

Research Article

Chronotype, Sleep Quality, and Academic Achievement of a University Students in Indonesia During Remote Learning

Nur Azizah¹, Hening Pujasari^{*2}

¹Undergraduate student at the Faculty of Nursing, Universitas Indonesia, Depok, Indonesia

²Department of Basic Nursing and Basic Nursing, Faculty of Nursing, Universitas Indonesia, Depok, Indonesia

***Corresponding Author:**

Hening Pujasari, S.Kp., M.Biomed., M.A.N.P., Ph.D

Department of Basic Nursing and Basic Nursing, Faculty of Nursing

Universitas Indonesia, Depok, Indonesia

Email: pujasari@ui.ac.id

ABSTRACT (ENGLISH)

Background: Chronotype, defined as an individual's biological preference for activity timing, has been shown to influence cognitive performance and engagement. Sleep quality, a critical determinant of mental and physical health, is likewise linked to academic outcomes.

Objective: This study investigates the relationship between chronotype, sleep quality, and academic achievement among undergraduate students at university in Indonesia.

Methods: Data were collected from 245 students from non-Jabodetabek regions using validated instruments: the Pittsburgh Sleep Quality Index (PSQI) and the Morningness-Eveningness Questionnaire (MEQ). Grade Point Average (GPA) served as the measure of academic performance.

Results: Results revealed that 80.8% of students experienced poor sleep quality, with 63.7% classified as intermediate chronotypes. Despite these challenges, 68.6% of students achieved good academic performance. Statistical analysis showed a significant association between chronotype and sleep quality ($p = 0.047$), but no significant relationship between chronotype and academic achievement ($p = 0.469$) or between sleep quality and academic achievement ($p = 0.593$). These findings align with recent literature suggesting that while chronotype and sleep quality influence well-being, their direct impact on academic performance may be moderated by other factors such as motivation, learning strategies, and institutional support.

Conclusion: The study underscores the importance of integrating chronobiological considerations into academic scheduling and student support services to enhance educational outcomes.

Keywords: Chronotype, Sleep Quality, Academic Achievement, Circadian Rhythms, Undergraduate Students

DOI: doi.org/10.xxxx/xxx

ABSTRAK (INDONESIA)

Latar Belakanag: Kronotipe didefinisikan sebagai preferensi biologis individu terhadap waktu beraktivitas. Kronotipe telah terbukti memengaruhi kinerja kognitif dan tingkat partisipasi mahasiswa terhadap proses pembelajaran. Kualitas tidur menjadi penentu penting bagi kesehatan fisik dan mental, yang juga memiliki hubungan signifikan dengan hasil akademik.

Tujuan: Penelitian ini bertujuan untuk menganalisis hubungan antara kronotipe, kualitas tidur, dan prestasi akademik di kalangan mahasiswa sarjana di perguruan tinggi di Indonesia.

Metode: Data dikumpulkan dari 245 mahasiswa yang berasal dari wilayah di luar Jabodetabek menggunakan Indeks Prestasi Kumulatif (IPK) sebagai ukuran kinerja akademik dan instrumen yang telah tervalidasi, yaitu Pittsburgh Sleep Quality Index (PSQI) serta Morningness-Eveningness Questionnaire (MEQ).

Hasil: Hasil penelitian menunjukkan bahwa 80,8% mahasiswa mengalami kualitas tidur yang buruk, dengan 63,7% di antaranya diklasifikasikan sebagai kronotipe menengah. Terlepas dari tantangan tersebut, 68,6% mahasiswa berhasil meraih prestasi akademik yang baik. Analisis statistik menunjukkan adanya hubungan yang signifikan antara kronotipe dan kualitas tidur ($p = 0,047$), tetapi tidak ada hubungan yang signifikan antara kronotipe dan prestasi akademik ($p = 0,469$) maupun antara kualitas tidur dan prestasi akademik ($p = 0,593$). Temuan ini sejalan dengan studi terbaru yang menunjukkan bahwa kronotipe dan kualitas tidur memang memengaruhi kesejahteraan diri, tetapi dampaknya secara langsung terhadap prestasi akademik masih dipengaruhi oleh faktor lain, seperti motivasi, strategi belajar, dan dukungan institusional.

Kesimpulan: Penelitian ini menekankan pentingnya untuk mengintegrasikan kronobiologi ke dalam penjadwalan akademik dan layanan dukungan mahasiswa untuk mengoptimalkan hasil pembelajaran

Kata kunci: Kronotipe, Kualitas Tidur, Prestasi Akademik, Ritme Sirkadian, Mahasiswa Sarjana

DOI: doi.org/10.xxxx/xx

Introduction

Sleep is a fundamental biological process that plays an important role in cognitive functioning, emotional regulation, and overall physical health. Among university students, inadequate sleep has been consistently associated with poorer academic performance, impaired memory consolidation, and increased psychological distress (Hassan et al., 2025; Nakie et al., 2024). Despite these established

associations, the extent to which sleep-related factors independently influence academic outcomes remains unclear, indicating the need for further investigation.

One factor that has gained increasing attention is chronotype, defined as an individual's natural preference for activity and rest within a 24-hour circadian cycle (Yuri et al., 2024; Liu et al., 2025). Chronotype is typically categorized into morning, intermediate, and

evening types. Morning-type individuals generally show higher alertness earlier in the day, whereas evening-type individuals tend to reach peak performance later. Previous studies have reported that evening chronotypes may demonstrate lower academic performance, particularly in settings with early-morning schedules (Singh et al., 2025; Alblewi & Mirghani, 2025). However, these findings should be interpreted cautiously, as they may also reflect a mismatch between students' biological rhythms and fixed academic schedules rather than inherent differences in ability.

This mismatch, often referred to as circadian misalignment, has been suggested as a contributing factor to reduced academic engagement and performance (Alblewi & Mirghani, 2025; Shimura, Sakai, & Inoue, 2022). Students with evening chronotypes may experience greater difficulty adapting to early class schedules, which can lead to increased absenteeism and reduced academic achievement (Arastoo et al., 2024; Yeo et al., 2021). Nevertheless, it is important to note that academic performance is a multifactorial outcome influenced by various factors beyond sleep and chronotype.

Indeed, existing evidence indicates that the relationship between sleep quality and academic performance tends to be relatively modest. A recent review reported relatively small effect sizes ($r = .03$ to $.15$), indicating that additional factors, such as motivation, study habits, and learning environments, may also

play important roles (Pahilan & Comahig, 2025). Therefore, sleep quality and chronotype should be considered as part of a broader set of variables influencing academic success, rather than as sole determinants (Altınöz et al., 2025; Santos Souza et al., 2025).

In Indonesia, research examining the relationship between chronotype, sleep quality, and academic performance is still limited. This gap is particularly relevant for students from non-metropolitan regions, who may face additional challenges such as limited access to digital resources, longer commuting times, and socio-cultural factors that affect daily routines. These conditions may influence sleep patterns and potentially contribute to differences in academic outcomes.

Based on these considerations, this study aims to examine the relationships among chronotype, sleep quality, and academic performance among university students in Indonesia, with a specific focus on those from non-Jabodetabek areas. By addressing this gap, the study is expected to provide a more contextually relevant understanding of student well-being and contribute to the development of strategies to support academic success.

Methods

Study Design and Participants

This study employed a cross-sectional, descriptive-analytical design to examine the relationships between chronotype, sleep quality, and academic achievement among

undergraduate students at a university in Indonesia. A total of 245 participants from non-Jabodetabek regions were recruited using convenience sampling. Inclusion criteria required participants to be actively enrolled in a regular undergraduate program and to provide informed consent for voluntary participation.

A cross-sectional design is a type of observational study that collects data on independent and dependent variables from research subjects at a single point in time. While descriptive-analytical designs are a research approach that not only measures and describes the prevalence of a condition within a population, but also analyses and tests the relationship between exposure variables and health outcomes simultaneously (Capili, 2021).

Data Collection and Measures

Data collection was conducted via an online survey comprising three components: (1) the Pittsburgh Sleep Quality Index (PSQI) to assess sleep quality, (2) the Morningness-Eveningness Questionnaire (MEQ) to determine chronotype, and (3) self-reported Grade Point Average (GPA) as a measure of academic performance. The PSQI is a widely used instrument with strong psychometric properties, demonstrating a Cronbach's alpha of 0.83 across its seven components (Buysse et al., 1989). The MEQ has also shown high internal consistency, with a Cronbach's alpha of 0.88 (Horne & Ostberg, 1976).

The PSQI global score ranges from 0 to 21,

with scores > 5 indicating poor sleep quality. For chronotype classification, MEQ scores were categorized into morning (≥ 59), intermediate (42–58), and evening (≤ 41) types. Academic performance was measured using GPA data extracted directly from the university's academic information system. For analysis, GPA scores were stratified into four levels: excellent (≥ 3.75), good (3.00–3.74), fair (2.50–2.99), and poor (< 2.50).

Data Analysis

Descriptive statistics were used to summarize demographic and categorical variables. Chi-square tests were employed to assess associations between chronotype, sleep quality, and academic achievement. Statistical significance was set at $p < .05$. All analyses were conducted using SPSS version 26. This methodological framework aligns with recent best practices in chronobiological and educational research (Alblewi et al., 2025; Fitzsimmons, Carter, & Scullin, 2026; Figueiredo & Kulari, 2025).

Ethical Considerations

This study was conducted in accordance with the Declaration of Helsinki and received ethical approval from the Health Research Ethics Committee (Approval No. KET-259/UN2.FI2.DI.2.I.PPM.00.02/2021).

Informed consent was obtained from all participants before the research began.

Results

The final sample consisted of 245 undergraduate students from a university in Indonesia, with a mean age of 20.77 years ($SD = 0.85$). The majority of participants were female (60.4%), in their seventh semester (52.2%), and from the 2018 cohort (52.7%). Ethnically, most students identified as Javanese (57.1%), lived in nuclear families (80.0%), and reported very high parental income (49.8%). Table 1 presents the demographic characteristics of the sample.

Regarding sleep quality, 80.8% of students were classified as having poor sleep ($PSQI > 5$), while only 19.2% reported good sleep quality. Chronotype distribution revealed that 63.7% of students were intermediate types, followed by morning types (24.9%) and evening types (11.4%). In terms of academic performance, 68.6% of students achieved a GPA categorized as good (3.00–3.74), with 27.3% classified as excellent (≥ 3.75). Table 2 summarizes the distribution of sleep quality, chronotype, and academic achievement.

Chi-square analyses were conducted to examine associations among chronotype, sleep quality, and academic achievement. The results indicated an association between chronotype and sleep quality, $\chi^2 (2, N = 245) = 6.13, p = .047$, suggesting that individuals with an evening chronotype were more likely to report poorer sleep quality. In contrast, no meaningful association was observed between chronotype and academic achievement, $\chi^2 (4, N = 245) = 3.03, p = .469$, nor between sleep quality and academic achievement, $\chi^2 (2, N = 245) = 1.05, p = .593$. These findings align with previous studies indicating that although chronotype and sleep quality may influence overall well-being, their direct contribution to academic performance is often shaped by other factors, such as motivation, learning strategies, and institutional context (Alblewi et al., 2025; Fitzsimmons, Carter, & Scullin, 2026; Figueiredo & Kulari, 2025). Table 3 presents the cross-tabulation and statistical outcomes.

Table 1. Distribution of Respondent Characteristics

Characteristics	Frequency (n)	Percentage (%)
Age (Mean, SD)	20,77	$\pm 0,85435$
Gender		
Male	97	39,6
Female	148	60,4
Semester		
3rd Semester	1	4
5th Semester	82	33,5
6th Semester	34	13,9
7th Semester	128	52,2
Faculty		

Health Science	82	33,5
Science and Technology	78	31,8
Social Sciences and Humanities	85	34,7
Academic Cohort		
Class of 2018	129	52,7
Class of 2019	116	47,3
Ethnicity		
Javanese	140	57,1
Minang	23	9,4
Sundanese	12	4,9
Others	70	28,6
Family Type		
Extended Family	49	20,0
Nuclear Family	196	80,0
Parental Income		
Very High	122	49,8
High	50	20,4
Moderate	48	19,6
Low	25	10,2

The data are presented as frequencies (n) and percentages (%) exception for the age variable, which were presented as the mean and standard deviation (M ± SD).

Table 2. Distribution of Respondents by Sleep Quality, Chronotype, and Academic Achievement

Variable	Frequency (n)	Percentage (%)
Sleep Quality		
Good (score ≤ 5)	47	19,2
Poor (score >5)	198	80,8
Chronotype		
Evening Type (score ≤ 41)	28	11,4
Intermediate Type (score 42-58)	156	63,7
Morning Type (score ≥ 59)	61	24,9
Academic Achievement		
Excellent	67	27,3
Good	168	68,6
Fair	9	3,7
Moderate	1	0,4

The data are presented as frequencies (n) and percentages (%). Poor sleep quality were classified as PSQI scores > 5.

Table 3. Association Between Sleep Quality, Chronotype, and Academic Achievement.

Variable	Sleep Quality				Total	<i>p value</i>	Academic Achievement						Total	<i>p value</i>
	Good		Poor				Excellent		Good		Fair			
	n	%	n	%			n	%	n	%	n	%		

Chronotype													
Evening Type	3	10,7	25	89,3	28		8	28,6	19	67,9	1	3,6	28
Intermediate Type	2	16,7	130	83,3	156	0.047	46	29,5	102	65,4	8	5,1	156
Morning Type	1	29,5	43	70,5	61		13	27,3	47	68,6	1	1,6	61
Sleep Quality													
Good							15	31,9	31	66,0	1	2,1	47
Poor							52	26,3	137	69,2	9	4,5	198

n = sample size; % = percentage; p = *p value* based on Chi-square test (χ^2). Significant at $p < .05$

Discussion

This study explored the interrelationships among chronotype, sleep quality, and academic achievement in a sample of undergraduate students from a university in Indonesia. The demographic profile of the participants—predominantly female, aged around 20.77 years, and from nuclear families with high socioeconomic status—reflects a relatively privileged academic population. These characteristics are important contextual factors, given that socioeconomic advantage has been linked to greater access to academic resources, healthier sleep environments, and stronger academic support systems (Rakesh et al., 2025). The demographic consistency with national trends in higher education enrolment further supports the generalizability of the findings within similar academic contexts in Indonesia.

The high prevalence of poor sleep quality (80.8%) among participants aligns with global findings indicating widespread sleep

disturbances among university students (Schmickler et al., 2025). This trend is often attributed to academic stress, irregular schedules, and excessive screen exposure, which disrupt circadian rhythms and melatonin secretion (Khare et al., 2021). The dominance of intermediate chronotypes (63.7%) is consistent with chronobiological patterns observed in young adult populations worldwide (Wei & Praharaj, 2019). However, the significant association between chronotype and sleep quality observed in this study reinforces the vulnerability of evening chronotypes to circadian misalignment and sleep disruption (Singh et al., 2025; Wang et al., 2024).

Despite the high incidence of poor sleep, a substantial proportion of students (68.6%) achieved good academic performance. This finding challenges the assumption that sleep quality is a direct predictor of academic success. The absence of significant associations between either chronotype or sleep quality and academic achievement is consistent with recent

meta-analyses that report small effect sizes ($r = .03$ to $.15$) in this domain (Pahilan & Comahig, 2025). These results suggest that academic performance is influenced by a complex constellation of factors, including biological rhythms (sleep and circadian preferences), environmental influences, sociocultural dynamics, and cognitive training (Gallego-Gómez et al., 2021; Novita, Alam, & Sujadi, 2024; Wang et al., 2025; Looney et al., 2024).

Academic success can be affected by a various factors, other than the quality of sleep alone. Internal factors such as physical condition, emotional intelligence, personality, memory, concentration and students' intrinsic motivation can also influence it. Individuals with a high GPA tend to be encouraged by the motivation to complete tasks for their own sake and strive to do well in every examination to achieve the best possible results, thereby maintaining a high GPA (Stavropoulou, Daniilidou, & Nerantzaki, 2025). External factors that can influence a person's academic achievement include family income, family size, family and community support, social issues, class characteristics, and teacher characteristics (Jalali et al., 2020).

One plausible explanation for the resilience in academic performance is the role of adaptive learning strategies and institutional flexibility. The availability of asynchronous learning formats, recorded lectures, and flexible assessment schedules may have allowed students—particularly those with evening chronotypes—to align academic tasks with

their peak cognitive periods (Figueiredo & Kulari, 2025; Staller et al., 2021). This alignment may mitigate the negative effects of circadian misalignment, enabling students to perform well despite suboptimal sleep patterns (Horzum, Önder, & Beşoluk, 2014). Moreover, students with high self-regulatory capacity, strong academic motivation, and effective time management skills may compensate for sleep-related deficits through strategic academic behaviors (Gallego-Gómez et al., 2021; Novita, Alam, & Sujadi, 2024; Wang et al., 2025).

The findings also underscore the importance of considering environmental and psychological moderators. Factors such as emotional support, stress management, and access to quiet study environments can significantly influence both sleep quality and academic outcomes (Hassan et al., 2025; Gallego-Gómez et al., 2021; Benjamin et al., 2024). For instance, students from supportive households may experience lower stress levels and better sleep hygiene, contributing to academic resilience. Conversely, students facing psychosocial stressors or living in disruptive environments may be more susceptible to sleep disturbances and academic difficulties, regardless of chronotype (Hu et al., 2024; Zavidíć et al., 2026).

In sum, this study contributes to a growing body of literature emphasizing the multifactorial nature of academic achievement. While chronotype significantly influences sleep quality, its direct impact on academic performance appears limited in the presence of

compensatory mechanisms such as motivation, institutional support, and environmental stability. These findings advocate for the integration of chronobiological awareness into academic policy, including flexible scheduling and sleep education programs. Future research should adopt longitudinal designs, incorporate objective sleep measures (e.g., actigraphy), and examine the interplay of psychological, social, and environmental variables to better understand the dynamics of student well-being and academic success.

Conclusion

This study found that while chronotype significantly influenced sleep quality, neither chronotype nor sleep quality was directly associated with academic achievement among university students in Indonesia originating from non-Jabodetabek regions. The findings suggest that students exhibit academic resilience despite experiencing poor sleep, likely due to compensatory factors such as motivation, adaptive learning strategies, and institutional flexibility. These results align with emerging literature emphasizing the multifactorial nature of academic success.

Limitation

As this study was only focused on undergraduate students, the findings cannot be generalized to higher or lower academic levels. Future studies should include a more generalized sample of students and explore longitudinal patterns of chronotype and sleep behavior, incorporate objective sleep measures,

and examine the role of psychological and environmental moderators. Universities are encouraged to integrate chronotype-aware scheduling and comprehensive sleep wellness programs into student support services to optimize both learning outcomes and holistic well-being.

Funding Statement

This research was conducted without external funding support.

Conflict of Interest

None declared.

Data Availability

Data that supports the findings of this study could be obtained from the corresponding author upon reasonable request.

Author Contributions

Nur Azizah: Conceptualization, methodology, data collection, data analysis, drafted the manuscript, revised the manuscript

Hening Pujasari: Methodology, supervision, validation, review and editing

References

- Alblewi, S. M., & Mirghani, H. (2025). Chronotype's effect on academic achievement and absence from classrooms and clinical sessions among clinical phase medical students at the Faculty of Medicine, University of Tabuk, Saudi Arabia. *Frontiers in Psychology*, 16.

- 98
<https://doi.org/10.3389/fpsyg.2025.16645>
- Altınöz, Ş. T., Tarlacık, L. D., Engin, E., Uzel, Y., Doğan, U., & Altınöz, A. E. (2025). Unraveling the role of dysfunctional sleep beliefs: How chronotype shapes sleep quality and academic success in medical students. *World Journal of Psychiatry, 15*(11).
<https://doi.org/10.5498/wjp.v15.i11.1095>
66
- Arastoo, H. S., Ghalehbandi, M. F., Alavi, K., Kashaninasab, F., & Nojomi, M. (2024). Comparison of Chronotypes and their Relationship with Academic Performance and Quality of Life in University Students. *Sleep Science, 17*(02), e157–e165. <https://doi.org/10.1055/s-0043-1777776>
- Benjamin, L. S., Pasay-an, E., Pangket, P., Alqarni, A., Gonzales, F., Sacgaca, L., Mahmoud, D. A., Mohsen, M., Ali Hamdi, Y. S., & Shanmugam, S. R. (2024). Impact of Sleep and Psychological Well-Being on the Academic and Clinical Performance of Nursing Students in Saudi Arabia. *Psychology Research and Behavior Management, Volume 17*, 1355–1364.
<https://doi.org/10.2147/PRBM.S453685>
- Buyse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Research, 28*(2), 193–213. [https://doi.org/10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4)
- Capili B. (2021). Cross-Sectional Studies. *The American journal of nursing, 121*(10), 59–62.
<https://doi.org/10.1097/01.NAJ.0000794280.73744.fe>
- Figueiredo, S., & Kulari, G. (2025). Sleep Preferences and Chronotype Traits Impact on Academic Performance Among University Students. *European Journal of Educational Research, 14*(1), 895–909. <https://doi.org/10.12973/euler.13.3.895>
- 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. *Advances in Physiology Education, 50*(2), 394–401.
<https://doi.org/10.1152/advan.00313.2025>
- Gallego-Gómez, J. I., González-Moro, M. T. R., González-Moro, J. M. R., Vera-Catalán, T., Balanza, S., Simonelli-Muñoz, A. J., & Rivera-Caravaca, J. M. (2021). Relationship between sleep habits and academic performance in university Nursing students. *BMC Nursing, 20*(1), 100. <https://doi.org/10.1186/s12912-021-00635-x>
- Hassan, S., M Alqahtani, N., M Alshahrani, S., A Alhefzy, A., Alharthi, O., & Alharbi, M. (2025). Association Between Sleep Quality and Academic Performance Among Undergraduate Medical Health Sciences Students: A Cross-Sectional Study. *Cureus.*
<https://doi.org/10.7759/cureus.91548>

- Horzum, M. B., Önder, İ., & Beşoluk, Ş. (2014). Chronotype and academic achievement among online learning students. *Learning and Individual Differences, 30*, 106–111. <https://doi.org/10.1016/j.lindif.2013.10.017>
- Hu, B., Wu, Q., Wang, Y., Zhou, H., & Yin, D. (2024). Factors associated with sleep disorders among university students in Jiangsu Province: a cross-sectional study. *Frontiers in Psychiatry, 15*. <https://doi.org/10.3389/fpsyt.2024.12884>
- Horne, J. A., & Ostberg, O. (1976). A self-assessment questionnaire to determine morningness-eveningness in human circadian rhythms. *International journal of chronobiology, 4*(2), 97–110.
- Jalali, R., Khazaei, H., Paveh, B. K., Hayrani, Z., & Menati, L. (2020). The Effect of Sleep Quality on Students' Academic Achievement. *Advances in medical education and practice, 11*, 497–502. <https://doi.org/10.2147/AMEP.S261525>
- Khare, R., Mahour, J., Ohary, R., & Kumar, S. (2021). Impact of online classes, screen time, naps on sleep, and assessment of sleep-related problems in medical college students during lockdown due to coronavirus disease-19 pandemic. *National Journal of Physiology, Pharmacy and Pharmacology, 11*(1), 1. <https://doi.org/10.5455/njppp.2021.10.09235202006092020>
- Liu, Y., Liu, Q., Gao, B., Fu, Q., Li, F., Ma, Y., & Liu, Y. (2025). Chronotype, cognitive outcomes, and neural dynamics: recent evidence and potential mechanisms with implications for perioperative period. *Frontiers in Neuroscience, 19*. <https://doi.org/10.3389/fnins.2025.1649396>
- Looney, L., Wong, E. H., Rosales, K. P., Bacon, J. M., & Wiest, D. J. (2024). Supporting Learning Differences: Effects of Cognitive Training on Cognitive Abilities in a School-Based Sample. *Education Sciences, 14*(1), 89. <https://doi.org/10.3390/educsci14010089>
- Nakie, G., Takelle, G. M., Rtbey, G., Andualem, F., Tinsae, T., Kassa, M. A., Tadesse, G., Fentahun, S., Wassie, Y. A., Segon, T., Kibralew, G., & Melkam, M. (2024). Sleep quality and associated factors among university students in Africa: a systematic review and meta-analysis study. *Frontiers in Psychiatry, 15*. <https://doi.org/10.3389/fpsyt.2024.1370757>
- Nora Novita, Masnur Alam, & Eko Sujadi. (2024). College Student Learning Preparedness: Do Time Management Skills and Sleep Quality Matter? *EduLine: Journal of Education and Learning Innovation, 4*(3), 386–396. <https://doi.org/10.35877/454RI.eduline2632>
- Pahilan, L., & Comahig, A. (2025). Study Habits, Learning Environment and Mathematics Performance of Grade 11 STEM Students. *Psychology and Education: A Multidisciplinary Journal*,

- 39(2), 200–214.
<https://doi.org/10.70838/pemj.390208>
- Rakesh, D., Lee, P. A., Gaikwad, A., & McLaughlin, K. A. (2025). Annual Research Review: Associations of socioeconomic status with cognitive function, language ability, and academic achievement in youth: a systematic review of mechanisms and protective factors. *Journal of Child Psychology and Psychiatry*, 66(4), 417–439.
<https://doi.org/10.1111/jcpp.14082>
- Santos Souza, S., Sacramento de Brito, K., Modesto de Amorim, G., Fontenele-Araujo, J., & Duarte, L. L. (2025). Sleep quality, chronotype and academic performance of university students in the health area. *Biological Rhythm Research*, 56(1), 31–44.
<https://doi.org/10.1080/09291016.2024.2437643>
- Schmickler, J. M., Blaschke, S., Mess, F., Olson, N., Reiner, B., Schulz, T., & Friedrich, J. (2025). Sleep in the academic sphere: identifying sleep profiles and their influencing factors using latent profile analysis in German university students. *BMC Psychology*, 13(1), 907.
<https://doi.org/10.1186/s40359-025-03280-0>
- Shimura, A., Sakai, H., & Inoue, T. (2022). Paradoxical association between chronotype and academic achievement: eveningness reduces academic achievement through sleep disturbance and daytime sleepiness. *Sleep and Biological Rhythms*, 20(3), 353–359.
<https://doi.org/10.1007/s41105-022-00375-8>
- Singh, A., Pande, B., Sinha, M., & Sinha, R. (2025). Exploring the learning process in college students: Impact of morning and evening chronotypes. *Medical Journal Armed Forces India*.
<https://doi.org/10.1016/j.mjafi.2025.02.001>
- Staller, N., Großmann, N., Eckes, A., Wilde, M., Müller, F. H., & Randler, C. (2021). Academic Self-Regulation, Chronotype and Personality in University Students During the Remote Learning Phase due to COVID-19. *Frontiers in Education*, 6.
<https://doi.org/10.3389/feduc.2021.681840>
- Stavropoulou, G., Daniilidou, A., & Nerantzaki, K. (2025). Exploring the Interplay of Motivation, Self-Efficacy, Critical Thinking, and Self-Regulation in Predicting Academic Achievement Among University Students. *F1000Research*, 14, 344.
<https://doi.org/10.12688/f1000research.161821.2>
- Wang, L., Huo, Y., Yao, L., Zhang, N., Ma, S., Nie, Z., Wang, W., Zhou, E., Xu, S., Weng, S., Xiang, D., Hu, M., & Liu, Z. (2024). Association of evening chronotype, sleep quality and cognitive impairment in patients with major depressive disorder. *Frontiers in Psychiatry*, 15.
<https://doi.org/10.3389/fpsy.2024.1494032>
- Wang, M., Chen, Z., Han, N., & Yao, H.

- (2025). Sleep duration and subject-specific academic performance among adolescents in China. *Npj Science of Learning*, 10(1), 71. <https://doi.org/10.1038/s41539-025-00361-y>
- Wei, N., & Praharaj, S. (2019). Chronotypes and its association with psychological morbidity and childhood parasomnias. *Indian Journal of Psychiatry*, 61(6), 598. https://doi.org/10.4103/psychiatry.IndianJPsychiatry_208_19
- Yeo, S. C., Tan, J., Lai, C. K. Y., Lim, S., Chandramoghan, Y., Fung, F. M., Chen, P., Strauman, T. J., & Gooley, J. J. (2021). *University-wide chronotyping shows late-type students have lower grades, shorter sleep, poorer well-being, lower self-regulation, and more absenteeism.* <https://doi.org/10.1101/2021.08.04.455177>
- Yuri, G., Chamorro, R., Tobar, N., & Cifuentes, M. (2025). The human chronotype: A multidimensional construct at the crossroad of physiology and behavior, with important health implications. *Sleep Medicine Reviews*, 83, 102142. <https://doi.org/10.1016/j.smrv.2025.102142>
- Zavidić, T., Dejhalla, E., Lesac Brizić, A., Čulina, T., & Popović, B. (2026). The Prevalence of Sleep Disturbances and Anxiety Among Croatian University Students: Possible Association with Lifestyle Factors and COVID-19. *Journal of Clinical Medicine*, 15(6), 2157. <https://doi.org/10.3390/jcm15062157>