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Relationship Between Chronotype, Social Jetlag, Attention Control, and Academic Achievement in Nursing Students During the COVID-19 Pandemic

COVID-19 Pandemisinde Hemşirelik Öğrencilerinde Kronotip, Sosyal Jetlag, Dikkat Kontrolü ve Akademik Başarı İlişkisi

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Abstract

Objective: This study aimed to examine the relationship between chronotype, social jetlag, attention control, and academic performance in nursing students during the Coronavirus disease-2019 pandemic.

Materials and Methods: The descriptive study was conducted online with undergraduate nursing students (n=405) who were members of the Student Nurses Association and volunteered to participate in the study between July 2021 and April 2022. In collecting the data of the research, students' academic performance information and sociodemographic data that may affect their chronotype were evaluated using the Student Information Form. In addition, the Social Jetlag Form, Morning Evening Scale, and Attention Control Scale were used for evaluation.

Results: The mean age of the students participating in the study was 20.29±0.91, 75.8% were female and 41.5% were freshmen. When the chronotypes of the students were examined, it was observed that 18.0% of them were morning-type, 68.6% of them were intermediate -type, and 13.4% of them were evening-type. When the chronotype characteristics of the students, their weighted passing grade, attention control point average, and weekday sleep duration were examined, no significant difference was observed between them ($p>0.05$). However, when the average of social jetlag hours was compared according to chronotypes, a statistically significant difference was found ($p<0.05$). Social jetlag values of morning students were found to be significantly lower than those in the evening and intermediate students. The social jetlag values in the intermediate type.

Conclusion: There is no significant relationship between social jetlag and chronotype variables, attention control, and academic performance in the post-pandemic period. It can be said that students with an evening type chronotype and creating their own timelines for the social jetlag value create a positive change. However, in the new post-pandemic period, this seemingly positive change is thought to have negative consequences in terms of the adaptation of university students to the new normal. Further studies are needed on the changes in chronotypes in the post-pandemic period.

Keywords: Social jetlag, circadian rhythm, attention control, academic performance, nursing students

Öz

Amaç: Araştırmada, Koronavirüs hastalığı-2019 pandemisinde hemşirelik öğrencilerinde kronitip, sosyal jetlag, dikkat kontrolü ve akademik başarı arasındaki ilişkinin incelenmesi amaçlanmıştır.

Gereç ve Yöntem: Tanımlayıcı tipte olan araştırma Temmuz 2021-Nisan 2022 tarihleri arasında Öğrenci Hemşireler Derneği'ne üye ve çalışmaya katılmaya gönüllü lisans hemşirelik öğrencileri (n=405) ile online olarak yürütülmüştür. Araştırmanın verilerinin toplanmasında öğrencilerin akademik başarı bilgileri ve kronotipini etkileyebilecek sosyodemografik verileri, Öğrenci Bilgi Formu ile değerlendirilmiştir. Ayrıca Sosyal Jetlag Formu, Sabahçıl Akşamcıl Ölçeği ve Dikkat Kontrol Ölçeği değerlendirme için kullanılmıştır.

Bulgular: Çalışmaya katılan öğrencilerin yaş ortalaması 20,29±0,91, %75,8'i kadın ve %41,5'i birinci sınıf öğrencisidir. Öğrencilerin kronotipleri incelendiğinde; %18,0'ının sabahçıl tip, %68,6'sının ara tip ve %13,4'ü akşamcıl tipte oldukları görülmüştür. Öğrencilerin kronotip özellikleri ile ağırlıklı geçer notu, dikkat kontrol puan ortalaması ve hafta içi uyku süresi incelendiğinde, aralarında anlamlı bir fark görülmemiştir ($p>0,05$). Ancak kronotiplere göre sosyal jetlag saat ortalaması karşılaştırıldığında, istatistiksel olarak anlamlı bir fark saptanmıştır ($p<0,05$). Sabahçıl öğrencilerin sosyal jetlag değerleri akşamcıl ve ara tipte olanlara göre anlamlı düzeyde daha düşük olduğu bulunmuştur. Ara tipte olanlarda sosyal jetlag değerleri akşamcıl tipte olanlara göre anlamlı derecede daha düşüktür ($p<0,005$).

Sonuç: Pandemi sonrası dönemdeki sosyal jetlag ve kronotip değişkenleri ile dikkat kontrolü ve akademik başarı arasında anlamlı bir ilişki saptanamamıştır. Akşamcıl tip kronotipe sahip öğrenciler ve sosyal jetlag değeri için kendi zaman çizelgelerini oluşturmalarının olumlu anlamda bir değişim yarattığından söz edilebilir. Ancak pandemi sonrası yeni dönemde üniversite öğrencilerinin yeni normale adaptasyonu açısından bu olumlu görünen değişimin aslında olumsuz sonuçları olduğu düşünülmektedir. Pandemi sonrası dönemde kronotipler üzerinde oluşan değişimler ile ilgili yapılacak daha ileri çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Sosyal jetlag, sirkadiyen ritim, dikkat kontrolü, akademik başarı, hemşirelik öğrencisi

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Introduction

The earth has a certain rhythm that occurs with the sunrise and sunset. Phylogenetically, living things determine their behavioral rhythms according to light and darkness and regulate their physiological functions by adapting to this rhythm. Human beings also adapt to this cycle of light and darkness by resting during the night and performing their activities during the day (1). Regulation of the physiological processes and rhythm of the body according to the daylight is called the circadian rhythm (1). Environmental conditions that change over time and social processes independent of daylight have changed the preferences of individuals about sleeping and activity times. This affects individuals both physiologically and behaviorally and is defined as the chronotype of the circadian rhythm (1,2). Chronotype is defined as the preference and tendency in individuals to wake up and sleep at certain times in a day (1-3). Chronotypes are examined in three groups: Morning, intermediate, and evening types (3). Evening chronotypes have been proven to have more difficulty remembering words early in the morning (4), lower academic performance levels (5), poorer sleep qualities, and higher social jetlag values (1). The highest cognitive and physical performances vary according to biological time; however, different chronotypes work at the same local time due to social programs such as school and working hours. Thus, there is a conflict between the social and biological clocks. The conflict between the social clock (external and common) and the biological clock (internal and individual) is defined as "social jetlag" (6).

Social jetlag is the primary indicator of circadian rhythm disorders and disrupts sleep patterns, which is a fundamental aspect of health, causing attention deficit by its negative effect on neurocognitive performance (7). Although attention deficit is associated with impaired cognitive functions such as slower response times and reduced working memory, it may result in compromising academic performance and achievement in university students (8,9). It is very common among university students due to the quite high pressure of academic performance on them (10). In addition, hybrid/mixed education, which is a combination of face-to-face education and online education that students encountered as the "new normal" during the pandemic, has negatively affected attention performance and led to severe anxiety (11,12). Changing chronotype cycles and related social jetlag create a cycle in students by negatively affecting cognitive functions (13,14).

Studies have been conducted on chronotype, social jetlag, and related attention deficits (7). On the other hand, no study was found on attention control, social jetlag, or chronotype in nursing students during the post-pandemic period. Therefore, it is very important that this study was conducted during the pandemic, and it is thought that knowing the chronotypes of the students could provide important data to increase their academic success.

Materials and Methods

This cross-sectional study was conducted online with undergraduate nursing students, who were members of the Student Nurses Association (OHDER), between July 2021 and April 2022 (n=405). The size of the sample was calculated with the formula for finite population ($n=Nt^2\ pq/d2(N-1)+t^2$) (11.000) $(1.96)^2$ x (0.5)(0.5)/$(0.05)^2$. (11.000)+$(1.96)^2$. (0.5). (0.5). In the study, the number of students who revealed their grades was 214. The inclusion criteria were being a member of the OHDER, studying in the nursing department, attending classes during the study period, and agreeing to participate in the research. The data collection forms used in the study were prepared online and distributed through Google Forms. The link to this form was shared on social media platforms created by students, who were members of OHDER, through OHDER. OHDER was founded in Izmir in 2006 and with its representative and 5 commissions in 90 universities, it is an association where all undergraduate nursing students in Turkey can become members in the field of nursing. The first part of the form included an informative text about the purpose of the study, the content of the questions, potential risks and benefits, inclusion criteria, our statement that the responses will be kept confidential and will not be shared with third parties, and the ethical aspect of the study. The participants who clicked the "Agree" button and continued were deemed to have declared their voluntary consent. No personal contact information (name, phone, e-mail) was requested. While preparing the questions with Google Forms, the "mandatory field" option, which enabled the participants to be informed by the system in case the questions were not answered, was selected for each question to prevent data loss. Attention was paid to ensuring that the students were not in the exam period at the time of data collection.

Data Collection Tools

The data for the study were collected using four forms, which included the "Student Information Form, Social Jetlag Form, Morning-evening Scale, and Attention Control Scale".

Student Information Form: It was prepared by the researchers based on the literature (1,5,14-16). It consisted of questions related to demographic information, such as age, gender, and year in the program, and questions about subjective sleep quality.

Social Jetlag Form: The social jetlag value was calculated by asking about the waking up/sleeping hours of the students on working/school days and waking/sleeping hours on free days, with the help of the following formula: Social Jetlag = (mid-sleep on free days - mid-sleep on workdays). For calculating the social jetlag value, students were asked to specify waking up/sleeping hours on working/school days and waking up/sleeping hours on free days, as open-ended questions (1).

Morning-evening Scale: Morning-Evening Scale was developed by Horne and Ostberg (17) and it was adapted to Turkish by Pündük et al. (18). The scale consists of 19 questions in total. Participants receive different scores according to the answers they mark for each question. Questions 3, 4, 5, 6, 7, 8, 9, 13, 14, 15, and 16 are scored between 1 and 4, questions 1, 2, 10, 17, and 18 are scored between 1 and 5, questions 11 and 19 are scored between 0 and 6, and question 12 is scored between

0 and 5. The total score varies between 16 and 86. Participants are classified as morning type for scores between 86 and 59, intermediate type for scores between 42 and 58, and evening type for scores between 6 and 41. Cronbach's alpha coefficient of the scale was 0.812 (18). In the present study, Cronbach's alpha coefficient of the scale was 0.758.

Attention Control Scale: Attention Control Scale was developed by Fajkowska and Derryberry (19) and adapted to Turkish by Akın et al. (20). In the original study of the scale, the Cronbach's alpha coefficient was found to be 0.88. The scale consists of 20 items. The frequency of the behaviors and conditions specified in the items by participants are scaled with a quadruple rating (1 = almost never, 2 = sometimes, 3 = often, 4 = always). The high score to be obtained from the scale indicates that the attention control levels of university students are high, and the low score indicates that the attention control levels of university students are low. The scores on the scale vary between 20-80. The Cronbach's alpha coefficient was found to be 0.78 (20). In this study, Cronbach's alpha coefficient of the scale was 0.82.

Academic Performance

The academic performance of the students was evaluated by asking about the grade point average (GPA) in a 4-point system in the same year. The 4-point system has been developed by the Council of Higher Education. The equivalent of 4 reflecting the highest GPA in the 100-point system is 100 (21).

Statistical Analysis

The data were analyzed using the SPSS software. The data obtained in the study were presented as frequency, percentage, mean, and standard deviation values, which were descriptive statistics. The suitability of the data for normal distribution was evaluated by Kolmogorov-Smirnov analysis. According to the statistical analysis of the measurement tools, it was found that the distribution was not normal, and the Kruskal-Wallis H test was applied. A Pearson correlation analysis was implemented to test the relationship between the scales. In the study, values below $p<0.05$ were considered significant. Cronbach's alpha coefficient was calculated to determine the reliability of the measurement tools.

Ethical Considerations

A written permission was obtained from the Scientific Research and Publication Ethics Committee of Izmir Tınaztepe University to conduct the study (protocol no: 17/2021, date: 20.04.2021). In addition to the approval of the Ethical Board, written permission was obtained from the OHDER. Permission was obtained by e-mail from the researchers, who had conducted the Turkish validity and reliability studies of the scales used in the study. Participation in the study was voluntary, and online written consent was obtained from the students participating in it. During the study, all the principles of the Declaration of Helsinki were adhered to.

Results

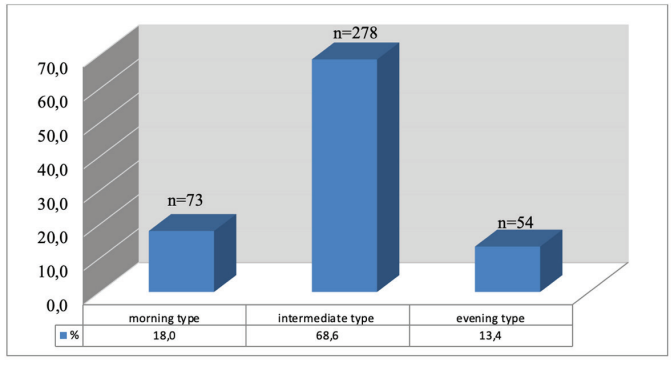
The mean age of the nursing students was 20.34±1.63 (min: 17, max: 30), 75.8% were female, 30.9% were in year 1, 41.5% were in year 2, 20.0% were in year 3, and 7.7% were in year 4. It was found that 58.8% had equal income and expenses, and 47.4% lived with their families (Table 1). Looking at the distribution of the students according to their chronotypes, it was observed that 18.0% were morning types, 68.6% were intermediate types, and 13.4% were evening-type (Graphic 1). The chronotype, social jetlag, and attention control scale mean scores and GPA total mean scores of the students are presented in Table 2.

There was no significant difference between the chronotype characteristics of the students and their GPAs, mean attention control scores, and sleep times during the week ($p>0.05$). A statistically significant difference was found when the mean social jetlag hours were compared according to the chronotypes ($p<0.05$), and it was observed that the "social jetlag" scores of the "morning" types were significantly lower compared to the "evening" and "intermediate" types. "Social jetlag" scores

Table 1. Descriptive characteristics of nursing students (n=405)

Descriptive characteristics	n	%
Age group		
17-20	235	58.0
21-23	161	39.8
24 and over	9	2.2
Age (mean ± SD)	20.34±1.63 (min: 17, max: 30)	
	n	**%**
Gender		
Female	307	75.8
Male	98	24.2
Grade		
1	125	30.9
2	168	41.5
3	81	20.0
4	31	7.7
Sleep quality		
Good	280	69.1
Bad	125	30.9

SD: Standard deviation



Graphic 1. Distribution of students according to chronotypes

were significantly lower in "intermediate type" participants compared to "evening type" participants (p<0.005). There was a significant difference between the groups in terms of the "weekend sleep duration" scores (p<0.05). "Weekend sleep duration" scores were significantly lower in "morning type" participants compared to "evening type" participants (p<0.05) (Table 3).

A negative relationship was found between social jetlag and chronotype (r=-0.399, p=-0.000). There was no relationship between attention control and academic performance (r=-0.070, p=0.305), social jetlag (r=0.045 p=0.370), or chronotype (r=-0.087 p=0.080) (Table 4).

Discussion

The unexpected emergence of Coronavirus disease-2019 (COVID-19) has affected many institutions, including higher education. Universities had to switch from face-to-face education to online education for the first time within the scope of social isolation measures (11). The need for social and economic activities brought about by the restrictions, the "new normal" lifestyle that integrated the face-to-face with the virtual, and the several variants emerging have necessitated acting carefully (11,22). In this context, universities have been trying to keep up with the changing conditions of the pandemic and decide on education processes for developing solutions for the pandemic (11). The changes in lifestyles and the concern regarding the recurrence possibility of the pandemic may cause anxiety in students. In addition, students have been involved in a limited area and scope of collective life for a long time, which has led to anxiety and insomnia (11,22). Chronotype is an individual characteristic related to the preference to function at different times of the day. Preference for morning or evening reflects individual differences in endogenous circadian rhythms manifested in various physiological and behavioral functions such as hormonal secretion, being asleep/awake, and mood (2,3,7,16). The majority of the study sample consisted of intermediate type students. During adolescence, both genders tend to become closer to the evening type, and it is the most common type among women at the age of 18 and men at the age of 19. While men have more evening chronotypes between 15 and 20 years of age, they have more morning chronotypes between 20 and 40. During these periods, the evening chronotype is more common in women on average. While more than 50% of chronotype changes occur in adolescence and early adulthood during the life span, variability decreases with age (23). Studies have reported that the gender difference disappears in chronotype around age 50 (24), and this is explained by changes in the endocrine system that coincide with the average onset of menopause in women (23,24). Among the students participating in our study, 58% were in early adulthood, and the majority (75.8%) were female students. This finding is consistent with the study data conducted on students before and during the pandemic quarantine. In the study conducted by Hasan et al. (16) during the pandemic period with the participation of 1011 students, 802 students (79.3%) were found to be of the intermediate type, and Marelli et al. (25) found that 400 university students (54%) were of intermediate type. In their study on nursing students during the pandemic, Çıray and Özcan (26) found that 67.5% of the students were of the intermediate type. Another study conducted with 117 students before the pandemic concluded

Table 2. Nursing students' chronotype, social jetlag, and Attention Control Scale mean scores and GPA total mean scores (n=405)

Variables	Mean ± SD
Chronotype (MEQ scores)	50.64±0.44
Social jetlag (h: min)	1.65±0.05
Attention Control Scale	47.44±0.28
GPA	3.09±0.82

MEQ: Morningness-Eveningness Questionnaire, GPA: Grade point average, SD: Standard deviation

Table 3. Variable distribution of nursing students by chronotypes

Variable	Chronotypes	n	Median	Rank average	Min-max	
*GPA	[a]Morning type	35	3.00	87.11	0.00-4.00	h=4.788 p=0.091
	[b]Intermediate type	145	3.10	110.39	0.00-4.00	
	[c]Evening type	34	3.36	116.15	0.00-4.00	
Social jetlag	[a]Morning type	73	1.10	126.01	0.00-4.15	h=60.422 p=0.0001 c-a (p=0.028<0.05) c-b (p=0.039<0.05) b-a (p=0.031<0.05)
	[b]Intermediate type	278	1.45	206.74	0.00-7.30	
	[c]Evening type	54	2.30	287.80	0.30-6.30	
Attention Control Scale	[a]Morning type	73	46.00	193.93	37.00-62.00	h=1.127 p=0.569
	[b]Intermediate type	278	47.00	202.82	36.00-80.00	
	[c]Evening type	54	47.00	216.18	37.00-59.00	

*GPA (n=214), [a]Morning type, [b]Intermediate type, [c]Evening type, GPA: Grade point average

Table 4. Relationship between social jetlag, chronotype, GPA and attention control

		Social jetlag	Chronotype	Attention control
GPA	r	-0.043	-0.114	-0.070
	p	0.527	0.097	0.305
	n	214	214	214
Social jetlag	r	-	-0.399**	0.045
	p	-	0.000	0.370
	n	-	405	405
Chronotype	r	-	-	-0.087
	p	-	-	0.080
	n	-	-	405

**p<0.05, GPA: Grade point average

that 51% of the students were of intermediate type (3). Social jetlag arises in the case of a conflict between environmental time and the internal clock of the body. Social jetlag is affected by school, work, and other responsibilities that require people to start the day before the natural waking time, especially the use of artificial light (1,6,11,26). In our study, the social jetlag score found to be 1.65. In the study conducted by Çıray and Özcan (26) during the pandemic quarantine, the social jetlag scores of the students was found to be 1.47. In a study conducted with university students in the new normal period, it was demonstrated that the social jetlag scores of the students decreased compared to the scores before the pandemic (22). In a study on sleep changes during the pandemic, which was conducted with 2,222 individuals, 61.7% (1,371 individuals) of whom were students, it was reported that the social jetlag scores decreased in all groups, and a 0.4-hour decrease was observed in students, while a 0.1-hour decrease was observed in employees (27). These findings suggested that the social jetlag scores changed positively in the new normal period compared to the studies conducted before the pandemic; however, they might have increased according to the studies conducted during the pandemic quarantine. This may be due to the fact that students could create a flexible calendar for themselves in the pandemic quarantine and limit their flexibility in the new normal period. In our study, 30.9% of the students indicated their subjective sleep quality assessments as poor. In their study examining the changes brought about by the COVID-19 pandemic during the post-pandemic period, Montagnese et al. (28) stated that university students reported a deterioration in their subjective sleep qualities, they slept and woke up later, and they experienced interruptions in their sleep. Duan et al. (12) concluded that 32% of university students developed insomnia during the post-pandemic period, 19% became overweight or obese, 15% got anxious, and 65% got depressed. In addition, it was found in our study that the weekend sleep duration of the individuals of the evening-type chronotype was higher compared to the morning-type students. It is thought that this may be because they slept less during the week to adapt to their obligatory schedules and tried to compensate at the weekend. Similarly, a study conducted before the pandemic reported that individuals of the evening type slept less during the week (29). Staller and Randler (30) stated that the sleep duration of evening chronotypes was higher during the pandemic restrictions and it was a positive development for their internal biological clock. Ramírez-Contreras et al. (22) demonstrated that university students woke up later on weekends in the new normal period, and their sleep time increased both on weekends and weekdays. It is thought that the fact that universities continued their education face-to-face during the post-pandemic period started to create a disadvantage for evening chronotypes. In the study conducted with a sample consisting of students during the pandemic quarantine period, the attention levels of the students were reported to have decreased (31). Cognitive components such as attention, attention maintenance, alertness, reaction time, and academic performance have hemostatic and circadian changes (32). In our study, chronotype and social jetlag were not found to be associated with attention control and academic performance. Nevertheless, social jetlag is known to have negative effects on cognitive performance (13,14,32). McGowan et al. (7) suggested that social jetlag had similar behavioral responses to attention disorders such as hyperactivity disorder. Unlike the literature, it is thought that the results of our study indicated a positive change in social jetlag value and that the attention control scale was a subjective data collection tool.

Conclusion

No significant relationship was found between social jetlag and chronotype variables and attention control and academic achievement during the post-pandemic period. It was observed that the ability of students to adjust their appropriate timetables during the COVID-19 pandemic created a positive change in evening types and social jetlag scores. On the other hand, the fact that university students retrieved their schedules before the pandemic with the developments to prevent disease transmission in the new normal period after the pandemic suggested that this change, which appeared positive, may have been negatively affected in reality. The limitation of this study was that there were no exclusion criteria due to the application of the online questionnaire based on the research design, the study population was not sufficiently homogeneous, and the basal sleep quality, chronotype, and attention control performances of the individuals before the pandemic were not questioned. The presence of a psychiatric or chronic systemic disease was not evaluated in this study. Considering the limitations, further studies are necessary on the changes in chronotypes. In addition, since the Attention Control Scale is a subjective data collection tool, it is recommended to conduct randomized controlled experimental studies on this subject.

Ethics

Ethics Committee Approval: A written permission was obtained from the Scientific Research and Publication Ethics Committee of Izmir Tınaztepe University to conduct the study (protocol no: 17/2021, date: 20.04.2021).

Informed Consent: Participation in the study was voluntary, and online written consent was obtained from the students participating in it.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: N.Ç., A.Ö., Design: N.Ç., M.A., A.Ö., Data Collection or Processing: A.Ö., Analysis or Interpretation: N.Ç., A.Ö., Literature Search: N.Ç., M.A., A.Ö., Writing: N.Ç., M.A., A.Ö.

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