion of students who exceeded the cutoff points for sleep status and mental health assessments.
- 2) to examine sex-related differences in sleep status and mental health
- 3) to examine grade-level differences in sleep status and mental health

Based on the three aforementioned points, we accumulated index data on the sleep status, lifestyle, and mental health of the students.

METHODS

1. Survey procedures

This study involved 369 students (50 males and 319 females) from the first to fourth year of the Department of Nursing, Department of Physical Therapy, and Department of Occupational Therapy at Yamagata Prefectural University of Health Sciences. The response rate was 93%.

All participants provided written informed consent to participate in the study.

2. Survey items

In addition to basic information, such as grade, sex, and age, the survey items included questions on commute time to school, club activity status, and part-time job status. Sleep-related indices used were the Insomnia Severity Index (ISI-J),¹³ Pittsburgh Sleep Quality Index (PSQI-J),¹⁴ and Epworth Sleepiness Scale (J-ESS).¹⁵ The daily living activity-related indicators used were the Dysfunctional Beliefs and Attitudes about Sleep Questionnaire (DBAS-J),¹⁶ chronotype preference questionnaire (the Japanese version of the Morningness - Eveningness Questionnaire (MEQ-J)),^{17,18} and Sleep Hygiene Practice Scale (SHPS-J).¹⁹ The Generalized Anxiety Disorder-7 (JGAD-7)²⁰ questionnaire and the Center for Epidemiologic Studies Depression Scale (JCES-D)²¹ were used as mental health-related indicators. The Engagement in Meaningful Activities Survey (EMAS-J)²² questionnaire was used as the participation-related index

3. Analysis of items

For each item, comparisons were made in terms of gender-related differences and grade levels. For survey items for which split points (cutoff score) have been reported in literature, the percentages of students exceeding the cutoff values were calculated for the ISI-J,¹³ PSQI-J,¹⁴ J-ESS,¹⁵ DBAS-J,¹⁶ JGAD-7,²⁰ and JCES-D,²¹ and the split points were set at 10, 6, 11, 69, 11, and 16, respectively.

For gender, a Mann-Whitney U-test was used. Between-group comparisons across grades were performed using one-way analysis of variance (ANOVA). When significant differences were detected by one-way ANOVA, the Bonferroni method, a multiple comparison procedure, was used for post-hoc comparisons. A p-value < 0.05 was considered statistically significant, and Cohen's d effect size was calculated for significant between-group differences. Statistical analyses were performed using EZR, a statistical software that extends the functions of R and R Commander, which is available free of charge on the website of Saitama Medical Center, Saitama, Japan.²³

4. Ethical considerations

The purpose and content of the study and the use and handling of the survey data were explained to the subjects before completion of the survey forms; submission of the survey form by the students was

Table 1 Survey results by percentage of people above boundary value

All Student	ISI-J	PSQI-J	J-ESS	DBAS-J	SHPS-J	MEQ-J	JGAD-7	JCES-D	EMAS-J
Boundary values	10	6	11	69	—	M : 85-56, I:55-42, E:41-16	11	16	—
Boundary ratio	36(9.8%)	134(36.3%)	125(34%)	164(45%)	—	M:76(21%), I:233(63%), E:60(16%)	19(5.1%)	100(27.1%)	—

M: Morning Type, I:Intermediate Type, Evening Type
Number (Ratio)

Table 2 Survey results by gender

By gender	ISI-J	PSQI-J	J-ESS	DBAS-J	SHPS-J	MEQ-J	JGAD-7	JCES-D	EMAS-J
Male vs Female	—	—	—	71.0±19.8(M) 63.1±25.1(F) t=2.14 * d=0.297	—	47.1±7.9(M) 50.5±8.1(F) t=-1.91 * d=-0.294	—	—	—

* : $p < 0.05$
M:Male t:Statistics
F:Female d:Effect Size
— :Not Significant

regarded as consent. The Ethics Committee of the Yamagata Prefectural University of Health Sciences approved this study (approval no. 2108-14)

RESULTS

Approximately 80% of the students commuted to university within 30 min; approximately 70% of the students held part-time jobs, with the majority reporting working 10–15 h/week; and approximately 90% of the students were not involved in any club activities.

The number and percentage of students above or below the split points in the ISI-J, PSQI J, J-ESS, and DBAS-J were 36 (9.8%), 134 (36.3%), 125 (34.0%), and 164 (45.0%), respectively. Regarding MEQ-J, scores between 85 and 56 indicated morning chronotype, scores between 55 and 42 indicated intermediate chronotype, and scores between 41 and 16 indicated evening chronotype. Analysis of MEQ-J revealed that 76 students (21%) reported morning chronotype, 233 (63%) reported intermediate chronotype, and 60 (16%) reported evening chronotype. Analysis of JGAD-7 questionnaire revealed that 19 students (5.1%) reported high anxiety scores. Finally, analysis of the JCES-D revealed that 100 students (27.1%) experienced depression symptoms (Table 1).

Statistically significant gender-related differences were observed only in DBAS-J survey ($d = 0.297$), in which males had higher dysfunctional sleep beliefs, and in MEQ-J ($d = -0.294$), in which more females reported a morning chronotype (Table 2).

Regarding grade, ISI-J was greater among third-graders than among second- ($d = -0.526$) and fourth-

graders ($d = 0.476$). PSQI-J was also higher among third-graders than among second-graders ($d = 0.435$). Third-graders had greater JGAD-7 than first- ($d = -0.43$) and second-graders ($d = -0.477$). JCES-D was more common among third-graders than among first- ($d = -0.417$) and second-graders ($d = -0.593$). EMAS-J was higher among second-graders than among fourth-graders ($d = 0.593$) (Table 3).

DISCUSSION

1. Characteristics based on gender and grade level differences

According to this survey, the commute time to school was ≤ 30 min for most students (81.6%); 70% held part-time jobs; and 10% were involved in club activities. No significant differences in these parameters were observed according to gender or grade. The low rate (10%) of participation in club activities was likely due to the suspension of most club activities due to coronavirus disease 2019 (COVID-19) restrictions during the survey period. The percentage of students with part-time jobs may have been higher if the surveys had not been conducted during the pandemic. The impact of COVID-19 is also affecting the outcomes of lifestyle habits.²⁴⁻²⁶

Dysfunctional sleep beliefs (DBAS-J) were significantly higher among males than among females, although the effect was small. However, these beliefs are associated with chronic insomnia. Therefore, the results suggest that male students are at a slightly greater risk of sleep disturbances than female students.²⁷ MEQ-J scores were significantly lower among males than among females, indicating that

Table 3 Survey results by grade

By grade	ISI-J	PSQI-J	J-ESS	DBAS-J	SHPS-J	MEQ-J	JGAD-7	JCES-D	EMAS-J
First vs Second	—	—	—	—	—	—	—	—	—
First vs Third	—	—	—	—	—	—	3.1±2.8(F) 4.7±3.9(T) t=-2.904* d=-0.430	11.8±7.1(F) 15.1±9.0(T) t=-2.820* d=-0.417	—
First vs Fourth	—	—	—	—	—	—	—	—	—
Second vs Third	4.4±3.0(S) 6.3±3.4(T) t=-3.478** d=-0.526	4.1±2.3(S) 5.3±2.2(T) t=-2.873* d=-0.435	—	—	—	—	2.9±4.3(S) 4.7±2.9(T) t=-3.152** d=-0.477	10.3±9.0(S) 15.1±9.0(T) t=-3.918** d=-0.593	—
Second vs Fourth	—	—	—	—	—	—	—	—	40.5±7.3(S) 35.8±8.5(Fo) t=4.024** d=0.593
Third vs Fourth	6.3±3.4(T) 4.5±3.4(Fo) t=3.161* d=0.476	—	—	—	—	—	—	—	—

** : p<0.01 * : p<0.05
F:First S:Second, T:Third, Fo:Fourth t:Statistics
d:Effect Size
—:Not Significant

males had a slightly higher tendency toward an evening-like chronotype. Several studies have analyzed the chronotypes of college students using MEQ-J.²⁸⁻³⁰ The findings of these studies were similar to those observed in this study, suggesting that men are more likely to have an evening chronotype than women.

Regarding the association between year of study and sleep-related factors, the most notable differences in sleep- and mental health-related factors were observed between second- and third-graders. Third-graders reported moderately higher insomnia symptom severity (ISI-J) and lower sleep quality (PSQI-J) than second-graders. Furthermore, third-graders reported moderately larger problems with anxiety (JGAD-7) and depression (JCES-D) than second- and first-graders. Emerging evidence has indicated that poor sleep quality co-occurring with elevated anxiety and depression levels increases the risk of behavioral difficulties.

Medical colleges usually offer numerous on-campus lectures, hands-on experiences, and practical training sessions in the first and second years. The amount of off-campus training increases in the third and fourth years, likely increasing learning and performance challenges, which may lead to poorer sleep quality and increased mental health difficulties among third- and fourth-year students. In this study, third-grade students reported moderately greater sleep difficulties (ISI-J) than fourth-grade students. This may be because of the lower clinical training demands in the fourth year because students complete their

research projects and prepare for job hunting and national examinations. Interestingly, fourth-grade students reported lower levels of meaningful activity (EMAS-J) than second grade students. Therefore, further exploring the differences between academic and clinical training demands in relation to students' sleep, mental health, and participation quality is important.

2. Sleep- and mental health-related survey results using the split-point method

The results indicated that the percentages of university students with sleep disturbances (ISI-J), low sleep quality (PSQI-J), and elevated daytime sleepiness (J-ESS) were 9.8%, 36.3%, and 34.0%, respectively. In a previous study using the Athens Insomnia Scale, which is a severity scale for insomnia, 35% of the university students experienced significant insomnia symptoms (≥ 6 points).³¹

Another study reported that 65% of undergraduate nursing students experienced sleep disturbances (PSQI-J ≥ 6 points).³² In another study that assessed the sleep habits of medical school students, 52.6% (PSQI-J ≥ 5.5) experienced sleep disorders, with a marked tendency toward sleep phase regression syndrome in men and chronic sleep deprivation syndrome in women³³; in this study,³⁴ 52.0% of the subjects were employed in the nursing profession.

In the current study, ISI-J, PSQI-J, and J-ESS scores were lower than those in previous studies conducted in other universities, indicating that our students showed no marked deterioration in sleep

status. MEQ-J results revealed that the classification for students at the Yamagata Prefectural University of Health Sciences was 1:3:1 for morning: intermediate: night, reflecting the results of similar studies.^{28,29}

Many studies have reported a tendency for students to become more night-oriented as they move through school years.^{9,32} However, no such trend was observed in this study. One reason for this may be the characteristics of a health science university: third- and fourth-year students have clinical training, and their life patterns are adjusted to the shift starting time of the hospital facilities. Thus, they have a regular life.

JGAD-7 and JCES-D analyses indicated that 5.1% and 27.1% of the students experienced anxiety and depression symptoms, respectively. Studies on college students using JGAD-7 have shown that 25.5% of college students experienced possible anxiety symptoms.³⁵ A Canadian study reported that the proportions of men and women with JCES-D scores of ≥ 16 were 15% and 19%, respectively³⁶; a previous study conducted in the US reported these figures as 0.8% and 20.8%, respectively³⁷; and in Japan, the figures have been reported to be 27.2% for men and 31.8% for women. Furthermore, approximately 25% of university students experienced depressive symptoms, and 27% had JCES-D scores of ≥ 16 .³⁸

This study highlights the need to investigate sleep status and cognitive beliefs and mental health from multiple perspectives. Although no split points existed in some cases, we believe that continued surveys could provide data for considering split points. Further basic surveys that seek data on various factors, such as commute time to school, part-time jobs, club activities, and living alone, could provide more concrete data for guidance. Furthermore, these data could be used to determine the effectiveness of medical examinations and sleep diaries, which affect students' rhythm of life and academic performance. Students who wish to pursue medical careers face various stressors in their academic, interpersonal, and student lives, such as acquiring national certifications and job hunting, in addition to acquiring specialized knowledge, skills, and clinical training. Consequently, their stress levels have been reported to be higher than those of students in other professions.^{11,39} To maintain a healthy lifestyle, a support system that corresponds to the academic year while considering the characteristics of both sexes is required. Moreover, we believe that the students' current lifestyles may reflect the characteristics of the university (i.e.,

humanities, sciences, and medicine). However, education programs that promote effective sleep habits may be necessary for health science students. The limitations and challenges of this study were as follows:

The relevance of each item was not examined. The addition of these items would enable the collection of data from multiple perspectives and provide guidance to students from various aspects. We plan to conduct additional surveys in the future.

CONCLUSION

We conducted a multifaceted survey on health science university students using sleep status, cognitive beliefs, and mental health indices. The results can be used for future guidance. Furthermore, we believe that a support system that corresponds to the academic year is necessary to enable students to maintain a healthy lifestyle.

AUTHOR CONTRIBUTIONS

Conceptualization; T.S., S.S., A.E. Data curation; T.S. Formal analysis; T.S., Y.K., M. T., S.S., D. K., A.E. Methodology; T.S., Y.K., M. T., S.S., D. K. Writing—original draft: T.S. Writing—review & editing; T.S., Y.K., M. T., S.S., D. K., A.E. All authors have read and agreed to the published version of the manuscript.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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