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Research Article

An Investigation of the Correlation Between Chronotype and Academic Achievement Among College Students in Diverse Disciplines

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Abstract

Background: The body's circadian rhythm is essential for the regulation of various biological processes such as physical capacity and primarily on sleep-wake cycle. Changes in circadian rhythm can cause chronic disorders and diminished sleep. In fact, over a day, an individual's preferred time for activeness and sleeping can be shown with the concept of morningness–eveningness. Five chronotypes are known: Morning, moderate morning, Noon, moderate Evening and Evening types. Inter individual differences in chronotypes need to be addressed to minimize the negative consequences of circadian interruption on academic percentage.

Aim: In the present study, we aimed to investigate the effects of chronotype on academic performance among different streams (Science, Arts and Commerce) students of our college. A cross-sectional comparative research was carried out among 300 students of 3 streams of Bachelor Degree (100 students of Arts, 100 students of Science and 100 students of Commerce) in the Dharam Samaj PG College, Aligarh of Raja Mahendra Pratap Singh State University, Aligarh (Utter Pradesh) India.

Methodology: The participants were well informed about the study and asked to sign a written informed consent. All the participants were asked to keep a diary record of their wake-up time, bedtime, sleep duration and sleep latency during working days and weekends.

Results: The result shows all 3 streams of Bachelor degree, the students with average grades tended to be the evening chronotype with below the average percentage 45-55% (Grade C), intermediate (N- type) students with average percentage 56-62% (Grade B) and morning chronotype students with topers percentage 62-88% (Grade A). Students with average grade C tended to have a later bed times during weekdays and weekends, longer weekends sleep, and were more evening directed.

Keywords: *Academic performance, Sleep duration, Sleep pattern, Chronotype*.

1. Introduction

Chronotype is the natural preference of your body to sleep timing which is determined by the central circadian clock. Circadian chronotype is a concept based on an individual's preference for morning or evening trait, a character obtained due to individual differences in conducting various biological and behavioral routines in entire day. The phenomenon of morningness-eveningness is described by variations among individuals in sleep-wake pattern, peak alertness times and daily predilections [1].

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Morning chronotypes (M-types) are Evening chronotypes (E-types) persons would rather have late risers and active till late night and also give their best during late afternoon or evening [2]. The M-type and E-type categories represented as the two extremes of a spectrum, with the majority of individuals classified as Intermediate type (I-type) or Neutral type (N-type). Intermediate-type individuals fall between M-type (morning) and E-type (evening) people in their sleep-wake patterns. Their preferred times for physical and mental tasks, as well as their alertness levels throughout the day, are also somewhere in between spectrum. Biological factors, like hormone levels such as cortisol and melatonin and clock genes along with external influences like seasonal changes, light-dark cycle and social habits are the main drivers of a person's daily biological rhythms. These individual preferences

are believed to be shaped by a mix of genetics, biological makeup, psychosocial and environmental factors. [3]. A person's chronotype, or their natural tendency to be a "morning person" or "night person, "influences more than just their sleep schedule. Research shows it also affects their lifestyle choices, cognitive abilities, motor skills, and even aspects of their personality [4-6]. Many people try to schedule their daily activities to synchronize their natural body clock

Researches have shown that people with a morning chronotype tend to experience better mental and physical health, higher self-esteem, and stronger academic performance. Conversely, those with an evening chronotype are more often associated with a higher risk of mental health issues, poorer sleep quality, and greater susceptibility to infections [8, 9]. Furthermore, diurnal preferences have shown association to various issues such as sleep pattern, eating behavior and usage of recreational drugs [7, 10].

2 Aims of the study:

1. To determine if the specific gender or Chronotype play any role in stream selection in D S Degree College, Aligarh and from students' data to make a chronotype figure of peoples of Aligarh district
2. Correlations of habitat (rural and urban) based Chronotype and students' Academic performance if any

3 Materials and Methods:

Site of study/data collection

This cross-sectional study was conducted in Dharam Samaj College Aligarh Located in UP 27.8817090,78.0766636, India from October 2024 to January 2025. Head, Department of Zoology and Institutional Head (Principal: Prof. Mukesh Kumar Bharadwaj) permitted on dated: 24/09/2024 to conduct this research. Data were collected from our college even semester graduate (Science, Arts, & Commerce) students by randomly selected 300 out of 15000.

1. **Inclusion criteria:** Students (male and female) between age group 18-25 years were included in the study.
2. **Exclusion criteria:**
    a. Students, aged less than 18 years and more than 25 years.
    b. Students having any chronic illness and sleeping disorder.

4 Research methodology

Self-assessment questionnaire (MEQ), was used to determine the Morningness-eveningness [11]. English language version was used for the study as it was not available in Hindi lenguage. Briefly, MEQ questionnaire (Horne and Ostberg 1976) comprises 19 questions/ items (close-ended) having a score 0-6 each. Participants were given instruction about the research to be carried out and to address clarify their queries, if any. Then, the questionnaire was distributed among participants Study participants completed the validated English version of the MEQ.

The total score for the 19 items ranges from 16-86 and were classified as

Scores ranging from 16-41 indicate evening preference (E-type),

Scores ranging from 59-86 indicate morning preference (M-type),

Scores ranging from 42-58 indicate no preference intermediate (I) or neutral (N)

Each type of responses was collected from all the participants and were analyzed statistically.

5 Statistical analyses

Out of 15,000 enrolled a total of 300 students were pursuing B. Sc./B.A./B.Com. (Even semester bachelor students). Collected data were used in the study. Participants were informed about the nature and goal of the study. Study procedures/assessments were explained to all participants. Excel sheet software in window 10 version was used for data analysis. Results were presented in frequencies and percentages for categorical variables while measures of central tendency and dispersion were used for continuous variables. Different charts were used for comparison of groups mean used to determine the chronology of different streams students, selection of science, arts and commerce streams on gender based or his residence (rural/urban) and association between chronotype and his academic performance if any.

The study sample of 300 healthy undergraduates comprised of 193 females (64.33%) and 107(35.7%) males. The study participants were in the age group of 18-23 years. Other anthropometric characteristics of the participants are listed in Table 1.

6 Results:

Results from this data analysis shows that gender specific chronotype is directly interrelated because the Science and commerce stream was first choice female students while arts was chosen by mostly male candidates. An analysis of admission data for the B.Sc. program (Biology & Mathematics) showed that females hold a significant majority, occupying 529 of the 720 seats, which is 73.47%. This trend of female predominance was also seen in the commerce group, where they held 67.87% (198 seats), though their representation was lower in the arts group at 48.13% (154 seats). The institute has a total enrollment of approximately 15,000 students. To investigate the

relationship between chronotype, gender, and academic performance, a random sample of 300 students was selected, with 100 students each from the science, commerce, and arts faculties (Table-1). The results from the science group revealed that males were more likely to be morning chronotypes, accounting for 58.33% of the male sample (n=14), compared to only 31.58% of the female sample (n=24). Conversely, females were predominantly intermediate (noon) types, with 65.79% (n=50) of the female sample falling into this category, while 58.33% (n=14) of the male sample were intermediate types (Table 2). Furthermore, evening chronotypes were rare in the science group, with only 2.63% of females being identified as such, and no males exhibiting this chronotype.

Table 1: The samples of healthy females and males undergraduates between the age group of 18-23 years

Variables (Different streams of D S College)	Females	Males	Age in Years	Weight in Kg
Science (100)	76	24	18-23	40-70
Arts (100)	77	23	18-23	40-70
Commerce (100)	65	35	18-23	40-70

Table 2 Male and female chronotypes of science stream

Gender	Chronotype of Science stream		
	Mod. morning	Intermediate	Mod. evening
Female (N=76)	24	50	2
Male (N=24)	14	10	0

The arts group (Table 3) showed a different pattern. Males were slightly more inclined to be morning types at 13.04% (n=3) than females, who were at 9.09% (n=7). The intermediate (noon) chronotype was highly prevalent in this group, particularly among females at 63.64% (n=49) compared to 52.17% of males (n=12). For the evening chronotype, females were more common at 34.78% (n=8), while males were at 27.28% (n=10).

Table 3: Male and female chronotypes of Arts stream

Gender	Chronotype of Arts stream		
	Mod.morning	Intermediate	Mod.evening
Female(N=77)	7	49	21
Male(N=23)	3	12	8

Table 4: Male and female chronotypes of Commerce stream

Gender	Chronotype of Commerce stream		
	Mod. morning	Intermediate	Mod. evening
Female (N=65)	17	32	16
Male (N=35)	14	11	10

In the commerce group, the data revealed that males were more likely to be morning types at 40% (n=14) compared to 26% of females (n=16). However, females were more frequently intermediate (noon) types, making up 49.23% of their group (n=32), while males were only 31.43% (n=12). Both genders showed a notable presence of evening types, with 28.57% of males (n=10) and 24.62% of females (n=16) falling into this category (Table 4).

Based on the provided data, a clear difference in chronotype distribution was observed between rural and urban students. Overall, rural students were significantly more likely to be morning chronotypes, with 49.48% (n=97) falling into this category compared to only 22.12% (n=23) of urban students. Conversely, urban students were predominantly intermediate (noon) types, a group that comprised 64.42% of their population (n=67) compared to 46.42% (n=91) of rural students. Additionally, the evening chronotype was more common among urban students, at 13.46% (n=14), than among rural students, at 4.08% (n=8) (Fig. 1).

The study also correlated chronotype with academic performance, measured by CGPA. Morning chronotypes in the science and commerce groups achieved the highest mean CGPA scores (66.36 and 63.19,

respectively), outperforming morning-type arts students (58.98). However, for both intermediate and evening chronotypes, arts students showed the best performance, with a mean CGPA of 61.08 for intermediate types and 49.28 (Fig. 2) for evening types. This was a more "valuable" result compared to the lower scores of intermediate and evening types in both science and commerce.

7 Discussion:

The present study suggests that most students fall into the intermediate chronotype, while the extreme types—morning and evening—make up a smaller portion of the sample. Given existing literature that morning types generally perform better academically than evening types, scheduling educational activities according to a student's chronotype could help improve their overall academic performance. The findings of current study are consistent with previous research, revealing that the majority of student participants are best classified as intermediate or neutral types. A moderate number of participants were identified as morning types, while a smaller proportion were classified as evening types. This distribution aligns with existing literature on chronotype prevalence [12].

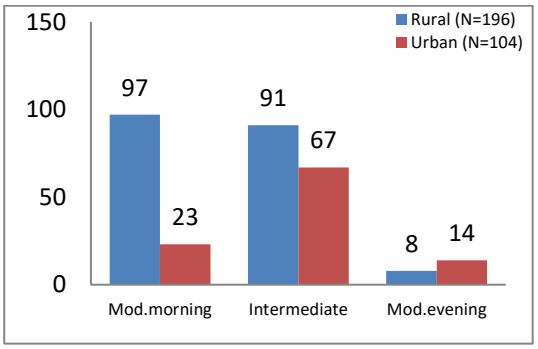

Fig. 1: Graphical presentation with mean value of Rural and urban chronotype

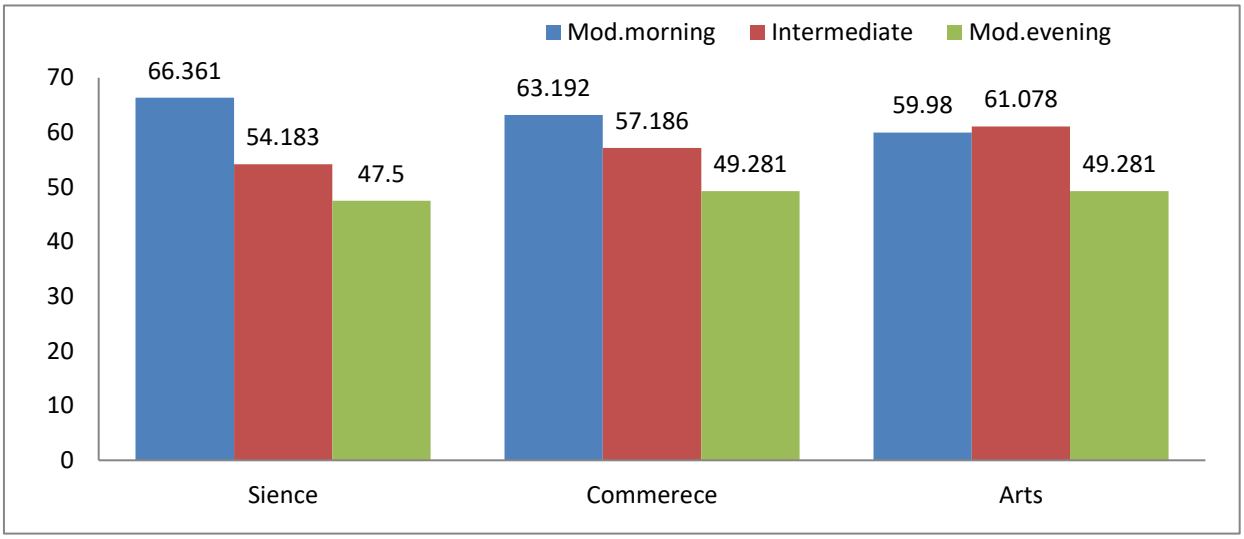

Fig. 2: Correlation between different streams students' chronotype and their previous year exam performance CGPA with mean value

Previous studies on chronotypes have shown mixed but insightful results. A review study [13] concluded that intermediate types make up the largest portion of the population, with roughly 39% belonging to the more extreme morning or evening chronotypes. Another study [14] observed similar results, while a different group [15] reported a much higher prevalence of evening types (47%) and a low number of intermediate types (only 9%).In line with some of this prior research, the present study found that morningness was more common among male students than female students. Conversely, the intermediate type was more prevalent among female students compared to their male counterparts. These specific findings align with the previous study [13], which showed higher percentage of intermediate types among females and a lower percentage of both morning and evening types.

The natural cycle of light and darkness is the most powerful external cue, or "Zeitgeber," that helps regulate a person's biological rhythms. However, modern life—with its constant technology use, demanding academic schedules, and high levels of stress—can disrupt this natural synchronization. This often shifts a person's internal clock toward an evening-type chronotype. Since an evening chronotype has been linked in past studies to negative physical and mental health outcomes [4, 11], this research was conducted to understand the morning and evening preferences of undergraduate students.

8. Conflict of Interest: Nil

9. References

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