



Investigation of Sleep Hygiene and Academic Achievement of Nursing Students by Chronotype

Hemşirelik Öğrencilerinin Kronotipine Göre Uyku Hijyeni ve Akademik Başarısının İncelenmesi

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Abstract

Objective: This study aimed to examine the relationship between sleep hygiene levels and academic achievement among nursing students according to their chronotype.

Materials and Methods: The sample for this descriptive, correlational study consisted of 376 students in the nursing department of a public university in the Black Sea Region of Türkiye. Data were collected between April 1, 2023, and June 10, 2023, using a student information form, the Sleep Hygiene Index, and the Morningness-Eveningness Questionnaire (a measure of chronotype).

Results: The mean age of the students was 21.21 ± 1.94 years. Nearly half of the participants perceived their academic achievement as moderate, and their mean grade point average was 2.94 ± 0.34 (out of 4). The average daily sleep time was 7.63 ± 1.28 hours, and 23.1% reported experiencing sleep problems. The mean Sleep Hygiene Index score was 32.27 ± 7.25 , and the mean Morningness-Eveningness Questionnaire score was 50.40 ± 8.22 . Regarding chronotype characteristics, 13.6% of the students were moderately morning types, 13.6% were moderately evening types, and the majority (71.0%) were intermediate types. Although no significant relationship was found between the chronotype and sleep hygiene ($r = -0.006$, $p = 0.903$), there was a weak positive correlation between chronotype and grade point average ($r = 0.132$, $p = 0.010$). No significant correlation was found between sleep hygiene and grade point average.

Conclusion: This study showed that nursing students generally had good grade point averages and moderate sleep hygiene, with most exhibiting intermediate chronotype characteristics. Higher chronotype scores were associated with higher grade point averages.

Keywords: Academic success, nursing student, chronotype, circadian rhythm, sleep hygiene

Öz

Amaç: Bu çalışmada hemşirelik öğrencilerinin kronotiplerine göre uyku hijyeni düzeyi ve akademik başarıları arasındaki ilişkinin incelenmesi amaçlanmıştır.

Gereç ve Yöntem: Tanımlayıcı ve ilişki arayıcı tipte planlanan araştırmanın örneklemini Karadeniz Bölgesinde bulunan bir devlet üniversitesinin hemşirelik bölümünde öğrenim gören 376 hemşirelik öğrencisi oluşturmaktadır. Veriler Öğrenci Bilgi Formu, Uyku Hijyen İndeksi ve Sirkadiyen Ritimde Sabahçıl ve Akşamcıl Tipleri Belirlemeye İlişkin Değerlendirme Formu (Kronotip Belirleme Formu) ile 1 Nisan 2023-10 Haziran 2023 tarihleri arasında toplanmıştır.

Bulgular: Öğrencilerin yaş ortalaması $21,21 \pm 1,94$, yaklaşık yarısı akademik başarılarını orta düzey olarak algılamakta ve akademik not ortalaması ise $2,94 \pm 0,34$ bulunmuştur. Günlük uyku süresi ortalama $7,63 \pm 1,28$ ve öğrencilerin %23,1'inin uyku problemi olduğu saptanmıştır. Uyku Hijyeni İndeksi puan ortalaması $32,27 \pm 7,25$, kronotip puan ortalaması ise $50,40 \pm 8,22$ 'dir. Öğrenciler kronotip özelliklerine göre incelendiğinde, %13,6'sının sabahçıl tipe yakın ve aynı oranda akşamcıl tipe yakın olduğu, çoğunluğun (%71) ara tipte olduğu belirlenmiştir. Öğrencilerin kronotip özellikleri ile uyku hijyeni arasında anlamlı ilişki bulunamazken ($r = -0,006$, $p = 0,903$), not ortalaması ile kronotipleri arasında pozitif yönde zayıf düzeyde anlamlı ilişki bulunmuştur ($r = 0,132$, $p = 0,010$). Uyku Hijyeni İndeksi ile kronotip ve not ortalaması arasında anlamlı bir ilişki bulunmamıştır.

Sonuç: Bu çalışmada öğrencilerin iyi düzeyde not ortalamasına ve orta düzeyde uyku hijyenine sahip olduğu belirlenirken, çoğunluğunun "ara tip" kronotip özelliğe sahip olduğu belirlenmiştir. Öğrencilerin kronotip puanları arttıkça, not ortalamalarının da anlamlı olarak arttığı görülmüştür.

Anahtar Kelimeler: Akademik başarı, hemşirelik öğrencisi, kronotip, sirkadiyen ritim, uyku hijyeni

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Introduction

Sleep is a basic human need and an integral part of the human biological and physiological rhythm. It is a state in which an individual's communication with the environment is temporarily and periodically interrupted, yet the person can be awakened by various stimuli (1,2). Maintaining good sleep hygiene, which encompasses behavioral and environmental practices related to sleep, is as important for overall sleep quality as having sufficient sleep duration. Poor sleep hygiene can lead to fatigue, impaired attention, difficulties in problem-solving and decision-making, reduced productivity, irritability, and psychological disturbances (3,4).

One of the factors affecting sleep quality and sleep hygiene is chronotype, which refers to individual differences in circadian typology (5,6). Chronotype is a concept associated with circadian rhythms and reflects individuals' preferences regarding their sleep-wake cycles. Morning-type individuals tend to feel more energetic and perform better in the morning, whereas evening-type individuals are generally more energetic and productive in the afternoon and evening. Intermediate-type individuals exhibit a more balanced level of activity throughout the day (5,7,8).

Among students, heavy academic workloads, clinical practice requirements, and irregular lifestyle habits may contribute to sleep-related problems. Previous studies have shown that poor sleep hygiene is associated with lower sleep quality, increased daytime sleepiness, and decreased academic performance, while chronotype characteristics can independently influence learning and educational outcomes (7,9,10). Figueiredo and Kulari (11) reported that chronotype characteristics were associated with academic achievement among university students, suggesting that factors such as sleep habits and class schedules likely mediate this relationship. Poor sleep quality can impair concentration, cognitive functioning, and mental performance, thereby negatively impacting academic achievement (12). In Türkiye, Odabaşioğlu et al. (13) found that university students generally had poor sleep hygiene. Similar findings were reported specifically for nursing students in studies by Molu et al. (14) and Ekenler and Altinel (12), with the latter also reporting an association between poorer sleep quality and lower academic achievement.

Although previous studies have examined the relationships among chronotype, sleep hygiene, and academic performance in different populations, research evaluating these variables together among nursing students remains limited. Therefore, this study contributes to the existing literature by jointly examining the relationships among chronotype, sleep hygiene, and academic achievement in nursing students. The findings provide further insight into the impact of sleep habits and chronotype characteristics on educational outcomes and offer evidence to support the development of educational and counseling programs aimed at promoting healthy sleep behaviors among students.

Study Objectives

This study aimed to investigate the relationship between nursing students' sleep hygiene levels and academic achievement according to their chronotypes.

Research Questions

1. What is the level of sleep hygiene among nursing students based on their chronotypes?
2. Is there a correlation between academic achievement and chronotype among nursing students?
3. Is there a correlation between sleep hygiene behaviors and academic achievement among nursing students?
4. Are there significant differences in chronotype and sleep hygiene based on the sociodemographic characteristics of nursing students?

Materials and Methods

Research Design

This study utilized a descriptive and correlational design.

Study Population and Sample

The population of this study comprised all 456 nursing students enrolled in the Nursing Department of a public university during the 2022-2023 academic year. The required sample size was calculated as 209 individuals based on a 95% confidence interval and a 5% margin of error. However, 80 students who could not be contacted or chose not to participate were excluded from the sample. In total, 376 reachable students voluntarily agreed to participate, representing 82.4% of the total population.

Inclusion Criteria

- Volunteering to participate in the study,
- Being 18 years old or older,
- Being an undergraduate nursing student at the relevant faculty.

Exclusion Criteria

- Withdrawing from the study after enrollment,
- Being diagnosed with a psychiatric illness,
- Using sedative, hypnotic, or psychiatric drugs.

Data Collection Tools

Three tools were utilized to collect the study data: a student information form, the Sleep Hygiene Index, and the Morningness-Eveningness Questionnaire.

Student Information Form

This form was developed by the researchers in accordance with the existing literature (4,14,15). It consisted of 21 questions covering sociodemographic characteristics (11 questions), sleep-related information (8 questions), and academic performance (2 questions, including grade point average).

Sleep Hygiene Index

Originally formulated by Mastin et al. (16) to evaluate sleep behaviors related to sleep hygiene, this tool was validated in

Turkish by Ozdemir et al. (17). The index criteria are derived from diagnostic guidelines for inadequate sleep hygiene in the International Classification of Sleep Disorders. This index includes 13 items and employs a five-point Likert scale ranging from 1 (never) to 5 (always). Scores range from a minimum of 13 to a maximum of 65, with higher scores indicating poorer sleep hygiene. In the Turkish validation study, the Cronbach's alpha coefficient for the scale was calculated as 0.70 (17). In this study, the Cronbach's alpha value was found to be 0.78.

The Morningness-Eveningness Questionnaire

Developed by Horne and Östberg (18) in 1976 to determine chronotype, the Turkish validity and reliability of the questionnaire were established by Pündük et al. (8) in 2005. The questionnaire consists of 19 items, with scores ranging from 16 to 86. Individuals are categorized by score into five chronotype groups: "definitely morning type" (70-86), "moderately morning type" (59-69), "intermediate type" (42-58), "moderately evening type" (31-41), and "definitely evening type" (16-30). The Cronbach's alpha value was 0.81 in the validity and reliability study (8) and 0.64 in the present study.

Data Collection

During the spring semester of the 2022-2023 academic year, a hybrid education system comprising online and face-to-face instruction was used. To ensure comprehensive inclusion, the questionnaire was administered face-to-face to those attending classes on campus and via Google Forms to those participating remotely. Data collection took place between April 1, 2023, and June 10, 2023.

Statistical Analysis

Data analysis was conducted using IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY). Descriptive statistics were reported as frequencies, percentages, means, standard deviations, and minimum and maximum values. The Kolmogorov-Smirnov test was used to assess the normality of data distribution. Because the data were non-parametric, the Kruskal-Wallis and Mann-Whitney U tests were used for independent group comparisons. Spearman's rank correlation analysis was utilized to evaluate the relationships between continuous variables. Cronbach's alpha coefficients were calculated to assess the internal consistency reliability of the scales. A p-value of <0.05 was considered statistically significant.

Written informed consent was obtained from all participating nursing students. The consent form detailed study confidentiality, voluntary participation, and the right to withdraw from the study at any time. Permission to utilize the Sleep Hygiene Index and the Morningness-Eveningness Questionnaire was obtained via email from the respective authors. Ethical approval for the study was obtained from the Ordu University Scientific Research Ethics Committee (date/number: 28.04.2023/116). Additionally, institutional authorization was obtained from the Ordu University Faculty of Health Sciences, Department of Nursing (date: 14.04.2023). The study adhered to the Declaration of Helsinki and ethical publication standards.

Results

The mean age of the nursing students was 21.21 ± 1.94 years, and their mean grade point average was 2.94 ± 0.34 out of 4. Among the participants, 78.2% were female, 31.4% were in their third year of study, and 98.7% were single. Furthermore, 44.7% chose nursing due to salary and appointment prospects, 76.1% had an income level equal to their expenses, and 50.8% perceived their academic success as moderate.

The students' average daily tea and coffee consumption were 2.60 ± 1.76 cups and 1.52 ± 1.49 cups, respectively. Regarding living conditions, 67.6% of the students lived in dormitories, with 53.2% staying in triple rooms. A large majority (79.8%) of the students did not smoke cigarettes. Additionally, 9.3% had a chronic disease and 22.1% used medication regularly.

Concerning sleep characteristics, the average daily sleep duration was 7.63 ± 1.28 hours, and 23.1% of the students reported experiencing sleep problems. Less than half of the students (42.6%) ate or drank immediately before sleep, while 62.8% woke up in the morning feeling only partially rested. In addition, 5.1% of the students reported being late for classes or clinical practice due to oversleeping, and 5.9% experienced poor concentration during the day (Table 1).

The students' mean Sleep Hygiene Index score was 32.27 ± 7.25 , and the mean Morningness-Eveningness Questionnaire score was 50.40 ± 8.22 . According to the Morningness-Eveningness Questionnaire results, 71.0% of the students were classified as intermediate type ($n = 267$), 13.6% as moderately morning type ($n = 51$), 13.6% as moderately evening type ($n = 51$), 1.3% as definitely morning type ($n = 5$), and 0.5% as definitely evening type ($n = 2$) (Table 2).

No statistically significant relationship was observed between the nursing students' sleep hygiene scores and their grade point averages ($r = -0.022$, $p = 0.664$) or chronotype scores ($r = -0.006$, $p = 0.903$). In contrast, a weak but statistically significant positive correlation was identified between grade point average and chronotype score ($r = 0.132$, $p = 0.010$) (Table 3).

A statistically significant difference was found in sleep hygiene index scores according to year of study (KW = 23.407, $p < 0.001$). In addition, sleep hygiene scores were significantly lower among students who used medication regularly compared to those who did not ($U = 9716.500$, $p = 0.005$) and among students who had the habit of eating and drinking before sleep compared to those without this habit ($U = 14985.500$, $p = 0.029$).

There was a statistically significant difference in nursing students' Morningness-Eveningness questionnaire scores according to their perceived academic achievement (KW = 12.275, $p = 0.006$), with the highest scores among those who rated their performance as very good. Morningness-Eveningness Questionnaire scores were significantly lower among smokers, students with sleep problems, and those who reported eating and drinking before sleep ($U = 9057.500$, $p = 0.006$; $U = 8320.000$, $p < 0.001$; $U = 14381.500$, $p = 0.006$). Conversely, waking up well-rested in the morning and being

Table 1. Sociodemographic characteristics of the participants (n = 376).

Variables	Min-max	Mean ± SD
Age (years)	18-39	21.21 ± 1.94
Grade point average	1.80-3.80	2.94 ± 0.34
Average daily tea consumption (cups)	0-10	2.60 ± 1.76
Average daily coffee consumption (cups)	0-10	1.52 ± 1.49
Average daily sleep duration (hours)	5-19	7.63 ± 1.28
	n	%
Gender		
Female	294	78.2
Male	82	21.8
Year of study		
1	93	25.0
2	81	21.5
3	118	31.4
4	83	22.1
Marital status		
Married	5	1.3
Single	371	98.7
Motivation to choose the nursing profession		
Personal choice	104	27.7
Family influence	37	9.8
Coincidence	28	7.4
A role model nurse	17	4.5
Salary and appointment prospects	168	44.7
Other	22	5.9
Family income level		
Income less than expenses	37	9.8
Income equal to expenses	286	76.1
Income more than expenses	53	14.1
Perceived academic success		
Very good	18	4.8
Good	153	40.7
Moderate	191	50.8
Poor	14	3.7
Place of residence		
Home	24	6.4
Family home	68	18.1
Dormitory	254	67.6
At home with friends	28	7.4
Other	2	0.5
Bedroom occupancy		
Single	79	21.0
Double	45	12.0
Triple	200	53.2
≥Quadruple	52	13.8

Table 1. Continued

Variables	Min-max	Mean ± SD
Smoking		
Yes	76	20.2
No	300	79.8
Chronic disease		
Yes	35	9.3
No	341	90.7
Regular medication use		
Yes	83	22.1
No	293	77.9
Sleep problems		
Yes	87	23.1
No	289	76.9
Eating and drinking immediately before sleep		
Yes	160	42.6
No	216	57.4
Waking well-rested in the morning		
Yes	98	26.1
Partly	236	62.8
No	42	11.2
Late to class/clinical practice due to oversleeping		
Yes	19	5.1
Sometimes	106	28.2
No	251	66.8
Concentration during the day		
Always good	75	19.9
Sometimes good	279	74.2
Poor	22	5.9
SD: Standard deviation.		

late due to oversleeping were associated with significantly higher Morningness-Eveningness Questionnaire scores (KW = 26.603, $p < 0.001$; KW = 15.485, $p < 0.001$) (Table 4).

The mean Sleep Hygiene Index scores according to the students' chronotype types were determined as 33.80 ± 8.22 for definitely morning-type students, 32.62 ± 8.16 for moderately morning-type students, 32.08 ± 7.16 for intermediate-type students, 32.82 ± 6.97 for moderately evening-type students, and 30.00 ± 4.24 for definitely evening-type students (Table 5).

Discussion

This study aimed to examine the relationship between sleep hygiene and academic achievement among nursing students according to their chronotype. The findings revealed that the students had good grade point averages, moderate sleep hygiene, and predominantly exhibited an "intermediate type" chronotype. Consistent with these results, Molu et al. (14) reported good sleep hygiene and a predominance of intermediate chronotype characteristics among nursing students. Similarly, Montaruli et al. (19) found that Italian nursing

Table 2. Students' mean grade point average, Sleep Hygiene Index, Morning-Eveningness Questionnaire Scores, and chronotype distribution (n = 376).

Scales	n	%	Min-max	Mean ± SD	Cronbach's Alpha internal consistency coefficient
Grade point average	376	100.0	1.80-3.80	2.94 ± 0.34	
Sleep Hygiene Index	376	100.0	14-55	32.27 ± 7.25	0.784
Morningness-Eveningness Questionnaire	376	100.0	29-84	50.40 ± 8.22	0.643
Definitely morning type	5	1.3	70-84	77.40 ± 6.06	
Moderately morning type	51	13.6	59-69	61.98 ± 2.98	
Intermediate type	267	71.0	42-58	50.19 ± 4.46	
Moderately evening type	51	13.6	31-41	38.13 ± 2.89	
Definitely evening type	2	0.5	29-30	29.50 ± 0.70	

SD: Standard deviation.

Table 3. Relationships between Sleep Hygiene Index, grade point average, and Morningness-Eveningness Questionnaire Scores (n = 376).

		Sleep Hygiene Index	Grade point average	Morningness-Eveningness Questionnaire
Sleep Hygiene Index	r	1.000		
	p	.		
Grade point averages	r	-0.022	1.000	
	p	0.664	.	
Morningness-Eveningness Questionnaire	r	-0.006	0.132*	1.000
	p	0.903	0.010	.

*: Spearman correlation.

students with a morning chronotype generally demonstrated better academic achievement. Although Santos et al. (20) discovered that most nursing students had poor sleep quality, they also noted that the majority of the students were of the intermediate chronotype, consistent with the present study. Furthermore, Ota et al. (21) found that approximately 80% of students with an evening chronotype experienced sleep disorder. Gallego-Gómez et al. (22) likewise determined that almost one-third of nursing students had poor sleep habits, with the majority categorized as the evening chronotype. In a study of undergraduate nursing students from six universities in Japan, Kayaba et al. (23) reported that absenteeism, lateness to class, falling asleep during class, and poorer academic achievement were more common among evening-type students compared to other chronotypes.

The current study revealed a weak but statistically significant positive correlation between grade point average and chronotype scores. This finding suggests that there may be an association between chronotype and academic achievement. However, the weak strength of the correlation indicates that academic achievement cannot be explained solely by chronotype and that other factors should also be taken into consideration. Consistent with this finding, Figueiredo and Kulari (11) reported a significant relationship between chronotype characteristics and academic achievement among university students. In contrast, Çıray et al. (24) found no significant relationship between chronotype and grade point average among nursing students.

Furthermore, first-year students exhibited the best sleep hygiene, while second-year students had the worst sleep hygiene. Similarly, Kurt et al. (25) found that third-year nursing students had the worst sleep quality, whereas first-year students had better sleep quality compared to other grades. Conversely, Ekenler and Altinel (12) found that first-year students had poorer sleep quality compared to those in other academic years. This discrepancy may be attributed to the academic, clinical, social, and personal changes encountered in different years of university life. Additionally, nursing students in our study who reported regular medication use had better sleep hygiene compared to those who did not use medication. This could be because nursing students acquire knowledge about health issues during their education, and when this knowledge is combined with medication use, they may pay more attention to sleep hygiene. Surprisingly, however, nursing students who reported eating and drinking immediately before sleep had better sleep hygiene scores than students without this habit. This finding contradicts the existing evidence. Faris et al. (26) found that university students who ate nighttime snacks were 1.24 times more likely to have poor sleep quality. The habit of eating late at night can disrupt the body's natural sleep-wake cycle, leading to poor sleep quality (19,20,22).

Moreover, nursing students who perceived their academic success as very good had higher Morningness-Eveningness Questionnaire scores. A meta-analysis by Preckel et al. (27) examining the relationship between different chronotypes, academic achievement, and cognitive abilities similarly found

Table 4. Comparison of Sleep Hygiene Index and the Morningness-Eveningness Questionnaire Scores according to sociodemographic characteristics (n = 376).

	Sleep Hygiene Index	Morningness-Eveningness Questionnaire
Variables	Median (Q1-Q3)	(Q1-Q3)
Gender		
Female	31 (28-37)	50 (45-56)
Male	31 (27-36)	50 (45.75-55)
	U = 11833.500 p = 0.800	U = 11755.500 p = 0.731
Year of study		
1 ^a	30 (26-34)	50.50 (45-57)
2 ^b	33 (29-42)	49 (44-54)
3 ^c	31 (27-35)	50 (45-55)
4 ^d	32 (29-37)	50 (45-55)
	KW = 23.407 p < 0.001 between a and b, a and d	KW = 2.257 p = 0.521
Marital status		
Married	27 (23-31)	55 (48.50-59)
Single	31 (28-37)	50 (45-55)
	U = 513.000 p = 0.086	U = 629.000 p = 0.216
Motivation to choose the nursing profession		
Personal choice	31 (28-37)	50 (45-56)
Family influence	30 (25.50-35.50)	50 (45-56.50)
Coincidence	31.50 (27-37.75)	49 (45-51.75)
A role model nurse	33 (28-37)	53 (46-55)
Salary and appointment prospects	31 (28-36)	50 (45-56)
Other	32 (26.75-35.25)	51 (48.50-55.25)
	KW = 2.203 p = 0.820	KW = 2.006 p = 0.848
Family income level		
Income less than expenses	30 (25.50-35.50)	49 (44.50-57.50)
Income equal to expenses	31 (28-37)	50 (45-55)
Income more than expenses	31 (28-36)	50 (48-55.50)
	KW = 1.968 p = 0.374	KW = 0.973 p = 0.615
Perceived academic success		
Very good ^a	29 (27.25-31.25)	55.50 (50-59.25)
Good ^b	31 (27-37)	51 (47-56)
Moderate ^c	31 (28-37)	49 (44-55)
Poor ^d	32.50 (24.25-36.25)	49 (38.75-54.25)
	KW = 2.558 p = 0.465	KW = 12.275 p = 0.006 between a and c, a and d

Table 4. Continued

	Sleep Hygiene Index	Morningness-Eveningness Questionnaire
Place of residence		
Home	32.50 (27-38.75)	50 (45.25-56.75)
Family home	31 (27.75-35)	50 (45-55.25)
Dormitory	31 (29-35.75)	50.50 (47.25-54)
At home with friends	34 (27.50-39.50)	48.50 (45-57)
Other	28 (26-30)	50 (45-55)
	KW = 5.496 p = 0.240	KW = 2.409 p = 0.661
Bedroom occupancy		
Single	32 (29-38)	50 (46-57)
Double	32 (26-38)	49 (45.50-54)
Triple	31 (28-35)	50 (45-56)
≥Quadruple	30 (27.25-35)	50 (44.25-55)
	KW = 2.753 p = 0.431	KW = 1.335 p = 0.721
Smoking		
Yes	30 (27-35)	49 (42-53)
No	31 (28-37)	50 (45-56)
	U = 10266.500 p = 0.180	U = 9057.500 p = 0.006
Chronic disease		
Yes	31 (28-36)	50 (45-55)
No	31 (28-37)	51 (48-57)
	U = 5708.000 p = 0.671	U = 5196.000 p = 0.207
Regular medication use		
Yes	30 (27-34)	50 (45-55)
No	32 (28-37)	50 (44-57)
	U = 9716.500 p = 0.005	U = 11626.000 p = 0.541
Sleep problems		
Yes	30 (27-36)	45 (41-53)
No	31 (28-37)	51 (47-56)
	U = 12006.500 p = 0.524	U = 8320.000 p < 0.001
Eating and drinking immediately before sleep		
Yes	30 (27-35)	49 (44-54)
No	32 (28-37)	51 (46-57)
	U = 14985.500 p = 0.029	U = 14381.500 p = 0.006

Table 4. Continued

	Sleep Hygiene Index	Morningness-Eveningness Questionnaire
Waking well-rested in the morning		
Yes ^a	30.50 (27-34.50)	54 (49-58)
Partly ^b	31 (28-37)	50 (45-55)
No ^c	30 (26-34)	45.50 (40.75-51.25)
	KW = 3.782 p = 0.151	KW = 26.603 p < 0.001 between a and b, a and c
Late to class/clinical practice due to oversleeping		
Yes ^a	30 (27-34)	45 (41-49)
Sometimes ^b	31 (27-37)	49 (44-54)
No ^c	31 (28-37)	51 (46-56)
	KW = 0.464 p = 0.793	KW = 15.485 p < 0.001 between a and b, a and c
Concentration during the day		
Always good	30 (27-34)	50 (44-57)
Sometimes good	31 (28-37)	50 (45-56)
Poor	31 (25-38)	47.50 (43.75-51.50)
	KW = 1.900 p = 0.387	KW = 2.377 p = 0.305
KW: Kruskal Wallis Test, U: Mann-Whitney U Test, p: significant value, Q1-Q3: First and third quartiles, Alphabetical superscripts (^{a,b,c,d}) are used to identify groups. Statistically significant values are shown in bold.		

Table 5. Comparison of Mean Sleep Hygiene Index Scores according to chronotypes (n = 376).

Chronotype (according to Morningness-Eveningness Questionnaire)	Sleep Hygiene Index	
	Min-max	Mean ± SD
Definitely morning type (n = 5)	27-48	33.80 ± 8.22
Moderately morning type (n = 51)	14-51	32.62 ± 8.16
Intermediate type (n = 267)	16-55	32.08 ± 7.16
Moderately evening type (n = 51)	22-54	32.82 ± 6.97
Definitely evening type (n = 2)	27-33	30.00 ± 4.24

that morning-type students generally had higher academic scores. While Çıray et al. (24) found no significant difference between the grade point averages of nursing students based on chronotype, a study of adolescents by Escribano et al. (28) demonstrated that morning-type students generally had better academic performance, particularly in morning classes. Furthermore, Santos et al. (20) noted that evening-type students experienced more sleep problems than their morning-type peers, which can negatively impact academic performance. These findings suggest that academic achievement may be

related to various individual and environmental variables beyond chronotype.

In the present study, chronotype scores were lower among students who smoked, experienced sleep problems, consumed food or beverages before sleep, did not wake up well-rested in the morning, and were late for class or clinical practice due to oversleeping. Supporting this, Fabbian et al. (29) reported that the evening chronotype negatively affects general health, physical and mental well-being, sleep quality, and academic outcomes Lucassen et al. (30) also observed that evening-type individuals tend to eat later in the day, a habit that can disrupt overall health and well-being. Molu et al. (14) found that chronotype scores were lower among nursing students who smoked, with a significantly higher prevalence of smoking observed in the moderately evening-type group. Santos et al. (20) emphasized that chronotype can also affect students' general health and lifestyle habits, noting that evening-type nursing students are more prone to unhealthy lifestyle habits such as eating late and having irregular sleep hours. Overall, the findings of the current study are consistent with the relevant literature.

It was determined that students classified as definitely morning types had the highest mean Sleep Hygiene Index score, indicating worse sleep hygiene compared to other chronotype groups. This finding diverges from the existing literature. Andrijević et al. (31) reported that among health sciences students, morning-type students demonstrated the best sleep hygiene practices and the best sleep quality, while evening-type students had the worst results. Similarly, Zhu et al. (7) observed that morning-type university students had better sleep quality and lower procrastination behavior, while evening-type students showed more negative results. The discrepancy observed in the current study may be attributed to the multifactorial nature of sleep hygiene, which is influenced not only by chronotype but also by numerous factors such as academic load, course schedules, exam stress, screen exposure, caffeine consumption, and individual lifestyle characteristics. In addition, the relatively small number of students who were definitely morning type in this study (n = 5) may have caused the mean scores of this group to be more affected by individual differences within the sample. The limited sample size in these groups may restrict the generalizability of the results and affect the interpretation of differences between chronotype groups.

Study Limitations

This study has some limitations. First, the small number of participants in the definitely morning and definitely evening chronotype subgroups weakens the statistical power of intergroup comparisons and limits the interpretation of these specific findings. Furthermore, although the data were collected using scales with proven validity and reliability, they are based on self-report methods and may be affected by biases such as recall bias and social desirability. The fact that the study was conducted in a single center limits the generalization of the results to all nursing students. In addition, due to the cross-sectional design of the study, the direction and underlying

mechanisms of the relationships between chronotype, sleep hygiene, and academic achievement cannot be explained, and causal inferences between the variables cannot be made.

Conclusion

This study demonstrated that nursing students generally had a good grade point averages and moderate sleep hygiene, with the majority exhibiting “intermediate type” chronotype characteristics. Although higher chronotype scores were significantly associated with higher grade point averages, this correlation was weak. Further research is needed to fully understand this relationship and determine potential causality. In addition, the sleep hygiene characteristics of definite morning-type students should be investigated with larger, more balanced sample sizes, and subsequent studies should include broader occupational and age demographics, such as working nurses, to validate and expand upon these findings.

Ethics

Ethics Committee Approval: Ethical approval for the research was obtained from Ordu University Scientific Research Ethics Committee (number: 28.04.2023/116) and written institutional permission to conduct the research was obtained from Ordu University Faculty of Health Sciences, Department of Nursing (date: 14.04.2023). The study complied with the Declaration of Helsinki and the principles of publication ethics.

Informed Consent: Informed written consent was obtained from nursing students who volunteered to participate in the research. Permission was received from the authors via e-mail for the evaluation form to determine morning and evening types in Sleep Hygiene Index and Circadian rhythm.

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Footnotes

This study was presented as an oral presentation at the 1st International Nursing Studies Congress held in Ordu/Türkiye on 12-14 July 2023.

Authorship Contributions

Concept: B.B., F.A.Ş., Design: B.B., F.A.Ş., Data Collection or Processing: B.B., F.A.Ş., Analysis or Interpretation: B.B., F.A.Ş., Literature Search: B.B., F.A.Ş., Writing: B.B., F.A.Ş.

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