The Relationship of Morning and Evening Education with Biological Rhythm and Academic Achievement

Gündüz ve İkinci Öğretimin Biyolojik Ritim ve Akademik Başarı İle İlişkisi

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Özet

Bu araştırma, birinci ve ikinci öğretim programında okuyan üniversite öğrencilerinde biyolojik ritim ile akademik başarıyı incelemeyi amaçlamıştır. Araştırma betimleyici tiptedir. Örneklem 777 hemşirelik öğrencisinden oluşmaktadır. Veri toplamada; değişkenleri inceleme formu, "Sabahçıl-Akşamcıl Anketi", "Biyolojik Ritim Değerlendirme Görüşmesi Ölçeği" ve "Başarı Algısı Değerlendirme Ölçeği" kullanılmıştır. Birinci öğretim öğrencilerin %71'i sabahçıl-akşamcıl açısından ara tip özellikte ve biyolojik ritim ölçek puanı 49.30±7.27 dir. Başarı puanları 2.51±0.47 olup kendilerini orta düzeyde başarılı olarak değerlendirmektedirler. İkinci öğretim öğrencilerin %69'u sabahçıl-akşamcıl açısından ara tip özellikte ve biyolojik ritim ölçek puanı 50.26±7.68 dir. Akademik başarı puanları 2.42±0.47 olup kendilerini orta düzeyde başarılı olarak değerlendirmektedirler. Öğrencilerin çoğunun orta tip ve düzensiz biyolojik ritimlere sahip olduğu görülmüştür. Sabah eğitimi öğrencilerinin akademik başarı puanları ikinci öğretim eğitimi öğrencilerine göre daha yüksektir; algılanan akademik başarı her iki grupta da ortalamaydı. İkinci öğretim öğrencilerinin akademik başarısı, uyku ve beslenme alışkanlıkları olumsuz etkilendiğinden eğitim gündüz yapılmalıdır.

Anahtar Sözcükler: Akademik Başarı, Biyolojik Ritim, Kronotip, Üniversite Öğrencisi.

Abstract

This study aims to analyze the biological rhythm and academic achievement of university students studying in morning and evening education programs. This is a descriptive study. Its sample group consists of 777 nursing students. "The form for inspection by variables", "Morningness-Eveningness Questionnaire", "Biological Rhythms Interview of Assessment Scale" and "Perceived Achievement Assessment Scale" were used in data collection. 71% of the students receiving morning education were of moderate type in terms of morningness-eveningness and had a biological rhythm scale score of 49.30±7.27. Their achievement score was 2.51±0.47 and they assessed themselves as having moderate achievement. 69% of the students receiving evening education were of moderate type in terms of morningness-eveningness and they had a rhythm scale score of 50.26±7.68. Their academic achievement score was 2.42±0.47 and they assessed themselves as having moderate achievement. Most of the students had intermediate-type and irregular biological rhythms. Morning education students have higher academic achievement scores than evening education students; however, perceived academic achievement is average in both groups. As the academic success, sleep, and eating habits of evening education students are negatively affected, education should be carried out during the daytime.

Keywords: Academic Achievement, Biological Rhythm, Chronotype, University Students.

Recently, there has been a growing interest in scientific research into circadian typology and individual circadian differences, with a significant surge in the body of research over the past decades (Adan et al., 2012). A circadian clock could be defined as a biological timing device within an organism that is synchronized to the environment and solar time, responding to light and darkness in almost all living beings (Genzel et al., 2013). Circadian rhythms could be distinguished by various biological or physiological markers, including the human sleep-wake cycle, core body temperature, certain hormones such as cortisol and melatonin, and one's genetic makeup (Adan et al., 2012).

The expression of circadian rhythm may show substantial variation from person to person, which is categorized based on the person's circadian typology into three chronotypes: morning-type, neither-type, and evening-type (Natale et al., 2006). Approximately 40 percent of adults are reported to be either morning-type or evening-type, and the remaining majority (60%) are classified as neither-type (Adan et al., 2012), consisting of individuals exhibiting an intermediary position in their time-of-day preference.

The degree of morningness and eveningness in humans is generally measured by research methods using self-reported data (Escribano et al., 2016). Hajaghazadeh et al., (2019)

reported that sixty percent of nurses were intermediate-type, and the remaining was morning (24.2%) and evening (15.8%) types. Morning-type individuals, often called early birds, usually prefer to start the day early and go to bed early, as their concentration, and physical, and intellectual performance tends to peak during the early hours of the day.

However, evening-type people, also called night owls, prefer delayed sleep and wake times, since this type of timing enables them to reach their maximum productivity (Adan et al., 2012; Tonetti et al., 2015). López-Soto et al., (2019) reported that show that female nurses with an evening-oriented preference suffer more problems of insomnia, sleepiness, fatigue, and anxiety.

Personal differences in morningness and eveningness result from the innate chronotype of each individual. Genetic mechanisms have recently been found to play a role in circadian rhythm, and around 37% of the variation in adult diurnal preference can now be attributed to hereditary factors. While individual preferences over the diurnal and nocturnal phases are strongly associated with genetic and intrinsic mechanisms, they may be controlled by specific sociodemographic characteristics, age, and gender. Of these factors, age is known to cause changes in chronotype in humans, as research over the years has consistently shown that morningness tends to be more frequent before the age of 10 and after the age of 50, whereas a prevalent change toward eveningness occurs mostly in late adolescence (Tonetti et al., 2015).

As it exerts a strong impact on a person's behavioral patterns, chronotype can be said to have serious implications on health, overall well-being, academic and professional performance, and daytime functioning (Randler & Truc, 2014). Variations in people's choice of circadian phase, or more plainly sleep and daytime behavior, are thought to play a role in human cognitive abilities (Tonetti et al., 2015). There exist some factors known to influence academic achievement, or success at school, some of which could be associated with chronotype (Zerbini & Merrow, 2017). On the other hand, Gray and Watson (2002) reported that there was little evidence to attribute personal differences in sleep length and sleep schedule to academic performance. In their study with medical students, Genzel et al. (2013) concluded that only actual sleep timing, rather than chronotype, could be an effective predictor of academic achievement. Mirghani (2017) found that evening chronotype, or delayed bedtime, was more prevalent among medical school students with average grades than in those with excellent grades, with no significant differences in sleep length or circadian preference between male and female students. Toscano-Hermoso et al. (2020) reported that morning chronotype achieves better academic results than their evening counterparts.

Healthy sleep is important for students' academic performance and well-being. However, many students obtain insufficient sleep and may not reach their full learning potential (Chen, 2021). Previous work in the literature suggested that the most important factor to predict academic achievement could be the timing of sleep-wake behavior, or circadian preference, rather than sleep duration (Tonetti et al., 2015). According to a meta-analysis conducted by Preckel et al. (2011), who examined a possible correlation between chronotype and cognitive performance and academic achievement, chronotype is correlated strongly with cognitive performance and academic achievement. Their study found that eveningness had a positive correlation with cognitive ability, but a negative correlation with academic achievement. In contrast, morningness had a negative association with cognitive ability and a positive relationship with academic achievement. Studies into the impact of chronotype on academic achievement suggest that morningness offers an advantage over eveningness in terms of academic success. Despite this, none of such studies accounted for the time of day during which the participants were assessed. Enright and Refinetti concluded that morning-type individuals usually get better grades in exams than do evening-type individuals, suggesting that morningness could enhance academic achievement (Enright & Refinetti, 2017). Ljevak et al. (2020) reported that as the academic achievement of students was higher they were more morning types. The participants who expressed higher levels of daytime sleepiness were more evening types.

In Türkiye, certain universities have been offering evening courses at undergraduate and graduate levels since 1992. In the evening courses, formal education is given at higher education institutions after the normal daytime formal education (Official Gazette, 1992). This study aimed to investigate the relationship between chronotype and academic achievement in nursing students taking morning and evening courses. The research was carried out in an attempt to find answers to the following questions.

1. Does the circadian rhythm differ between morning and evening education students?
2. Are there any academic achievement differences between morning and evening education students?

The research results are significant for guiding policymakers and practitioners and contributing to lecturers and researchers.

Methods

Type of Research

The aim of a cross-sectional study is to obtain a representative sample by taking a cross-section of the population. Cross-sectional studies are generally quick,

easy, and cheap to perform, and they often involve a questionnaire survey (Sedgwick, 2015). It is widely used in nursing, medical and social sciences research to collect information about a specific population or phenomenon (Connelly, 2016). All the measurements for a study participant are obtained at a single time. (Sedgwick, 2015). In cross-sectional research, researchers aim to understand the current status or characteristics of the target population. The data collected typically focus on variables of interest such as demographics, attitudes, behaviours, opinions, or preferences. Surveys can be administered through various methods, including online questionnaires, telephone interviews, face-to-face interviews, or paper-based forms (Connelly, 2016). Therefore, a descriptive cross-sectional research design was used in this study.

Population and Sample of the Study

The study was conducted in a nursing school that offers both morning and evening education programs. In this school, both types of courses were given by the same lecturers. The research data were collected in the classroom environment. The target population consisted of 916 students. After the students were informed about the purpose and importance of the research, about 84% of them verbally expressed their willingness to participate in the study, thus 777 of these students constituted our sample.

Data Collection

Demographics

This is a personal information form asking questions about the participant's age, gender, marital status, class, type of education, and final grade point average (GPA).

Morningness-Eveningness Questionnaire (MEQ)

Originally developed by James A. Horne and Olov Östberg in 1976, the MEQ is the most commonly utilized self-assessment questionnaire in measuring circadian typology in adults. The original version of the MEQ comprises 19 items, which are multiple-choice questions, and each item provides four or five response options. The reliability coefficient of the scale ranged between 0.78 and 0.86 (Horne & Östberg, 1976). The MEQ has a multidimensional structure, so using a composite score yielded by the scale might not be always appropriate in different constructs (Adan & Almirall, 1991; Adan et al., 2012). This scale is used to determine the chronotype in individuals. The first Turkish language adaptation and validity and reliability study were conducted by Pündük, Gür, and Ercan with 618 university students (Pündük et al., 2005). According to the combined scores from the questions, there are 5 different chronotypes, which are as follows: scores between 70 and 86 points indicate "absolutely morning type", 59-69 points "close to the morning type", 42-58 points "intermediate type", 31-41 points "close to

the evening type", and 16- 30 "absolutely evening type". Higher scores mean a higher tendency toward morningness (Doğutepe, 2010). In our study, we used the Turkish language version of the scale adapted and validated by Pündük et al. The Cronbach's Alpha value calculated for the Morningness-Eveningness Questionnaire is 0.684.

Biological Rhythm Assessment Interview Scale (BRAIS)

Developed by Giglio et al in 2009, this Likert-type scale consists of 21 questions designed to measure the circadian rhythm and functionality of the patients in the 24-hour cycle. High scores are interpreted as the existence of an impaired biological rhythm (Giglio et al., 2009; Giglio et al., 2010). The subdimensions of the scale include the domains of sleep, activities, social, eating habits, and dominant rhythm pattern (chronotype). The Turkish language adaptation and validity-reliability studies of the scale were carried out by Aydemir and Köroğlu. The scale has proven to be useful in determining the prevalent morning and evening type, as well as possible risks of deterioration in biological rhythm in patient groups (Aydemir & Köroğlu, 2012). The Cronbach's Alpha value calculated for the Biological Rhythm Assessment Interview Scale is 0.712.

Perceived Achievement Rating Scale

It is a 10-point scale prepared by the researchers to allow students to evaluate their achievement subjectively. The scale goes from 1 to 10, one being poor academic achievement and 10 being excellent academic achievement, and students are asked to rate their academic success by choosing a number on a 10-point scale.

Statistical Analysis

The research data were analyzed on SPSS 21.0 software package for Windows. Along with descriptive statistics, T-test, and variance analysis were used to determine the relationship between the independent variables and the scales, and Bonferroni was used for further analysis. The level of statistical significance was accepted as $p < 0.05$.

The Ethical Principles of the Research

Prior written consent was obtained from the Clinical Trials Ethics Committee of Süleyman Demirel University, Faculty of Medicine and verbal consent was obtained from each of the study participants (numbered 72867572-050-4236).

Results

The mean age of the students attending morning courses was 19.88 ± 1.3, ranging from 17 to 26 years, and around 83.6% of these students were female. The mean age of the students in the evening education program ranged from 18-24 years with a mean age of 20.19±1.2, and about 81% of the evening education students were female (■ Table 1).

Table 1. Descriptive data about the students of morning and evening schools.

Gender	Morning School		Evening School	
	Number	%	Number	%
Female	412	83.6	230	81.0
Male	81	16.4	54	19.0
Total	493	100	284	100

71% of the morning education students and 69% of the evening education students showed neither-type characteristics in terms of chronotype. The score for the MEQ among the students attending morning courses ranged between 24 and 80, with a mean score of 49.68±8.16. The evening students' MEQ score was between 25 and 73 with a similar mean score of 49.09 ± 8.02. There was no significant difference between the mean MEQ scores of morning and evening education students (p>0.05) (Table 2).

Table 2. Morningness-Eveningness Questionnaire scores in students.

	Morning School		Evening School	
	Number	%	Number	%
Definitely evening type (Evening type)	7	1.4	1	0.4
Close to the morning type	69	14.0	47	16.5
Neither-type	350	71.0	196	69.0
Close to the morning type	65	13.2	38	13.4
Definitely morning type (Morning type)	2	0.4	2	0.7
Total number of students	493	100	284	100

The mean BRAIS score of the morning education students was 49.30 ± 7.27, ranging from 30 and 73, and evening education students had a similar mean score of 50.26 ± 7.68 (range 29-72). There was no statistically significant difference between the mean BRAIS scores of morning and evening education students. In the sub-dimensions of the scale, only sleeping and eating habits showed a significant difference (p>0.05), (Table 3).

The achievement scores of the morning education students ranged from 0.84 to 3.89 and their mean grade point average (GPA) was 2.51±0.47. The achievement scores

of the evening education students ranged between 1.02 and 3.50, with a mean GPA of 2.42±0.47. A statistically significant difference was found between the general GPA of the morning and evening students (p<0.05). When the students' self-assessment of their academic achievements was analyzed, it was found that the self-perceived academic achievement levels were similar among both morning and evening education students (Table 4).

Discussion and Conclusion

The findings obtained in the research, which examined the relationship between circadian preference and academic achievement among nursing students taking morning and evening courses, are compared with the results of previous work contained in the relevant literature. In terms of gender, our findings indicate no clear-cut differences in circadian preference. However, most large-scale studies revealed a clear but small gender difference, with women being more morning-oriented than men (Randler, 2016). A meta-analysis conducted by Randler (2007) suggests a weak but significant impact of gender on morningness where females exhibit more morning-type features than males.

There was no statistically significant difference between the average MEQ and BRAIS scores in morning and evening education students in terms of gender and age. It is quite normal that there is no correlation between age and means MEQ/BRAIS scores since there was no difference between the mean ages of the groups.

Table 3. Students' Biological Rhythm Assessment Interview Scale score.

	Morning School		Evening School		t
	Min-Max	X̄	Min-Max	X̄	
Daily activities	11-37	23.47±4.65	13-39	23.58±4.66	t=-0.305 p=0.761
Sleeping and eating habits	11-30	21.62±3.20	13-31	22.38±3.20	t=-3.174 p=0.002
Interpersonal relationships	2-8	4.20±1.35	2-8	4.29±1.34	t=-0.923 p=0.356
Scale-wide	30-73	49.30±7.27	29-72	50.26±7.68	t=-1.729 p=0.084

Table 4. Students' academic achievement scores and Perceived Achievement Rating Scale scores.

	Morning School		Evening School		t
	Min-Max	X̄	Min-Max	X̄	
Academic achievement scorev	.84-3.89	2.51±0.47	1.02-3.50	2.42±0.47	t=2.621 p=0.009
Perceived Achievement score	1-10	5.86±1.71	1-10	5.87±1.84	t=-0.039 p=0.969

The majority of the morning and evening education students who participated in our study were found to show neither-type characteristics in terms of chronotype. Pündük et al. (2005), in their research with university students and employees, found that the majority of the participants showed neither-type characteristics, followed by the students close to the morning type. Agargun et al. (2007), on the other hand, found that 70% of medical faculty students displayed morning-type characteristics. Sukegawa et al. (2009) calculated that 71.2% of 52 university students were the intermediate type, 19.2% the evening type, and 9.6% the morning type. İşman et al. (2010) reported that 54.6% of the participants were the intermediate type, 29.5% morning-type, and 15.8% evening-type. Beşoluk (2011), in his research conducted with 235 high school students, found that 68.1% of the participants were the intermediate type, 19.1% were morning-type, and 11.9% were evening-type. Kayaba et al. (2020) reported that about 18% of Japanese female nursing students were identified as evening type (Kayaba et al., 2020). Randler (2016) reported that morningness in adults tended to increase with age, so individuals would become morning types after turning the age of 18. In their research, Adan et al., Escribano et al., and Randler found that the majority of the adult population showed neither-type characteristics (Adan et al., 2012; Escribano et al., 2016; Randler 2016). Marta et al. (2020) reported that circadian rhythm preferences, 66% of male and 51.7% of female nursing students were categorized as intermediate- and morning-type people, respectively (Marta et al., 2020). The data presented in this study show clear age effects. The research findings are in concordance with the results reported by some of the above-given studies in the literature, as most of the students were found to be neither type in terms of circadian rhythm, which was followed by being close to the evening type. Being neither-type characteristics is a common situation in society.

Our statistical analyses showed no significant difference between the mean scores of the students attending morning and evening courses, which contradicts the common idea that students in evening courses are more inclined to sleep during the day and study at night. In addition, students being close to the evening type in second place in the morning-evening type classification may have affected their thought and choice of being able to do a job that requires night shifts. Based on the findings regarding the BRAIS scores, we determined that the biological rhythms of both morning and evening education students tended to be irregular. In the evening education students, a statistically significant difference was calculated in sleep and eating habits, two of the biological rhythm sub-dimensions. Curcio, Ferrara, and Gennaro reported that students with different educational backgrounds experienced chronic insomnia and impaired sleep quality, while sleep quality and sleep duration were related to learning capacity and performance (Curcio et al., 2006). Kopacz et al. emphasized that sleep affected simple memory activities, ensuring memory consolidation in children and adolescents (Kopasz et al., 2010). Mayda et al. (2012) found that more than half of the medical faculty students suffered from impaired sleep quality. Aysan et al. (2014) determined that sleep quality among university students studying health sciences was poor. Based on the findings obtained from our study sample, it can be stated that the biological rhythms of nursing students taking morning and evening courses tend to be irregular. In addition, the sleep and eating habits of the evening education students appear to be affected more negatively as compared to the morning education students.

We found a significant difference between the mean academic achievement scores of the morning and evening students in our research. In the second education, the entrance score of a department is lower. The relatively low academic achievement scores of the secondary education students in the research group can be explained by the difference in university entrance scores. When the students' self-assessment of their academic achievement was analyzed, the perceived achievement of both morning and evening education students was similar. The second-education students think they have similar academic achievement levels to the first-education students may be due to their relatively low self-awareness levels.

A study conducted in Türkiye reported that morning-type students were more successful in university entrance exams (Beşoluk, 2011). Beşoluk et al. (2011), in their study investigating the relationship between academic success and circadian rhythm in university students, found that morning-type students had higher exam scores than those evening-type students. A meta-analysis systematically reviewing 1647 relevant studies in the current literature concluded that evening-type circadian preference is linked to poor academic performance, both in school pupils and higher education students (Tonetti et al., 2011).

Psychosocial functioning and academic performance related to circadian rhythm were examined in 838 university students in the USA. As a result, it was found that the evening type had higher fatigue, alcohol and caffeine use, and worse academic performance than the morning or intermediate type (Taylor et al., 2011).

AlFakhri et al. (2015) conducted a study to examine the perceptions of 259 medical students and 21 academic advisors about sleep deprivation and its relationship with academic performance. Most students reported that sleep deprivation negatively affected academic performance. Önder et al. (2014) discovered that individual circadian preference, sleep patterns, sleep quality, character traits, and academic motivation were highly intertwined, significantly impacting academic success. In general, circadian preference toward eveningness seems to result in lower grades in school exams (Zerbini & Merrow, 2017). In addition to these reasons, the fact that students are working in an income-generating job may also have negatively affected their academic performance.

Limitations

Further studies with different samples are needed to confirm the current findings and to generalize these findings to a larger population.

In conclusion, our research revealed that the majority of the students participating in the study showed neither-type characteristics in their circadian preference; their biological rhythms tended to be irregular; the sleep and eating habits of the evening education students were more adversely affected as compared to the morning education students; the students attending morning courses had higher academic achievement scores; perceived academic achievement was average in both groups.

The nursing students constituting our study sample were classified as neither morning-type nor evening-type in terms of circadian preference, as the students mostly exhibited neither-type characteristics. However, we cannot suggest that the prevalence of neither type in our sample had an impact on academic achievement, as there was no relationship found between academic achievement and circadian preference among the participants.

The students attending morning courses had higher academic achievement scores than did the students attending the evening courses, which could be explained by the fact that evening programs accept students with university entrance exam scores lower than morning programs, and be in an income generating jobs by certain factors affecting as negative changes in sleep patterns and eating habits, dimensions of their circadian rhythm.

As for perceived academic achievement, students in both groups rated their achievement as average, suggesting we

should approach the results of subjective assessment tools cautiously.

References

Adan, A., & Almirall, H. (1991). Horne and Östberg morningness-eveningness questionnaire: a reduced version. *Personality and Individual Differences*, *12*: 241-53. doi.10.1016 / 0191-8869 (91) 90110-W

Adan, A., Archer, S.N., Hidalgo, M.P., Milia, L.D., Natale, V., & Randler, C. (2012). Circadian typology: a comprehensive review. *Chronobiology International*, 29(9):1153-1175. doi.org/10.3109/074 20528.2012.719971

Agargun, M.Y, Cilli, A.S., Boysan, M, Selvi, Y., Güleç, M., & Kara, H. (2007). Turkish version of the morningness-eveningness questionnaire (MEQ). *Sleep and Hypnosis,9*(1):16-23.

AlFakhri, L., Sarraj, J., Kherallah, S., Kuhail, K., Obeidat, A., & Abu-Zaid, A. (2015). Perceptions of pre-clerkship medical students and academic advisors about sleep deprivation and its relationship to academic performance: a cross-sectional perspective from Saudi Arabia. *BMC research notes*, *8*(1), 1-9. DOI 10.1186/s13104-015-1755-y

Aydemir, Ö., & Köroğlu, E. (2012). Psikiyatride Kullanılan Klinik Ölçekler. Ankara: Hekimler Yayın Birliği.

Aysan, E., Karaköse, S., Zaybak, A., & Günay-İsmailoğlu, E. (2014). Üniversite öğrencilerinde uyku kalitesi ve etkileyen faktörler. *Dokuz Eylül Üniversitesi Hemşirelik Fakültesi Elektronik Dergisi*. 7(3):193-198.

Beşoluk, Ş., Önder, İ., & Deveci, İ. (2011). Morningness-eveningness preferences and academic achievement of university students. *Chronobiology International*, 28(2):118-125. doi.org/10.3109/07420 528.2010.540729

Beşoluk, Ş. (2011). Morningness-eveningness preferences and university entrance examination scores of high school students. *Personality and Individual Differences*, *50*(2):248-252. doi.org/10.1016/j. paid.2010.09.038

Chen, Y.S. (2021). Effects of Class Start Times and Chronotype on Sleep and Learning in University Students. ScholarBank@NUS Repository.. https://scholarbank.nus.edu.sg/handle/10635/201687

Connelly, L. M. (2016). Cross-sectional survey research. *Medsurg nursing*, *25*(5), 369.

Curcio, G., Ferrara, M., & De Gennaro, L. (2006). Sleep loss, learning capacity and academic performance. *Sleep Medicine Reviews,10*(5): 323-337. doi.org/10.1016/j.smrv.2005.11.001

Doğutepe, D.E. (2010). Biyolojik Saat ve Kaygının Temel Bilişsel İşlevler Üzerindeki Etkileri. [Doctorate thesis] Ankara: Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü.

Enright, T., & Refinetti, R. (2017). Chronotype, class times, and academic achievement of üniversity students. *Chronobiology International*, *34*(4):445-450. doi.org/10.1080/07420528.2017.1281287

Escribano, C., & Díaz-Morales, J.F. (2016). Are achievement goals different among morning and evening-type adolescents *Personality and Individual Differences*, *88*:57-61. doi.org/10.1016/j. paid.2015.08.032

Genzel, L., Ahrberg, K., Roselli, C., Niedermaier, S., Steiger, A., Dresler, M., & Roenneberg, T. (2013). Sleep timing is more important than sleep length or quality for medical school performance. *Chronobiology International*, *30*(6): 766-771. doi.org/10.3109/07420 528.2012.763132

Giglio, L.M., Magalhães, P.V., Andreazza, A.C., Walz, J.C., Jakobson, L., Rucci,.... & Kapczinski, F. (2009). Development and use of a biological rhythm interview. *Journal of Affective Disorders,118*(1-3):161-165. doi.org/10.1016/S0924-9338(09)70793-X

Giglio, L.M.F., Magalhães, P.V., Andersen, M.L., Walz, J.C., Jakobson, L., & Kapczinski, F. (2010). Circadian preference in bipolar disorder. *Sleep and Breathing*, *14*(2):153-155. doi.10.1007/s11325-009-0301-3

Gray, E.K., & Watson, D. (2002). General and specific traits of personality and their relation to sleep and academic performance. *Journal of Personality,70*(2):176-206. doi.org/10.1111/1467-6494.05002

Hajaghazadeh, M., Zamanzadeh, V., Ghofrani, M., & Orujlu, S. (2019). Morningness-Eveningness Chronotypes, Sleep Quality, and Sleepiness Among Nurses. *Open Public Health J.* *12*(1): 414-419.

Horne, J.A., & Östberg, O. (1976). A self-assessment questionnaire to determine morningness-eveningness in human circadian rhythms. *International Journal of Chronobiology*, *4*:97-110.

İşman, Ç., Gülen, Ş., & Gündoğan, N. (2010). Tıp fakültesi öğrencilerinde el-parmak oranı ve sirkadyen tipoloji arasındaki ilişki. *Trakya Üniversitesi Tıp Fakültesi Dergisi*. 27(1):68-73.

Kayaba, M., Matsushita, T., Katayama, N., Inoue, Y., & Sasai-Sakuma, T. (2020). *Chronotype and its association with lifestyle, health-related quality of life and academic performance among Japanese nursing students: A cross-sectional study*. https://web.archive.org/web/20200822124307id_/https://assets.researchsquare.com/files/rs-51264/v1/c1569a44-95bc-413f-8661-d583d0126c82.pdf

Kopasz, M., Loessl, B., Hornyak, M., Riemann, D., Nissen, C., Piosczyk, H., & Ulrich, V. (2010). Sleep and memory in healthy children and adolescents- a critical review. *Sleep Medicine Reviews,14*(3): 167-177. doi.org/10.1016/j.smrv.2009.10.006

Ljevak, I., Raguž, D., Ladan, D., Šaravanja, N., & Romic, M. (2019). The correlation between academic achievement, daytime sleepiness and sleep habits among students of the Faculty of health studies in Mostar. *International Journal* of *Scientific and Engineering Research*, *10*(12): 172-180.

López-Soto, P. J., Fabbian, F., Cappadona, R., Zucchi, B., Manfredini, F., García-Arcos, A., ... & Rodríguez-Borrego, M. A. (2019). Chronotype, nursing activity, and gender: A systematic review. *Journal of Advanced Nursing*, *75*(4): 734-748.

Loureiro, P., & Garcia-Marques, T. (2015). Morning or evening person? Which type are you? Self-assessment of chronotype. *Personality and Individual Differences*, *86*:168-171. doi.org/10.1016/j. paid.2015.06.022

Mayda, A.S., Kasap, H, Yıldırım, C., Yılmaz, M., Derdiyok, Ç., Ertan, D.,.....& Kasırga, F. (2012). 4-5-6. Sınıf tıp fakültesi öğrencilerinde uyku bozukluğu sıklığı. *Düzce Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi*. 2(2):8-11.

Marta, O.F.D., Kuo, S.Y., Bloomfield, J., Lee, H. C., Ruhyanudin, F., Poynor, M. Y., ... & Chiu, H.Y. (2020). Gender differences in the relationships between sleep disturbances and academic performance among nursing students: A cross-sectional study. *Nurse Education Today*. *85*: 104270.

Mirghani, H.O. (2017). The effect of chronotype (morningness/ eveningness) on medical, students' academic achievement in Sudan. *Journal of Taibah University Medical Sciences*, *12*(6):512-516. doi. org/10.1016/j.jtumed.2017.03.007

Natale, V., Grandi, C.A., Fabbri, M., Tonetti, L., Mortoni, M., & Esposito, M.J. (2006). Validity of the reduced version of the Morningness-Eveningness Questionnaire. *Sleep and Hypnosis*, *8*(2): 47-53.doi.org/10.1111/j.1479-8425.2006.00192.x

Official Gazette. (1992). http://www.mevzuat.gov.tr/MevzuatMetin/1.5.3843.pdf

Önder, İ., Beşoluk, Ş., İskender, M., Masal, E., & Demirhan, E. (2014). Circadian preferences, sleep quality and sleep patterns, personality, academic motivation and academic achievement of university students. *Learning and Individual Differences*, *34*:184–192. doi.org/10.1016/j.lindif.2014.02.003

Preckel, F., Lipnevich, A.A., Schneider, S., & Roberts, R.D., (2011). Chronotype, cognitive abilities, and academic achievement: A meta-analytic investigation. *Learning and Individual Differences*, *21*(5):483-492. doi.org/10.1016/j.lindif.2011.07.003

Pündük, Z., Gür, H., & Ercan, İ. (2005). Sabahçıl-Akşamcıl Anketi Türkçe uyarlamasında güvenilirlik çalışması. *Türk Psikiyatri Dergisi*. *16*(1):40-45.

Randler, C., & Truc, Y. (2014). Adaptation of the composite scale of morningness for parent report and results from Kindergarten Children. *Swiss Journal of Psychol*. *73*(1): 35-39. doi.org/10.1024/1421-0185/a000121

Randler, C. (2007). Gender differences in morningness-eveningness assessed by self-report questionnaires: A meta-analysis. *Personality and Individual Differences*, *43*:1667-1675. doi:10.1016/j.paid.2007.05.004

Randler, C. (2016). Ontogeny of morningness-eveningness across the adult human lifespan, *Naturwissenschaften*. *103*(1-2):3. doi:10.1007/s00114-015-1326-z

Sukegawa, M., Noda, A., Morishita, Y., Ochi, H., Miyata, S., Honda, K., ….& Koike, Y. (2009). Sleep and lifestyle habits in morning and evening types of human circadian rhythm. *Biological Rhythm Research*, *40*(2): 121–127. doi.org/10.1080/09291010701794404

Sedgwick, P. (2015). Bias in observational study designs: cross sectional studies. *Bmj*, *350*. doi: https://doi.org/10.1136/bmj.h1286

Taylor DJ, Clay KC, Bramoweth AD, Sethi K, Roane BM. Circadian phase preference in college students: relationships with psychological functioning and academics. *Chronobiol Int*. 2011;*28*(6):541-547. doi:10.3109/07420528.2011.580870

Tonetti, L., Natale, V., & Randler, C. (2015). Association between circadian preference and academic achievement: A systematic review and meta-analysis, *Chronobiology International*, *32*(6):792-801. doi:10.3109/07420528.2015.1049271

Toscano-Hermoso, M. D., Arbinaga, F., Fernández-Ozcorta, E. J., Gómez-Salgado, J., & Ruiz-Frutos, C. (2020). Influence of sleeping patterns in health and academic performance among university students. *International Journal of Environmental Research and Public Health*, *17*(8): 1-11.

Zerbini, G., & Merrow, M. (2017). Time to learn: How chronotype impacts education. *Psychology Journal*, *6*: 263–276. doi.org/10.1002/pchj.178