

Academic Success Among Medical Students Is Not Associated with Chronotype or Creativity: The Only Significant Determinant Among Sociodemographic Variables Is Mother's Educational Level

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Research Article

Keywords: chronotype, morning–evening type, creativity, academic achievement, medical students, sociodemographic factors

Posted Date: June 30th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-9784349/v1>

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Additional Declarations: No competing interests reported.

Abstract

Objective: This study examined the relationship between chronotype (morning–evening type) and creative personality traits and academic achievement among third-year medical students at Sakarya University Faculty of Medicine; it also assessed the potential effects of sociodemographic variables on these relationships.

Method: Conducted using a cross-sectional and descriptive design, the study administered the Morning–Evening Type Questionnaire (MEQ), the Creative Personality Traits Scale (CPTS), and a sociodemographic/academic information form prepared by the researchers to the participants. Academic achievement was assessed using self-reported semester grade point averages and university entrance placement scores. Analyses included descriptive statistics, normality tests, correlation analyses, and group comparisons (t-test/Mann–Whitney U; ANOVA/Kruskal–Wallis); regression analyses were applied when necessary. The significance level was set at $p \leq 0.05$.

Findings: 63.6% of the sample were female, and 36.4% were male. According to the MEQ classification, most participants had an intermediate chronotype (64.5%); eveningness accounted for 27.1% and morningness for 7.5%. Academic achievement indicators (grade point averages for the 1st, 2nd, and 3rd grades) did not show significant differences across chronotype groups. No significant relationship was found between CPTS scores and academic achievement indicators or variables related to university placement. No significant relationship was found between chronotype and creative personality traits either. Among sociodemographic variables, a significant difference in CPTS scores was observed only based on the mother's educational level ($p = .005$).

Conclusion: This study suggests that academic achievement may be independent of chronotype and creative personality traits in a selective sample of medical students; however, creative personality traits may be associated with early-stage sociocultural determinants (maternal education level). It is recommended that these findings be validated using more heterogeneous samples and longitudinal designs.

Introduction

Academic performance is a multidimensional concept that reflects a student's level of success in the educational process and is typically assessed through indicators such as grade point average, exam scores, course performance, class attendance, and educational continuity. However, in programs requiring intense cognitive load and continuity, such as medical education, a student's academic success is determined not only by these factors but also by time management, study habits, and the sustainability of long-term performance. Current literature indicates that academic success is shaped by the combined influence of numerous cognitive, emotional, behavioral, and environmental variables. This topic is addressed across a broad spectrum, including individual differences, environmental conditions, educational structure, and biological rhythms (Vidueira et al., 2023; Yang et al., 2025; Spiegel et al., 2021; Denervaud et al., 2019). Also, academic achievement, cognitive abilities, executive functions, self-efficacy, motivation, personality traits, stress levels, and sleep patterns are among the primary variables associated with academic performance (Adam et al., 2015; Chisholm-Burns et al., 2021; Fonteyne et al., 2017; Spiegel et al., 2021). Therefore, single-dimensional explanations are insufficient when evaluating academic performance; a multivariate approach is required.

Within this multifaceted framework, variables related to sleep and circadian rhythms have garnered particular attention in recent years. Research indicates that not only total sleep duration but also sleep quality, sleep regularity, daytime sleepiness, social jet lag, and chronotype are associated with academic performance. It has been reported that students with more regular sleep-wake patterns have higher grade point averages, while those with irregular sleep patterns exhibit a more delayed circadian timing (Phillips et al., 2017). Similarly, better sleep quality, lower social jet lag, and a more morning-oriented chronotype were found to be significant predictors of academic performance; conversely, poor sleep quality, daytime sleepiness, and sleep-related problems were shown to be associated with lower achievement (Fitzsimmons, Carter, & Scullin, 2026; Prichard, 2020; Seoane et al., 2020; Cohen-Zion and Shiloh, 2018).

Chronotype is a trait that varies along the morning-evening axis and reflects an individual's sleep-wake rhythm and peaks in daily performance. From a chronotype perspective, meta-analytic findings indicate that morning orientation is positively associated with academic achievement at a small but significant level (Tonetti et al., 2015). However, it is also observed that this relationship is not consistent across all studies, and no significant relationship was found in some samples (Ajeebi et al., 2024; Reddy and Nagothu, 2019). This suggests that the effect of chronotype on academic performance is shaped not directly but through mediating variables such as sleep quality, motivation, mood, class schedules, and social environment (Vidueira et al., 2023).

Another area of individual characteristics associated with academic success is creativity and the personality traits linked to it. Although creativity has long been primarily addressed in terms of cognitive products, divergent thinking, or original problem-solving, it is known that affective and personality-based traits that support creativity are also important in this process (Marjoribanks, 1976; Liu et al., 2013; Filippetti & Krumm, 2020). Creative personality traits encompass individual tendencies such as intrinsic motivation, self-confidence, risk-taking, independence, curiosity, open-mindedness, the ability to develop different perspectives, and goal-orientation. It has been reported that creative individuals differ from their peers in terms of characteristics such as greater independence in decision-making, higher intrinsic motivation, greater inquisitiveness, higher aesthetic sensitivity, and stronger self-confidence (Feist, 1998; Selby et al., 2005). Furthermore, it has been demonstrated that creativity—particularly its flexibility dimension—is associated with both intelligence and academic achievement; that creative problem-finding ability is significantly predicted by academic achievement; and that creative thinking influences academic outcomes in certain educational contexts (Marjoribanks, 1976; Liu et al., 2013; Denervaud et al., 2019). However, the relationship between academic performance and creativity has been examined in most studies through general measures of creativity or cognitive creativity tests; the relationship with creative personality traits has been addressed to a more limited extent. Yet academic success may depend not only on information processing capacity but also on an individual's openness to risk-taking, self-confidence, intrinsic motivation, and ability to think outside the box (Chisholm-Burns et al., 2021; Fonteyne et al., 2017).

All these findings indicate that academic success should be considered within a holistic framework that encompasses not only cognitive factors but also biological rhythms and personality traits. However, studies in the literature that examine chronotype and creative personality traits in conjunction with academic achievement are limited. Therefore, this study aims to investigate the relationship between chronotype and creative personality traits and academic achievement among third-year medical students at Sakarya University Faculty of Medicine, the relationship between chronotype and creative personality traits, and the potential connections between sociodemographic variables and these areas. The study's main hypothesis is that chronotype and creative personality traits may be associated with academic achievement; furthermore, sociodemographic characteristics may exert moderating effects, particularly on levels of creativity.

METHOD

Study Design and Participants

This study was conducted as a cross-sectional and descriptive research involving third-year medical students at Sakarya University Faculty of Medicine. Data collection took place during the week following the completion of final exams.

Students were contacted via their university email addresses and a shared WhatsApp group. The scales were presented in a digital format. Participants who preferred to complete the survey in person rather than digitally were provided with a printed questionnaire.

All questionnaires were designed to be anonymous. Participants were not asked for any personal information such as their name, student ID number, or any other identifying details. The data was not tracked to identify specific participants. Participation in the study was voluntary.

The survey form included self-report questions regarding whether participants had a known severe psychiatric or neurological disorder or a diagnosed sleep disorder. Data from participants who reported such conditions were excluded from the analysis.

Data Collection Tools

Sociodemographic Information Form

This form, prepared by the research team in accordance with the literature, included descriptive information such as participants' age, gender, housing status, and the number of people they live with.

Morningness–Eveningness Questionnaire (MEQ)

The 19-item Morningness–Eveningness Questionnaire (MEQ), developed by Horne and Ostberg (1976) to assess individuals' circadian rhythm characteristics, was used. Based on the total score obtained from the scale, participants were classified as morning type (59–86 points), intermediate type (42–58 points), and evening type (16–41 points). The validity and reliability study of the scale in Turkish was conducted by Ağargün and colleagues (Pündük, Gür, & Ercan, 2005).

Creative Personality Traits Scale (CPTS)

The Creative Personality Traits Scale, developed by Şahin and Danişman (2017) and consisting of 17 items and four factors, was used. The scale was developed to assess personality traits related to creativity, and validity and reliability studies have been conducted in Turkey (Şahin and Danişman, 2017).

Academic Achievement Assessment Form

To determine participants' academic achievement levels, university entrance placement scores and third-semester grade point averages were collected via self-report (Sakarya University, 2019).

Statistical Analysis

The collected data were analyzed using the SPSS software. First, descriptive statistics (mean, standard deviation, percentage, minimum–maximum values) were calculated. The normality of continuous variables was assessed using the Shapiro–Wilk test.

To examine the relationships between variables, Pearson correlation analysis was applied when parametric conditions were met, and Spearman correlation analysis was applied when they were not.

In comparisons between two groups, Student's t-test was used when the assumption of normal distribution was met, and the Mann–Whitney U test was used when it was not. For comparisons involving three or more groups, one-way analysis of variance (ANOVA) was applied when parametric conditions were met, and the Kruskal–Wallis test was used when they were not.

Linear regression analyses were conducted as necessary to identify variables predicting academic achievement. Statistical significance was set at $p \leq 0.05$ at the 95% confidence level.

FINDINGS

Sociodemographic Data

63.6% of the study sample were women and 36.4% were men. The mean age of the participants was determined to be 22.26 ± 1.06 . While mothers' educational levels were concentrated at the elementary school and below (29.2%) and university (28.3%) levels, it was observed that fathers' educational levels were predominantly university graduates (43.9%). When examining the participants' housing situations, it was determined that the most common living arrangement was a state-run dormitory (43.0%), followed by student housing (21.5%) and living with family (20.6%).

The median duration of students' admission to medical school was found to be 1 year, with a minimum of 1 year and a maximum of 4 years; it was observed that they were admitted to the faculty where they are currently studying as their fifth choice on average. The average admission score to the faculty is 502.08. When examining academic performance indicators, the first-year grade point average was 76.48, the second-year average was 73.12, and the third-year average was 73.91. The vast majority of participants (91.5%) reported not having lost any academic years during their medical education.

Independent samples t-tests conducted to examine academic achievement differences by gender revealed that there were no significant differences in first-year ($t(97.75) = -0.26, p = .796$), second year ($t(99) = 0.16, p = .873$), and third-year grade point averages ($t(53) = -0.90, p = .372$).

When academic achievement was examined according to housing status, no significant differences were found between groups regarding first-year ($F(5,96) = 0.22, p = .954$), second-year ($F(5,95) = 0.64, p = .673$), and third-year grade point averages ($F(4,50) = 1.80, p = .143$). Effect sizes were small for first and second grades ($\eta^2 = .01$ and $.03$) and close to moderate for third grade, though not statistically significant ($\eta^2 = .13$).

The comparison of academic achievement averages by mother's education level revealed no significant differences in first grade ($F(4,96) = 0.99, p = .420$), second grade ($F(4,95) = 1.11, p = .354$), and third grade ($F(4,49) = 1.43, p = .237$), no significant differences were found between groups in terms of grade point averages.

According to the results of the one-way analysis of variance (ANOVA) conducted to compare academic achievement averages based on father's educational level, no significant differences were found between groups in terms of first-grade ($F(4,97) = 0.84, p = .504$), second-grade ($F(4,96) = 1.80, p = .135$), third grade ($F(4,50) = 0.72, p = .582$), no significant differences were found between the groups in terms of grade point averages.

The Relationship Between Sociodemographic Data and the Morning-Evening Type Scale (MEQ)

The five-category chronotype classification obtained from the Turkish version of the MEQ was reduced to three groups to increase sample sizes in the analyses; the definite and intermediate morning types were combined into the "morning" group, the definite and intermediate evening types into the "evening" group, and the intermediate type was evaluated as a separate group. According to the MEQ classification, the majority of participants belong to the intermediate chronotype (64.5%). Evening-oriented individuals constitute 27.1% of the sample, while the morning-oriented type is represented at a rate of 7.5%. Only one participant was classified as a definite evening-oriented type.

As shown in Table 1, there were no significant differences among the groups in first-year end-of-term grade point average, $F(2, 99) = 1.47, p = .235$; second-year end-of-term grade point average, $F(2, 98) = 1.18, p = .313$; or third-year end-of-term grade point average, $F(2, 52) = 0.09, p = .915$.

Table 1. Comparison of Academic Achievement Levels by Chronotype Groups

Variable	df / H	Statistic	p
1st-grade grade point average	F(2, 99)	1.47	.235
2nd-year grade point average	F(2, 98)	1.18	.313
3rd-year grade point average	F(2, 52)	0.09	.915

Kronotip gruplarına göre yaş, fakülteyi kazanma süresi, fakülte tercih sırası ve fakülteye giriş puanı değişkenlerinin farklılaşıp farklılaşmadığını incelemek amacıyla yapılan Kruskal-Wallis testi sonuçlarına göre gruplar arasında istatistiksel olarak anlamlı bir fark saptanmamıştır (Table 2).

Table 2. Comparison of Age and Academic Background Variables by Chronotype Group

	H	sd	p
Age	3.75	3	.290
Time since admission to the faculty	2.20	3	.531
Faculty preference order	2.72	3	.437
Faculty admission score	2.00	3	.368

Chronotype groups and gender ($\chi^2(2, N = 107) = 0.76, p = .685$), grade repetition status ($\chi^2(2, N = 106) = 1.76, \text{exact } p = .392$), creativity level ($\chi^2(6, N = 107) = 8.93, \text{exact } p = .134$), mother's education level ($\chi^2(6, N = 106) = 5.19, \text{exact } p = .513$), father's education level ($\chi^2(6, N = 107) = 10.47, \text{exact } p = .070$), and place of residence ($\chi^2(2, N = 107) = 1.84, \text{exact } p = .403$) (Table 3).

Table 3. Relationships Between Chronotype Groups and Sociodemographic Variables

Variable	df / N	χ^2	p
Gender	$\chi^2(2, N=107)$	0.76	.685
Grade repetition	$\chi^2(2, N=106)$	1.76	.392
Level of creativity	$\chi^2(6, N=107)$	8.93	.134
Mother's education level	$\chi^2(6, N=106)$	5.19	.513
Father's education level	$\chi^2(6, N=107)$	10.47	.070
Place of residence	$\chi^2(2, N=107)$	1.84	.403

The total MEQ score was not significantly correlated with the first-year end-of-term GPA ($r = -.09$, $p = .349$), the second-year end-of-term GPA ($r = .004$, $p = .969$), the third-year final grade point average ($r = -.09$, $p = .521$), and the college entrance exam score ($r = .06$, $p = .563$) (Table 4).

Table 4. Correlations Between the MEQ Total Score and Academic Variables

Variable	r	p
1st-grade grade point average	-.09	.349
2nd-year grade point average	.004	.969
3rd-year grade point average	-.09	.521
Faculty admission score	.06	.563

The Relationship Between Sociodemographic Characteristics and the Creative Personality Traits Scale (CPTS)

When examining the range distribution of total CPTS scores, it was observed that 6.5% of participants scored 50 or below, 34.6% scored between 51 and 60, 45.8% scored between 61 and 70, and 13.1% scored 71 or above.

No significant relationship was found between CPTS scores and variables such as age, academic achievement indicators, and faculty placement. CPTS scores did not differ based on gender or whether students had lost a year during their education. However, the Kruskal–Wallis test revealed a significant difference in total CPTS scores based on the mother's educational level ($H(3) = 12.79$, $p = .005$). No statistically significant difference was found in total CPTS scores based on the father's educational level ($H(3) = 6.03$, $p = .110$) (Table 5).

Table 5. Relationship Between Sociodemographic Data and the Creative Personality Traits Scale (CPTS)

Variable	Statistics	p
Age	$r = -0.107$	.283
Year of admission to the faculty	$r = .076$	.436
Faculty entrance score	$r = .051$	.644
Faculty preference order	$r = .090$	.371
1st-grade grade point average	$r = -.132$	.185
2nd-grade grade point average	$r = -.054$	.591
3rd-grade grade point average	$r = -.047$	.733
Gender	$t = -0.62$	.538
Repetition	$t = -0.34$	.733
Housing status	$F(6,100)=1.90$	.088
Mother's education level	$r = 0.243$	.005*
Father's education level	$r = 0.086$	.110

Bonferroni-corrected pairwise comparisons revealed that participants whose mothers had completed only elementary school had lower CPTS total scores compared to those whose mothers had completed middle school ($p = .026$), high school ($p = .022$), and those whose mothers had a college education or higher ($p = .045$) (Figure 1). No significant differences were found between the middle school, high school, and college or higher education groups (all adjusted p -values = 1.000).

The Relationship Between Scores on the Creative Personality Traits Scale (CPTS) and the Morning–Evening Type Scale (MEQ)

A one-way analysis of variance (ANOVA) conducted to compare CPTS scores across chronotype groups revealed no statistically significant difference between the groups ($F(3,103) = 1.59$, $p = .197$) (Table 6).

Table 6. Comparison of CPTS Scores by Chronotype Groups

	SS	F	p
Between groups	3	1.59	.197
Within groups	103		

No statistically significant differences were found between the groups in terms of the total CPTS score, $F(2, 104) = 1.63, p = .201$ (Table 7).

Table 7. The Relationship Between Scores on the Creative Personality Traits Scale (CPTS) and the Morning–Evening Type Scale (MEQ)

Variable	df / H	Statistics	p
YKOÖ total score	$F(2, 104)$	1.63	.201

According to the results of the independent samples t-test conducted to examine whether creativity and chronotype scores differed based on whether students had experienced a lost academic year during medical school, no statistically significant difference was found between the groups. No difference was found in creativity scores between students who had experienced a year of academic delay and those who had not ($t(104) = -0.34, p = .733, d = 0.07$). Similarly, no significant difference was observed in chronotype scores ($t(104) = -0.12, p = .902, d = 0.02$) (Table 8).

Table 8. Comparison of Creativity and Chronotype Scores by Year of Loss

Variable	t	sd	p	Ortalama farkı	Etki büyüklüğü (d)
CPTS total score	-0.34	104	.733	-0.95	0.07
MEQ total score	-0.12	104	.902	-0.37	0.02

DISCUSSION

This study examined the relationships between chronotype, creative personality traits, and academic achievement among third-year medical students. The findings revealed that neither chronotype nor creative personality traits showed a significant association with academic achievement. Among sociodemographic variables, only the mother’s educational level was found to be significantly associated with creative personality traits.

In this study, no significant relationship was found between chronotype and academic achievement among third-year medical students. This finding is consistent with studies that report no relationship between chronotype and academic performance (Ajeebi et al., 2024; Reddy and Nagothu, 2019). In contrast, the current results do not align with meta-analyses and studies reporting a positive association between morning orientation and academic achievement (Tonetti, Natale, & Randler, 2015; Enright & Refinetti, 2017; Roy et al., 2023; Scherrer & Preckel, 2021). Furthermore, the fact that evening-oriented tendencies have been found to be associated with higher performance in certain contexts in some studies indicates that the pattern in the literature is not unidirectional (Yang et al., 2025). In this regard, the current finding is more closely aligned with studies demonstrating that the relationship between chronotype and academic achievement may vary across different samples.

The literature suggests that school start times may influence academic performance by affecting the alignment between biological rhythms and social timing; specifically, educational programs beginning early in the day may increase circadian misalignment in individuals with a late chronotype, leading to sleep loss and reduced performance (Borisenkov et al., 2022; Gallego-Gomez et al., 2021; Wernette and Emory, 2017). Similarly, it has been shown that an increase in social jet lag creates negative effects on cognitive performance, and this effect may manifest in academic performance through attention, memory, and executive functions (Burns et al., 2025). However, some studies have reported that the difference between chronotype and academic achievement may disappear depending on certain behavioral variables; for example, it has been shown that the academic achievement gap between morning and evening type students disappears in cases of high caffeine consumption (Cole, 2015). In this context, the fact that chronotype did not show a significant relationship with academic achievement in the current study suggests that academic performance may be shaped not so much by individuals’ chronotype characteristics, but rather through the interaction between the timing of the educational system, behavioral factors, and biological rhythms.

The study also found no significant relationship between creative personality traits and academic achievement. This result does not align with some studies reporting that creativity or creative tendencies are associated with academic achievement. In particular, Liu et al. (2013) reported that creative tendencies are associated with the ability to identify scientific problems; Aran, Filippetti, and Krumm (2020), on the other hand, reported that spontaneous flexibility, in particular, is more strongly associated with academic achievement and creativity. Similarly, Denervaud et al. (2019) demonstrated that the academic excellence of Montessori students could be explained through creativity. However, Marjoribanks (1976) noted that the relationship between creativity and academic achievement is not linear; beyond a certain cognitive level, this relationship may weaken. Furthermore, Batey and Furnham (2006) and Feist (1998) emphasized that creativity is a multidimensional, heterogeneous structure that is sensitive to measurement methods and cannot be explained by a single variable. Therefore, the fact that no significant relationship was found between creative personality traits and academic achievement in the present study is consistent with the variable and context-sensitive findings in the literature.

From a sociodemographic perspective, the fact that only the mother’s educational level was found to be significantly associated with creative personality traits parallels studies indicating that creativity is not merely an individual trait but a construct shaped by environmental and social factors. Amabile (1996)

emphasized that creativity is influenced not only by internal motivation but also by the social environment and motivational conditions. Similarly, Selby, Shaw, and Houtz (2005) defined creative personality within the interaction of cognitive, affective, and motivational components; while Qian, Plucker, and Shen (2010) demonstrated that creative personality is a multidimensional structure composed of internal, external, and self-related dimensions. In this context, the established relationship between maternal educational level and creative personality traits supports the notion that creative personality cannot be considered independently of the family and environmental context. However, the literature also indicates that the relationships between sleep and chronotype variables and academic performance may vary across specific subgroups; for example, it has been reported that sleep quality and chronotype show a significant relationship with academic performance only among female students in the health sciences (Duarte et al., 2025).

In conclusion, this study demonstrates that academic success is associated with chronotype and creative personality traits, but that this relationship is shaped through multidimensional and mediating processes. The findings suggest that interventions aimed at improving academic performance should focus not only on cognitive skills but also on sleep patterns, alignment with biological rhythms, and individual personality traits. It is important for future studies to use longitudinal and multivariate models to better understand the relationships among these variables.

Strengths and Limitations

The study's strengths include the use of scales with established validity and reliability, an anonymous data collection method, and the systematic application of both parametric and non-parametric analyses.

However, there are some limitations. Since the study has a cross-sectional design, causal inferences cannot be made. Academic achievement and university entrance scores were obtained through self-report. The sample is limited to a single faculty and a single grade level; therefore, the generalizability of the findings is limited. Additionally, the uneven distribution across chronotype categories may have reduced statistical power in subgroup analyses.

CONCLUSION

This study suggests that academic success in a selective sample of medical students may be largely independent of chronotype and creative personality traits. It is believed that academic performance in such samples may be more closely related to structural educational processes and cognitive competence rather than individual biological rhythms or personality differences.

In contrast, it was observed that creative personality traits may be associated with early-life sociocultural factors. It is recommended that future studies examine these relationships in greater detail using multicenter, more heterogeneous samples and longitudinal designs. Additionally, incorporating objective sleep measurements, performance-based creativity assessments, and clinical performance indicators could contribute to a more comprehensive understanding of the subject.

Declarations

Ethics Approval and Consent to Participate:

This study was conducted in accordance with the ethical standards of the institutional and national research committees and with the principles of the 1964 Declaration of Helsinki and its later amendments. Ethical approval was obtained from the Sakarya University Faculty of Medicine, Health Sciences Scientific Research Ethics Committee on May 16, 2025, with the reference number E-43012747-050.04-475162. All participants were informed about the study, and written informed consent was obtained before participation.

Consent to Publish Declaration:

All participants provided written consent for publication of the study findings.

Data Availability:

The datasets utilized and/or analyzed during this study are available from the corresponding author upon reasonable request.

Clinical Trial Number:

Not applicable.

Competing Interests:

All authors declare no competing interests.

Funding:

Not applicable.

Author Contributions:

EY designed the study. AA, NB, and AŞ contributed to patient recruitment and data collection. AK performed the statistical analyses and coordinated the preparation of the manuscript. All authors critically reviewed the manuscript and approved the final version.

Acknowledgements

We would like to thank the medical students who contributed to the study process for their valuable support.

References

1. Adam, J., Bore, M., Childs, R., Dunn, J., Mckendree, J., Munro, D., & Powis, D. (2015). Predictors of professional behaviour and academic outcomes in a UK medical school: A longitudinal cohort study. *Medical Teacher*, 37(9), 868–880. <https://doi.org/10.3109/0142159X.2015.1009023>
2. Ajeebi, Y., Oberi, I. A., Al-Hulaibi, M., Omair, B. A., Alsum, G. F., Abukhairat, S. M., . . . Gosadi, I. M. (2024). Assessment of Chronotype Distribution Among University Students and Its Association With Lifestyle Characteristics and Academic Performance. *Cureus*, 16(8), e67678. doi:10.7759/cureus.67678
3. Aran Filippetti, V., & Krumm, G. (2020). A hierarchical model of cognitive flexibility in children: Extending the relationship between flexibility, creativity and academic achievement. *Child Neuropsychol*, 26(6), 770-800. doi:10.1080/09297049.2019.1711034
4. Borisenkov, M. F., Popov, S. V., Smirnov, V. V., Dorogina, O. I., Pechsmallie, C. A. A., & Symaniuk, E. E. (2022). Later school start time is associated with better academic performance, sleep-wake rhythm characteristics, and eating behavior. *Chronobiol Int*, 39(11), 1444-1453. doi:10.1080/07420528.2022.2117050
5. Burns, J., Li, A. R., Rohr, K. E., Thomas, M. L., McCarthy, M. J., & Meruelo, A. D. (2025). The influence of chronotype, socioeconomic status, latitude, longitude, and seasonality on cognitive performance and academic outcomes in adolescents. *Sleep Med*, 128, 95-102. doi:10.1016/j.sleep.2025.01.030
6. Chisholm-Burns MA, Berg-Poppe P, Spivey CA, Karges-Brown J, Pithan A. Systematic review of noncognitive factors influence on health professions students' academic performance. *Adv Health Sci Educ Theory Pract*. 2021 Oct;26(4):1373-1445. doi: 10.1007/s10459-021-10042-1. Epub 2021 Mar 26. PMID: 33772422.
7. Cohen-Zion, M., & Shiloh, E. (2018). Evening chronotype and sleepiness predict impairment in executive abilities and academic performance of adolescents. *Chronobiol Int*, 35(1), 137-145. doi:10.1080/07420528.2017.1387792
8. Cole, J. S. (2015). A survey of college-bound high school graduates regarding circadian preference, caffeine use, and academic performance. *Sleep Breath*, 19(1), 123-127. doi:10.1007/s11325-014-0976-y
9. Duarte, L., Closs, I., Vasconcelos, S., Henrique Rosa Santos, E., Matos, R., de Oliveira Tozetto Klein, S., . . . Fontenele-Araujo, J. (2025). Sleep habits and academic performance of Brazilian undergraduate students in the health-related fields. *Chronobiol Int*, 42(4), 551-559. doi:10.1080/07420528.2025.2490504
10. Denervaud, S., Knebel, J. F., Hagmann, P., & Gentaz, E. (2019). Beyond executive functions, creativity skills benefit academic outcomes: Insights from Montessori education. *PLoS One*, 14(11), e0225319. doi:10.1371/journal.pone.0225319
11. Enright T, Refinetti R. Chronotype, class times, and academic achievement of university students. *Chronobiol Int*. 2017;34(4):445-450. doi: 10.1080/07420528.2017.1281287. Epub 2017 Mar 8. PMID: 28272914.
12. Feist, G. J. (1998). A meta-analysis of personality in scientific and artistic creativity. *Pers Soc Psychol Rev*, 2(4), 290-309. doi:10.1207/s15327957pspr0204_5
13. Fitzsimmons, C. L., Carter, J. R., & Scullin, M. K. (2026). Sleep and Circadian Predictors of Academic Performance and Retention in STEM Pathways: A Longitudinal Study in University Freshmen. *Adv Physiol Educ*. doi:10.1152/advan.00313.2025
14. Fonteyne L., D. W., De Fruyt F. (2017). Program-specific prediction of academic achievement on the basis of cognitive and non-cognitive factors. *Learning and Individual Differences*, 56, 34-48. doi:doi.org/10.1016/j.lindif.2017.05.003.
15. Gallego-Gomez, J. I., Gonzalez-Moro, M. T. R., Gonzalez-Moro, J. M. R., Vera-Catalan, T., Balanza, S., Simonelli-Munoz, A. J., & Rivera-Caravaca, J. M. (2021). Relationship between sleep habits and academic performance in university Nursing students. *BMC Nurs*, 20(1), 100. doi:10.1186/s12912-021-00635-x
16. Horne, J. A., & Ostberg, O. (1976). A self-assessment questionnaire to determine morningness-eveningness in human circadian rhythms. *Int J Chronobiol*, 4(2), 97-110. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/1027738>
17. Liu M, Hu W, Adey P, Cheng L, Zhang X. The impact of creative tendency, academic performance, and self-concept on creative science problem-finding. *Psych J*. 2013 Apr;2(1):39-47. doi: 10.1002/pchj.13. Epub 2012 Nov 6. PMID: 26272863.
18. Marjoribanks K. Academic Achievement, Intelligence, and Creativity: A Regression Surface Analysis. *Multivariate Behav Res*. 1976 Jan 1;11(1):105-18. doi: 10.1207/s15327906mbr1101_7. PMID: 26797182.
19. Phillips, A. J. K., Clerx, W. M., O'Brien, C. S., Sano, A., Barger, L. K., Picard, R. W., . . . Czeisler, C. A. (2017). Irregular sleep/wake patterns are associated with poorer academic performance and delayed circadian and sleep/wake timing. *Sci Rep*, 7(1), 3216. doi:10.1038/s41598-017-03171-4
20. Prichard, J. R. (2020). Sleep Predicts Collegiate Academic Performance: Implications for Equity in Student Retention and Success. *Sleep Med Clin*, 15(1), 59-69. doi:10.1016/j.jsmc.2019.10.003
21. Pündük, Z., Gür, H. ve Ercan, İ. (2005). Sabahçıl-Akşamcıl Anketi Türkçe uyarlamasında güvenilirlik Çalışması. *Türk Psikiyatri Dergisi*, 16(1), 40-45.
22. Reddy, I. Y., & Nagothu, R. S. (2019). Academic performance depends on chronotype: Myth or reality? *Indian J Clin Anat Physiol*, 6(4), 471-474. doi:10.18231/j.ijcap.2019.103
23. Roy, J., Godin, R., Gaudreault, P., & Forest, G. (2023). The relationship between sleep, perfectionistic strivings, perfectionistic concerns, and academic and sports performance in young athletes. *Chronobiol Int*, 40(11), 1500-1514. doi:10.1080/07420528.2023.2273828
24. Sakarya Üniversitesi. (2019). Tıp Fakültesi Mezuniyet Öncesi Eğitim-Öğretim ve Sınav Yönergesi. Retrieved from <https://ogrdek.sakarya.edu.tr/sites/ogrdek.sakarya.edu.tr/file/Y%C3%96NERGELER/SAKARYA%20%C3%9CN%C4%B0VERS%C4%B0TES%C4%B0%20TIP%20FAK%C3%9CLTESI/2019-2020%20YILI%20TIP%20FAK%C3%9CLTESI%20MEZUNİYET%20ÖNCESİ%20EĞİTİM%20ÖĞRETİM%20VE%20SINAV%20YÖNERGESİ.pdf>

25. Scherrer, V., & Preckel, F. (2021). Circadian preference and academic achievement in school-aged students: a systematic review and a longitudinal investigation of reciprocal relations. *Chronobiol Int*, 38(8), 1195-1214. doi:10.1080/07420528.2021.1921788
26. Seoane HA, Moschetto L, Orliacq F, Orliacq J, Serrano E, Cazenave MI, Vigo DE, Perez-Lloret S. Sleep disruption in medicine students and its relationship with impaired academic performance: A systematic review and meta-analysis. *Sleep Med Rev*. 2020 Oct;53:101333. doi: 10.1016/j.smr.2020.101333. Epub 2020 May 15. PMID: 32485517.
27. Spiegel, J. A., Goodrich, J. M., Morris, B. M., Osborne, C. M., & Lonigan, C. J. (2021). Relations between executive functions and academic outcomes in elementary school children: A meta-analysis. *Psychol Bull*, 147(4), 329-351. doi:10.1037/bul0000322
28. Şahin, F., & Danışman, Ş. (2017). Yaratıcı Kişilik Özellikleri Ölçeği: Güvenilirlik ve geçerlik çalışması. *Karabük Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 7(2), 747-760.
29. Tonetti, L., Natale, V., & Randler, C. (2015). Association between circadian preference and academic achievement: A systematic review and meta-analysis. *Chronobiol Int*, 32(6), 792-801. doi:10.3109/07420528.2015.1049271
30. Vidueira, V. F., Booth, J. N., Saunders, D. H., Sproule, J., & Turner, A. P. (2023). Circadian preference and physical and cognitive performance in adolescence: A scoping review. *Chronobiol Int*, 40(9), 1296-1331. doi:10.1080/07420528.2023.2256901
31. Wernette, M. J., & Emory, J. (2017). Student Bedtimes, Academic Performance, and Health in a Residential High School. *J Sch Nurs*, 33(4), 264-268. doi:10.1177/1059840516677323
32. Yang, Y., Zhu, Y., Ni, J., Yan, J., Yin, J., Yang, L., & Li, H. (2025). Impact of circadian rhythm preference on performance in China's standardized residency training: The mediating role of loneliness. *PLoS One*, 20(10), e0331551. doi:10.1371/journal.pone.0331551

Figures

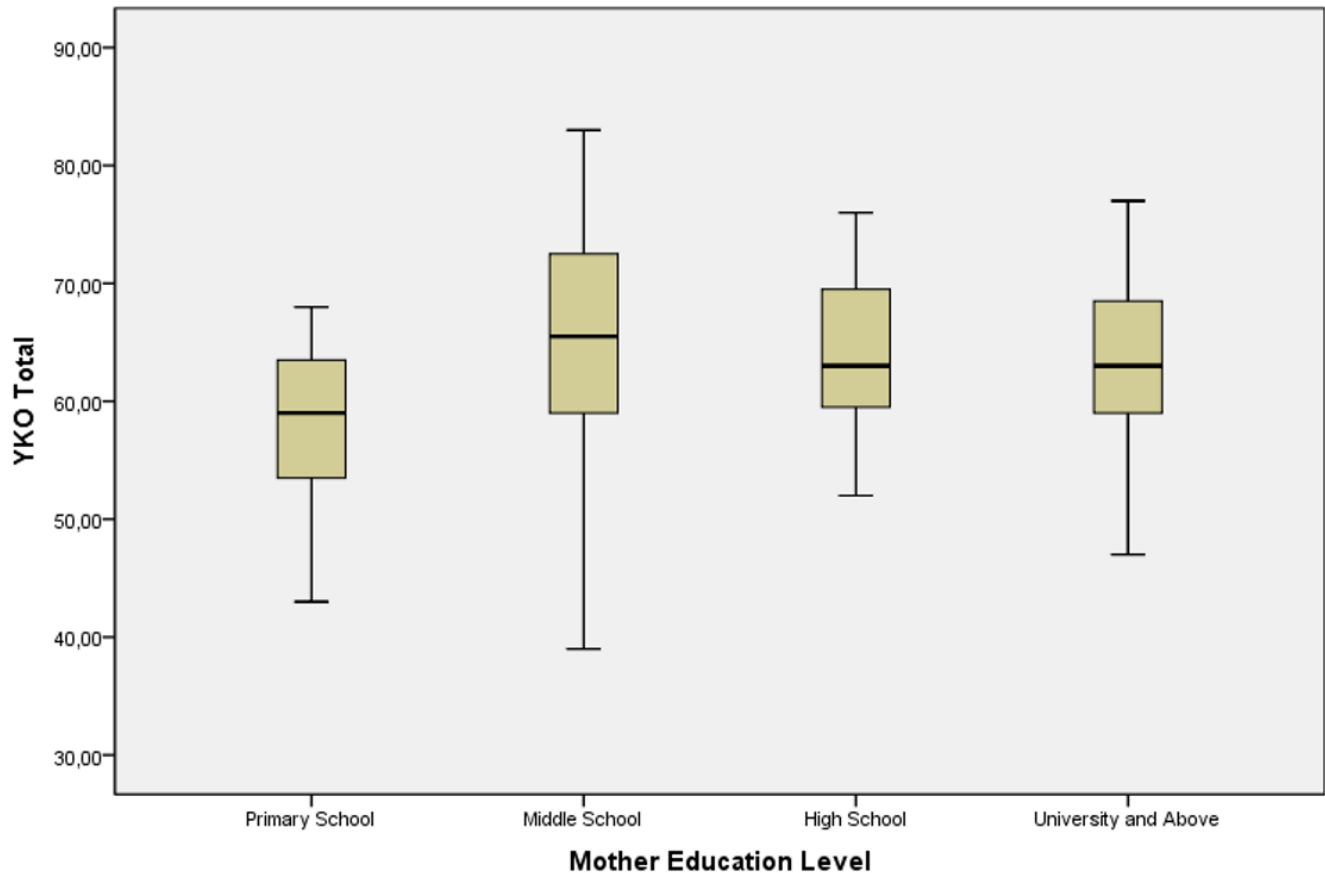


Figure 1

Distribution of Total CPTS Scores by Mother's Educational Level