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Perceived stress and academic achievement among medical students with different chronotypes: a cross sectional study on first year medical students from India

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Abstract

Background Chronotype, which denotes an individual's preference for morning or evening activity patterns, has been linked to variations in cognitive performance, sleep behavior, and stress levels. This study investigates the association between chronotype, perceived stress, and academic performance among first-year medical students.

Methods A cross-sectional descriptive study was conducted among 148 medical students at a private university. Chronotype was assessed using the Munich Chronotype Questionnaire (MCTQ), and perceived stress was measured using the Perceived Stress Scale (PSS). Academic performance was categorized into "Excellent" (marks > 65%) and "Average" (marks < 55%). Statistical analyses included independent t-tests, chi-square tests to evaluate differences and associations.

Results Morning chronotypes demonstrated significantly higher academic performance, with 49.1% in the "Excellent" group compared to 29% of Evening chronotypes ($p = .03$). Perceived stress scores were significantly higher among Evening chronotypes (24.9 ± 12.1) than Morning chronotypes (20.7 ± 9.3, $p = .028$). Furthermore, Evening chronotypes exhibited longer sleep latency (41.17 ± 13.35 min vs. 14.49 ± 12.14 min, $p < .001$) and greater variability in weekend sleep schedules ($p < .001$). Gender differences in stress and academic performance were minimal and not statistically significant.

Conclusion Chronotype significantly affects academic performance and stress levels among medical students, with Morning types performing better academically experiencing less stress. Tailored strategies like flexible scheduling and sleep hygiene promotion can help Evening chronotypes overcome challenges, improving academic outcomes and psychological well-being.

Keywords Sleep pattern, Morningness, Eveningness, High achievers

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Background

Chronotype refers to an individual's endogenous predisposition for activity and rest at specific times within the 24-hour cycle, primarily governed by the circadian system. It determines the preferred timing of sleep, wakefulness, and other physiological and behavioral rhythms. Chronotype is influenced by genetic, environmental, and social factors and plays a significant role in cognitive performance, mental and physical health, and overall well-being [1].

Chronotype can be conceptualized in two primary ways: 1. Chronotype as a Preference (Subjective Morningness-Eveningness). This often measured by self-report questionnaires like the Horne-Östberg Morningness-Eveningness Questionnaire (MEQ), defines chronotype based on an individual's preferred time of day for cognitive and physical performance. Morning types ("larks") feel more alert and perform better in the early part of the day, while evening types ("owls") experience peak performance later in the evening. The intermediate chronotype, also known as the neither or the neutral type, has no morning or evening preference as such are referred to ("humming birds") [2]. This view is subjective, focusing on what an individual perceives as their ideal or preferred schedule rather than their actual sleep-wake behavior.

2. Chronotype as Actual Sleep Timing (Objective Behavioral Assessment). This approach, utilized by the Munich ChronoType Questionnaire (MCTQ), defines chronotype based on an individual's actual sleep-wake patterns, particularly the midpoint of sleep on free days (MSFsc, sleep-corrected). Unlike preference-based measures, this method considers real-life constraints, such as work schedules and social obligations, to determine an individual's natural sleep timing. Chronotype is thus operationalized as the midpoint between sleep onset and wake time on days without external constraints, providing a more objective and behaviorally grounded measure.

An individual's chronotype like a spectrum, lies on a continuum between the two extremes of morning type and evening type [3]. However, the circadian preference or chronotype might not always match with the actual sleep timing owing to the regular lifestyle activities of an individual [4].

The circadian time keeping system or the biological "clock" helps organisms anticipate and adapt to day-night environmental changes, ensuring appropriate behavior (including sleep, feeding pattern for example) at the right time. Multiple circadian rhythms maintain internal synchronization and internal temporal order, coordinating physiological processes efficiently [5]. The two-process model of sleep regulation suggests that sleep timing and structure result from the interaction between a homeostatic mechanism and a circadian rhythm [6].

The distribution of chronotypes in the general population follows a normal (Gaussian) distribution, with most individuals falling in the intermediate type and fewer people at the extremes (strong morning or evening types). Chronotypes shift throughout life; small children are relative morning larks, adolescents and young adults more likely to be evening types, middle-aged adults tend to shift toward intermediate types and older adults (more than 60 years) again have a shift towards morningness [7].

Previous meta-analyses have shown that morningness is positively correlated with academic achievement in students, while eveningness tends to negatively correlate with academic outcomes. The correlation between evening chronotype and poor academic performance was seen to become weaker in university students in comparison to high school students [8]. However, Roser et al. observed no direct influence of chronotype on school performance [9]. Additionally, Diaz Morales et al. reported that morning types often set higher learning and performance goals, while Short et al. found that evening types may experience lower sleep quality, depressed moods, and reduced alertness [10, 11]. A contrasting study from a university in Saudi Arabia revealed no correlation between chronotypes and cumulative grades in medical students [12].

Research indicates that stress negatively impacts academic achievement, though there is limited literature connecting perceived stress to different chronotypes and its influence on academic performance [13]. This study aims to evaluate morningness and eveningness in first-year medical students through a standardized sleep pattern questionnaire, to examine the association between chronotype, perceived stress, and academic performance, and to analyze stress and academic achievement across different chronotype groups.

Methods

Study design and setting This cross sectional study was conducted over a period of two months among first-year medical students at a private university, as part of a project for the Advanced Medical Education Training Course, 2019. The project has been presented and submitted to the Medical Education Unit of Sriher University, Chennai, an affiliated nodal center of National Medical Council of India.

Participants Following approval from the Institutional Ethics Committee, all students were briefed on the study's purpose and methodology. The study adhered to the Declaration of Helsinki and Informed consent was taken from all the participants. Only students who consented were included, while those with chronic diseases affecting sleep or those who smoked were excluded.

Study tools Data on sleep patterns were collected using the validated Munich Chronotype Questionnaire (MCTQ) over a one-month period [14]. The MCTQ collected averages for weekday and weekend bedtimes, wake times, subjective sleep durations, time taken to fall asleep, and variations between weekday and weekend sleep-wake schedules. This questionnaire was chosen over others for its ability to assign an internal clock time, allowing better understanding of internal and external time interactions. The MCTQ offers a continuous chronotype measure based on a preference or a time-based variable, enabling population-specific threshold definitions for categorizing chronotypes [15]. Chronotype was calculated using an established equation [16]. Most of the earlier studies have used the MCTQ scores as continuous parameter and used correlation coefficient or regression analysis models with other variables. In this study, the categorization of chronotypes as early chronotypes and late chronotypes has been made with MSFsc (Mid sleep time on free days corrected for sleep debts on work days) cutoff value of 4.28 according to Kuhnle, 2006. Individuals with MSFSc ≤ 4.28 classified as early chronotypes and individuals with MSFSc > 4.28 classified as late chronotypes. This cutoff allows for distinguishing between earlier and later chronotypes while minimizing biases caused by extreme chronotype overestimations [17].

To assess perceived stress, the validated Perceived Stress Scale (PSS) questionnaire, consisting of 10 items on a five-point Likert scale (0 = never to 4 = very often), was used to gauge stress levels over the prior month. The scores are reversed for item numbers 4, 5, 7 and 8 and then all scores of each item are added up. Individual total scores on the PSS can range from 0 to 40 with higher total scores indicating higher perceived stress. Scores ranging from 0 to 13 would be considered mild stress, scores ranging from 14 to 26 would be considered moderate stress, and scores ranging from 27 to 40 would be considered high perceived stress [18]. Students completed both questionnaires during regular curricular activities.

According to National Medical Council of India, the passing percentage of an undergraduate medical student is 50%. In this study, we have included students who have passed the previous semester examination keeping more than 50%. Academic performance data were obtained from the previous semester's results and categorized into "Excellent (Marks in % > 65)" "Good (Marks in % 55–65)" and "Average (Marks in % < 55)" groups. For analysis, only students from the Excellent and Average groups were selected, as the Good group could overlap with either group. Of 151 first-year students, 148 participated, with three students declining consent and 46 categorized as "Good" performers.

Statistical analysis Each variable in the data set was tested for normality distribution using Shapiro-Wilk test and graphical representation of histogram. The p value for all the variables namely MSFsc, PSS Scores, and mark percentage were greater than 0.05 suggesting all the variables in the data set are normally distributed. Data are presented as means ± SD. Independent unpaired t-tests were used to compare sleep variables and perceived stress scores between the Excellent and Average groups. Categorical variables are expressed as percentages, and chi-square tests were applied as needed. A p-value < 0.05 was considered statistically significant. Analysis was conducted using SPSS software, version 20.

Results

The study included 102 first-year medical students, out of an initial 151, after excluding students who did not consent or who fell within the "Good" performance group. Among the remaining students, 54 were classified as Excellent performers, while 48 were categorized as Average performers. As per Kühnle T, MSfsc < 2.17 are the extremely morning chronotype, MSFsc between 2.17 and 7.25 are the intermediate chronotype and MSFsc > 7.25 are the extremely evening types. This sample had 17 extremely morning chronotype, 39 extremely evening chronotype with remaining 92 in the intermediate chronotype. In this study, morning and evening chronotype have been categorized with MSFsc < 4.28 (55) and ≥ 4.28 respectively (93).

Figure 1 represents the distribution of chronotype across different perceived stress levels, academic performances and genders. A significantly higher number of participants with evening chronotype experienced severe perceived stress in comparison to the morning chronotype. The excellent performers were equal in number for both the chronotypes but a higher number of average performers were of the evening chronotype.

Chronotype distribution and academic performance

Students with a chronotype score below 4.28 were considered Morning chronotypes, while those with a score at or above 4.28 were classified as Evening chronotypes. Results indicated that students in the Average performance group showed a stronger tendency towards an Evening chronotype compared to those in the Excellent performance group, who exhibited a preference for Morning hours (p = .04).

Sleep-wake variables and statistical comparisons

Table 1 displays the mean values and significance levels for sleep-wake variables, including weekday and weekend wake-up times, bedtimes, sleep duration, and latency measures. Significant differences were noted in various parameters between the Excellent and Average

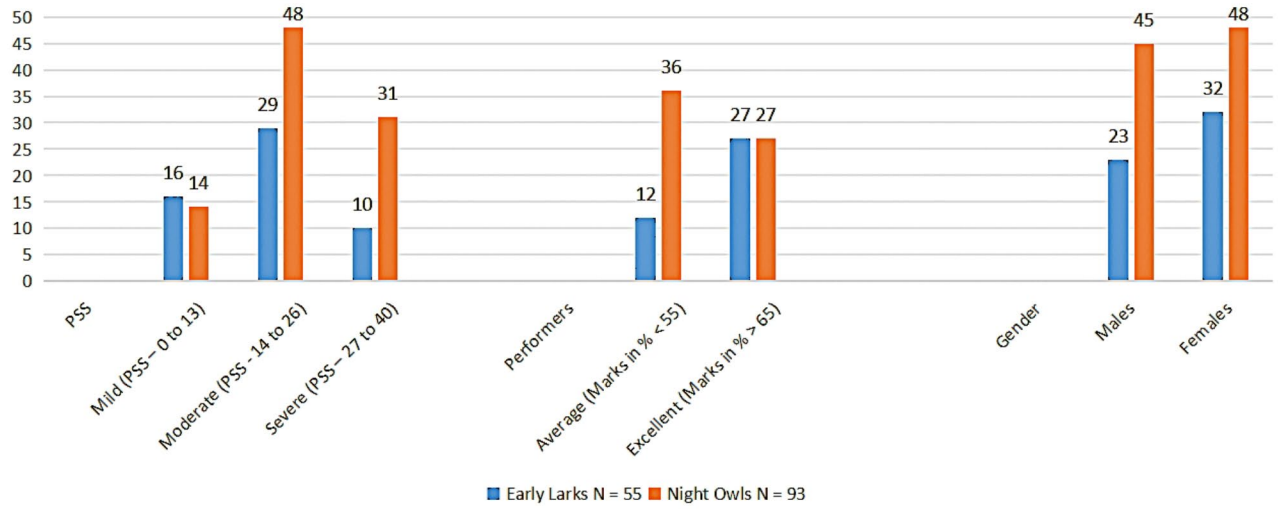

Fig. 1 Distribution of chronotype across different perceived stress levels, academic performances and genders

Table 1 Difference in sleeping variables and Perceived Stress Score in Excellent and Average Performers

	Excellent Students (54)	Average Students (48)	t–value	*P* value
Age	19.6 ± 1.8	19.9 ± 1.3	0.95	0.34
Week day Wake up time	6.40 ± 2.7	7.37 ± 1.9	2.07	0.04*
Week day Bed time	23.30 ± 1.52	24.27 ± 2.34	2.5	0.014*
Week day Sleep duration	7.10 ± 2.5	7.10 ± 3.17	0.00	1.00
Week end Wake up time	8.47 ± 2.12	11.33 ± 1.41	7.9	< 0.001*
Week end Bed time	24.33 ± 1.31	26.07 ± 1.39	6.5	< 0.001*
Week end Sleep duration	8.14 ± 3.13	9.26 ± 2.26	2.05	0.04*
Chronotype	3.74 ± 1.41	4.39 ± 1.78	2.05	0.04*
Lag in Bed time between weekends & week days	1.03 ± 1.02	1.40 ± 1.3	1.6	0.11
Delay in Wake up time between weekends & week days	2.07 ± 1.41	3.55 ± 1.45	5.22	< 0.001*
Sleep Latency in minutes	14.49 ± 12.14	41.17 ± 13.35	10.6	< 0.001*
Wake up Latency in minutes	9.20 ± 3.30	11.30 ± 5.2	2.5	0.02*
Perceived Stress Score	17.8 ± 8.2	24.7 ± 9.5	3.93	< 0.001*

*Statistically Significant

performance groups. For instance, Excellent performers had earlier weekday wake-up times (6:40 AM ± 2.7) than Average performers (7:37 AM ± 1.9, $p = .04$). Additionally, bedtime was earlier among Excellent students on weekdays (11:30 PM ± 1.52) compared to Average students (12:27 AM ± 2.34, $p = .014$).

A similar pattern emerged for weekend wake-up times, with Excellent performers waking up significantly earlier (8:47 AM ± 2.12) than Average performers (11:33 AM ± 1.41, $p < .001$). Weekend bedtimes also followed this trend, with Excellent students going to bed at 12:33 AM ± 1.31, while Average performers went to bed around 2:07 AM ± 1.39 ($p < .001$). Additionally, weekend sleep duration was notably longer among Average performers (9.26 h ± 2.26) than Excellent performers (8.14 h ± 3.13, $p = .04$. Other measures, such as sleep and wake-up latency, were also significantly different between the groups. Sleep latency was much longer for Average performers (41.17 min ± 13.35) compared to Excellent performers (14.49 min ± 12.14, $p < .001$), suggesting difficulties with initiating sleep in the Average group. Wake-up latency showed a similar pattern, with Average students taking longer to become fully awake (11.30 min ± 5.2) than Excellent students (9.20 min ± 3.30, $p = .02$).

Perceived stress scores

The perceived stress scores (PSS) were significantly higher among Average performers (24.7 ± 9.5) compared to Excellent performers (17.8 ± 8.2, $p < .001$), as shown in Table 1. This substantial difference suggests that higher stress levels may be associated with lower academic performance. The majority of participants, regardless of performance category, exhibited moderate stress levels, but those with Evening chronotypes showed notably higher perceived stress.

Chronotype and perceived stress scores among all participants

When all 148 students were considered, 37.16% were identified as Early Larks, while 62.84% were classified as

Table 2 Comparison of percentage of total marks and perceived stress score among the two chronotypes

	Early Larks (55)	Night Owls (93)	T value	*P* Value
Total Marks %	**57.1 ± 14.3**	**52.7 ± 12.2**	**1.99**	**0.048***
PSS	**20.7 ± 9.3**	**24.9 ± 12.1**	**2.21**	**0.028***

*Statistically significant PSS– Perceived stress score

Table 3 Gender wise comparison of percentage of total marks, perceived stress score and chronotypes

	Females (80)	Males (68)	T value	*P* Value
Total Marks %	**58.3 ± 13.2**	**54.1 ± 12.5**	**1.98**	**0.05**
PSS	**24.4 ± 12.5**	**20.3 ± 14.3**	**1.86**	**0.06**
Chronotypes	**4.02 ± 2.11**	**4.38 ± 1.69**	**1.13**	**0.26**

*Statistically significant PSS– Perceived stress score

Table 4 Association of chronotype with perceived stress, performance and gender

	Early Larks *N* = 55 (%)	Night Owls *N* = 93 (%)	χ^2	*P* Value
PSS				
Mild (PSS– 0 to 13)	16 (29.1)	14 (15.1)	6.23	0.04*
Moderate (PSS – 14 to 26)	**29 (52.7)**	**48 (51.6)**		
Severe (PSS– 27 to 40)	**10 (18.2)**	**31 (33.3)**		
Performers				
Average (Marks in % < 55)	**12 (21.8)**	**36 (38.7)**	**6.96**	**0.03***
Good (Marks in % 55–65)	**16 (29.1)**	**30 (32.3)**		
Excellent (Marks in % > 65)	**27 (49.1)**	**27 (29.0)**		
Gender				
Males	**23 (41.8)**	**45 (48.4)**	**0.60**	**0.44**
Females	**32 (58.1)**	**48 (51.6)**		

*Statistically significant PSS– Perceived stress score

Night Owls. Table 2 summarizes the comparison of total percentage marks and perceived stress scores between the Early and Evening chronotype groups. Although the difference in total marks was minor, it was statistically significant, with Early Larks achieving slightly higher average marks (57.1% ± 14.3) compared to Night Owls (52.7% ± 12.2, $p = .048$). Perceived stress scores were also significantly higher in the Night Owl group (24.9 ± 12.1) than in the Early Lark group (20.7 ± 9.3, $p = .028$), indicating that Evening chronotypes tend to experience more stress.

Gender differences in academic performance, perceived stress, and chronotype

Table 3 Compares male and female students across total marks, perceived stress scores, and chronotype values. No statistically significant differences were found in total percentage marks ($p = .05$) or perceived stress scores ($p = .06$) between males and females. Chronotype scores were also similar between genders, with males averaging a chronotype score of 4.38 ± 1.69 and females scoring 4.02 ± 2.11 ($p = .26$). This suggests that gender May not significantly influence academic performance, stress levels, or chronotype distribution within this sample.

Association of chronotype with perceived stress levels and academic performance

Table 4 illustrates the associations between chronotype and perceived stress levels, academic performance, and gender distribution. A chi-square test revealed a statistically significant association between chronotype and perceived stress levels ($\chi^2 = 6.23$, $p = .04$). Specifically, among Early Larks, 29.1% reported mild stress, while only 15.1% of Night Owls fell into this low-stress category. Conversely, a higher proportion of Night Owls (33.3%) reported severe stress compared to Early Larks (18.2%).

An association was also found between chronotype and academic performance ($\chi^2 = 6.96$, $p = .03$). A larger percentage of Average performers were Evening chronotypes (38.7%) compared to Excellent performers (21.8%). The distribution of Excellent performers was notably higher in the Early Lark group (49.1%) than among Night Owls (29.0%). No significant association was observed between gender and chronotype ($\chi^2 = 0.60$, $p = .44$).

Discussion

This study aimed to explore the relationship between chronotype, perceived stress, and academic performance in first-year medical students. The results show a notable association between these variables, with Morning chronotypes (Early Larks) tending to perform better academically and experiencing lower levels of stress compared to Evening chronotypes (Night Owls). These findings highlight the potential impact of chronotype on students' ability to meet the academic and psychological demands of medical education.

Chronotype and academic performance

Our study revealed that Morning chronotypes exhibited significantly higher academic performance than Evening chronotypes, as evidenced by their average scores and greater representation in the "Excellent" performance category. This relationship aligns with previous studies showing that Morning chronotypes tend to have better academic outcomes. For example, research by Escribano & Diaz Morales et al. suggests that Morning types often set higher academic and performance goals, which may contribute to their success [10]. In contrast, Evening chronotypes may face difficulties adapting to the standard early start times of academic schedules, which can lead to a decrease in alertness and cognitive functioning during peak study hours [19]. One plausible explanation for these differences lies in the alignment between circadian preferences and academic routines. Most educational schedules are structured to start early, which aligns well with the biological rhythms of Morning

chronotypes, allowing them to engage in learning activities during times when they are naturally more alert and productive. On the other hand, Evening chronotypes may struggle with reduced alertness and motivation early in the day, which could impair their academic performance. This mismatch, sometimes referred to as "social jetlag," has been shown to impact academic performance and general well-being, especially in populations required to follow rigid schedules [10]. An Indian study reported the evening chronotype teenagers were significantly sleeping less with more social jetlag [20].

Furthermore, studies indicate that Morning chronotypes often benefit from better sleep quality and duration compared to Evening types. Consistent sleep routines in Morning types may enhance memory consolidation and cognitive function, factors directly linked to academic performance [21, 22]. Our findings align with those of earlier studies which noted that Evening types are more prone to sleep difficulties, depressed moods and stress—all of which can detract from academic performance [23, 24]. These sleep challenges may lead to cumulative sleep debt over time, impacting the cognitive and emotional resources needed for academic tasks [9, 19].

Contrary to our findings, a few studies reported no significant correlation between chronotype and academic performance [25, 26, 27, 28]. The disparity between this study and ours could be attributed to cultural differences, variations in academic structures, or even environmental factors such as climate and lifestyle, which might influence students' adaptation to rigid schedules. Cultural expectations regarding morning productivity versus evening productivity could also play a role in shaping students' chronotype and its impact on academic performance. This discrepancy suggests a need for cross-cultural research to better understand how context may modify the relationship between chronotype and academic success. However, an Indian study also reported results contrary to our results stating no correlation between chronotype and academic grades. The same study reported poor academic performance associated to reduced mean sleep duration before exams [29]. Such incongruity in results between this study and our study may be attributed to the different questionnaires used to assess the chronotypes.

Perceived stress and chronotype

Our study found that Evening chronotypes reported significantly higher levels of perceived stress compared to Morning chronotypes, regardless of their academic performance level. This association between Evening preference and elevated stress is consistent with prior research, which shows that Evening types often face greater psychological challenges in environments that do not align with their circadian rhythms [23]. Evening chronotypes may experience more stress due to the difficulty of adapting to early schedules, which can lead to feelings of fatigue, frustration, and mental exhaustion. Additionally, research suggests that Evening types may be more susceptible to stress-related sleep disturbances, further exacerbating their stress levels [30]. The Perceived Stress Scale (PSS) scores indicate that most Evening chronotypes in our study experience moderate to high stress. Chronotype misalignment with societal expectations can contribute to an increased stress load, as Evening types are often pressured to conform to an early schedule that conflicts with their biological inclinations. This mismatch can lead to a phenomenon known as "circadian misalignment," which has been linked to greater morbidity [31]. The higher perceived stress in Evening chronotypes observed in this study aligns with findings from other studies linking stress with circadian rhythm disruptions [23, 30]. The increased stress levels observed among Evening chronotypes may also be compounded by the demands of medical education, which requires high levels of sustained focus, resilience, and emotional stability. Given that Evening types are already at a disadvantage due to circadian misalignment, the added academic pressures of the curriculum which is shown to have been contributing to increased anxiety levels may lead to more pronounced stress responses, which could interfere with academic success and overall mental well-being [32].

Gender, chronotype, and academic performance

The study found no significant gender differences in chronotype distribution, perceived stress scores, or academic performance. Our finding suggests that gender does not substantially influence chronotype's impact on academic performance and stress in similar student populations. However, studies have revealed some gender difference in chronotype where younger males are found to be more evening type compared to females, a finding contrary to ours [33, 34, 35]. Although some studies have suggested that females may be more prone to higher perceived stress levels due to biological and social factors, our data did not reveal any significant gender-based differences in stress or performance. Few earlier studies are in alignment to our research results [21, 36]. However past studies have also shown higher stress levels and better academic performance in females [37, 38]. Our study suggests that chronotype may play a more decisive role than gender in influencing academic outcomes and stress levels in medical students.

Implications for academic institutions

Our findings have potential implications for academic institutions, particularly in medical education where demands are high, and students are often required to adapt to rigid schedules. Given that Evening chronotypes

are at greater risk of stress and academic difficulties, universities could consider implementing flexible scheduling or providing support resources specifically tailored to Evening types. For instance, allowing students some flexibility in course schedules, or providing alternative study session times, could reduce the impact of circadian misalignment. By helping students align their schedules with their natural rhythms, institutions could potentially enhance academic outcomes, reduce stress levels, and promote overall student well-being.

Moreover, mental health and academic support services could consider offering resources specifically aimed at Evening chronotypes, such as workshops on sleep hygiene, stress management techniques, and cognitive behavioral strategies to improve morning productivity. Encouraging students to develop consistent routines that respect their chronotype could help mitigate the stress effects associated with circadian misalignment. Awareness of one's chronotype could empower students to make informed lifestyle adjustments, improving sleep quality, managing stress, and ultimately enhancing academic performance.

Limitations and future research directions

Despite these meaningful findings, several limitations must be acknowledged. First, this study did not consider intermediate chronotypes, which could provide a fuller understanding of how a broader range of chronotype preferences impacts academic and psychological outcomes. Additionally, the study primarily relied on self-reported data, particularly for excluding smokers, which could introduce bias as students may underreport habits that may affect sleep and health. Thirdly, social jetlag, a component that is an important variable affecting chronotype has not been included in this study. Future studies could employ more objective measures to validate such exclusions and improve accuracy in data collection.

Further, the study did not assess other crucial factors such as sleep quality, duration, and daytime sleepiness, all of which could play essential roles in shaping academic performance and perceived stress. Including these factors in future research would allow a more nuanced understanding of how sleep influences academic outcomes and stress, particularly among students with Evening chronotypes who may experience fragmented or lower-quality sleep.

Another limitation is the exclusion of "Good" performers from the comparison, as this group may exhibit unique chronotype and stress profiles that could enhance understanding of the full spectrum of academic performance. Including students from the entire range of performance levels could provide insights into whether intermediate chronotypes or those with "Good" performance exhibit different sleep, stress, and academic characteristics compared to their peers.

In addition, the study focused on a single institution, which may limit the generalizability of the findings to other universities or regions. Expanding future research across different educational settings and cultural contexts could provide valuable insights into how cultural and environmental factors impact the chronotype-performance relationship. A longitudinal approach could also add depth by tracking how chronotype and stress interactions evolve over time in response to changing academic and personal demands.

Conclusion

In conclusion, our study reinforces the notion that chronotype plays a significant role in shaping academic performance and perceived stress levels in first-year medical students. Morning chronotypes are more likely to achieve better academic outcomes and experience lower stress compared to Evening chronotypes, who face challenges adapting to early schedules, which may heighten stress and hinder academic success. These findings suggest that aligning academic expectations with students' chronotypes, or providing support tailored to chronotype needs, could enhance academic performance and well-being.

Academic institutions, particularly those with high academic demands, could benefit from considering flexible scheduling options, tailored mental health support, and sleep education to accommodate diverse chronotypes. By recognizing individual differences in chronotype and their impact on academic success, educational institutions could create more inclusive environments that foster both academic achievement and mental health for all students. Continued research in this area, particularly across various cultural and educational contexts, could further clarify the role of chronotype in academic settings, ultimately contributing to more effective strategies for supporting student success and well-being.

Abbreviations

MSFsc	Mid sleep time on free days corrected for sleep debts on work days
MCTQ	Munich chronotype questionnaire
PSS	Perceived stress scale
SD	Standard deviation

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Author contributions

MM and RCD were involved in designing the study. MM conceived it, participated in data collection, performed the statistical analysis and data interpretation and drafted the manuscript. SD, PK and RCD participated in data collection and interpretation and critically revised the manuscript. All authors read and approved the final manuscript.

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Data availability
The datasets generated or analysed during this study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The study proposal was presented to the Institute Ethics Committee (IEC) of Kalinga Institute of Medical Sciences, KIIT Deemed-to-be-University, Bhubaneswar and was approved by the IEC (IEC Approval Certificate Reference No.- KIIT/KIMS/IEC/42/2019). The research carried out on the human data was in adherence to the Declaration of Helsinki. Informed consent was taken from all the participants in the study and data was collected only after the participants consented.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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