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Original Article

Physiology Section

Influence of Chronotype Profile, Personality Trait and Emotional Competence on Perceived Stress in Undergraduate Medical Students: A Cross-sectional Study

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ABSTRACT

Introduction: Physical, emotional, and behavioural changes are hallmarks of stress, which is a normal human reaction to demanding or difficult circumstances. High stress levels can significantly impact the academic performance and mental health of young students. Chronotype represents genetically determined behavioural characteristics of a person's twenty-four-hour activity cycle and is pivotal in mental health. Individual differences in stress experiences may be partially explained by personality traits. Individuals with greater emotional intelligence tend to exhibit lower stress reactivity.

Aim: To assess the influence of chronotype, personality, and Emotional Competence (EC) on perceived stress among undergraduate medical students.

Materials and Methods: This cross-sectional study was conducted in the Department of Physiology at Panimalar Medical College Hospital and Research Institute in Chennai, Tamil Nadu, India, from November 2024 to January 2025. It involved 114 first-year medical students, with the primary inclusion criterion being that participants were first-year medical undergraduates aged 18-25 years. Both genders were included. Participants, after giving informed consent, completed the Horne-Ostberg Morningness-Eveningness Questionnaire (MEQ), the Big Five Inventory, the Profile of EC, and the Perceived Stress Scale via Google Forms. Statistical Package for the Social Sciences (SPSS) version 29 was used for data analysis. Spearman's correlation test was employed to examine the association between perceived stress and additional variables. Multiple regression analysis was performed to predict the level of perceived stress based on variables such as chronotype, EC, and personality traits (Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism). Statistical significance was set at $p<0.05$.

Results: The mean age of the study population was 18.75±0.64 years, out of which 80 were females and 34 males. The data indicated that most participants had an intermediate chronotype 69 (60.5%), followed by the morning type 31 (27.2%) and evening type 14 (12.3%). A significant, strong positive correlation was observed between neuroticism and perceived stress ($r=0.74$, $p<0.01$). A significant negative correlation was found between perceived stress and the measured variables, namely chronotype ($r=-0.25$, $p=0.01$), conscientiousness ($r=-0.35$, $p<0.001$), extraversion ($r=-0.49$, $p<0.001$), agreeableness ($r=-0.27$, $p<0.001$), intrapersonal EC ($r=-0.53$, $p<0.001$), interpersonal competence ($r=-0.29$, $p<0.001$), and global EC ($r=-0.52$, $p<0.001$). Regression analysis revealed extraversion as a negative predictor and neuroticism as a positive predictor of perceived stress among medical students.

Conclusion: The present study reveals complex relationships between chronotype, personality traits, EC, and perceived stress among students. Intermediate chronotypes were the most common, with morningness negatively correlated to stress. Personality traits, especially extraversion and neuroticism, significantly predicted stress levels. Higher EC was associated with lower perceived stress, potentially indicating better stress management skills. These findings contribute to the understanding of factors influencing stress perception in students and may inform targeted interventions for stress management in academic settings.

Keywords: Conscientiousness, Emotional intelligence, Extraversion, Neuroticism, Psychological stress

INTRODUCTION

Physical, emotional, and behavioural changes are hallmarks of stress, which is a normal human reaction to demanding or difficult circumstances. Stress occurs when coping mechanisms are stretched beyond their limits [1]. High levels of stress can significantly impact the academic performance and mental health of young students. Stressful lifestyle choices make students more likely to develop metabolic syndrome and other cardiovascular problems in the future [2]. Long study hours, frequent assessments, and the transition from secondary to tertiary education constitute the leading stressors in medical undergraduate life [3]. Medical students seem to face greater emotional difficulties, physical and psychosocial risks, as well as mood disorders, as they progress in their field of study [4].

In particular, chronotype has been reported to strongly influence stress perception. Chronotype represents genetically determined behavioural characteristics of a person's 24-hour activity cycle and plays a pivotal role in mental health. It is typically categorised into three types: morning, intermediate, and evening [5]. Commonly called "larks," morning types are most productive in the morning [6]. The late afternoon or evening is when night owls, or evening types, function best both mentally and physically during the late afternoon or evening [7]. Multiple adverse consequences, especially low academic achievement [8], health-compromising behaviours [9], sleep disorders such as insomnia and daytime sleepiness [10], and an increased risk of accidents [11] have been attributed to the eveningness chronotype.

Given the established influence of chronotype on health, it is imperative to consider how individual personality traits further modulate stress experiences among medical students. Personality refers to a complex and organised collection of traits that affect

an individual's environment, motivation, emotions, and behaviours across various contexts. An individual's personality is often described by a set of attributes called the Big Five personality traits. The predominant characteristics include neuroticism, extraversion, openness, agreeableness, and conscientiousness [12].

Individual differences in stress experiences have been speculated to be partially explained by these personality traits. Originality, curiosity, and inventiveness define openness. Individuals with high levels of openness display decreased sympathetic activation, as seen by stress-induced increases in blood pressure [13]. Conscientiousness is characterised by the ability to comply with social expectations, which aids in impulse management, goal setting, and the postponement of immediate satisfaction [14]. Additionally, higher levels of conscientiousness are associated with improved life satisfaction, positive affect, and perceived health [15]. Extraversion characterises a person's propensity to seek external stimulation, particularly through social interactions. It has been documented that extraversion is associated with positive affect, happiness, and emotional wellness [16]. The preference for getting along well with peers is a sign of agreeableness. Compared with their peers, agreeable people are seen by others as exhibiting less tension in their social interactions and eliciting less conflict from their partners [17]. Conversely, people who exhibit high levels of neuroticism are frequently characterised as emotionally unstable and stress-reactive [18].

The EC refers to the ability to understand, manage, and express emotions effectively in oneself and in relationships with others. Emotional intelligence and EC are interrelated concepts. Emotional intelligence is an essential prerequisite for developing EC. Based on both biological and psychological parameters, a significant correlation has been found between higher emotional intelligence and lower stress reactivity [19]. This is attributed to the use of better coping mechanisms by emotionally competent individuals [20].

Although there are data regarding the relationship between personality traits, chronotypes, and perceived stress, there is a paucity of studies that attempt to explore all these factors in one matrix, particularly in Indian Indian medical students, with an additional emphasis on EC. The present study assumes importance in providing a multifaceted approach to understanding stress among first-year Indian medical undergraduates.

The current study aimed to identify the association between individual trait differences and perceived stress in medical students. The primary objective of present study is to assess the influence of chronotype, personality, and EC on perceived stress among undergraduate medical students. Identifying the most prevalent chronotype among Indian medical students is the secondary objective of this study.

Null Hypothesis (H0): There is no significant relationship between chronotype, personality traits, EC, and perceived stress levels among undergraduate medical students.

Alternate Hypothesis (H1): There is a significant relationship between chronotype, personality traits, EC, and perceived stress levels among undergraduate medical students.

MATERIALS AND METHODS

The present cross-sectional study was conducted in the Department of Physiology at Panimalar Medical College Hospital and Research Institute, Chennai, Tamil Nadu, India, from November 2024 to January 2025, involving first-year Bachelor of Medicine and Bachelor of Surgery (MBBS) students. The study commenced after obtaining approval from the Institutional Ethics Committee (PMCH&RI/IHEC/2024/207). Written informed consent was obtained from all participants before data collection.

Sample size calculation: The sample size was calculated using Fisher's transformation of correlation coefficients (G*Power 3.1 software). Based on the correlation (r=0.607) obtained from a previous study [21] on personality and perceived stress, with a 95% confidence interval and 90% power (1-β=0.90), the required sample size was 94. To account for a possible 20% non response rate, the final sample size was calculated as 113 participants.

Out of the total 150 first-year medical students, 135 expressed their willingness to participate in the study. From these, 115 students were selected through simple random sampling. However, one sample was excluded due to an incomplete questionnaire, resulting in a final sample size of 114.

Inclusion criteria: First-year MBBS students of either gender, aged between 18 and 25 years, who were willing to participate in the study, were included.

Exclusion criteria: Students who were unwilling to participate or aged<18 years or >25 years were excluded.

Study Procedure

The present study involved 114 first-year medical students aged 18–25 years, selected through simple random sampling. Basic demographic information, like age and gender, was collected. The study participants attended an orientation session to go through the assessment tool items and address any queries. Subsequently, they completed the assessment questionnaires—namely, the Morningness Eveningness Questionnaire (MEQ), Big Five Inventory, Profile of EC, and Perceived Stress Scale (PSS)—which were administered via Google Forms.

Assessment of chronotype: The chronotype or circadian preference of the study participants was assessed using the Horne–Östberg MEQ [22]. This self-assessment questionnaire consists of 19 questions assessing individual preferences regarding the temporal organisation of activity and alertness. The peak productivity time of the study participants can be identified. Individuals can be categorised based on their MEQ scores, which range from 16 to 86, individuals were categorised as follows:

- Definitely evening type (16-30)
- Moderately evening type (31-41)
- Intermediate type (42-58)
- Moderately morning type (59-69)
- Definitely morning type (70-86) [22]

Assessment of personality traits: Personality traits of the study sample were assessed by the Big Five Inventory . It is a 44-item inventory that measures individual on the five major (dimensions) of personality [23]. This instrument includes five scales:

- Extraversion (8 items)
- Agreeableness (9 items)
- Conscientiousness (9 items)
- Neuroticism (8 items)
- Openness (10 items)

Population rated each BFI item on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Some items were reverse-scored [13]. The responses within each personality subdomain were averaged to obtain mean scores for each trait.

Assessment of Emotional Competence (EC): The EC of the study participants was assessed using the Profile of Emotional Competence (PEC) questionnaire developed by Brasseur S et al., [24]. This 50-item measure that assesses an individual's ability to identify, understand, express, regulate, and use emotions in themselves and in others.

The PEC consists of two main scales:

- Intrapersonal EC
- Interpersonal EC

Each scale consists of five subscales: identification, comprehension, expression, regulation, and utilisation. Scores were calculated

based on the mean response to each item of the corresponding component and ranged from 1 to 5. Global EC was calculated as the mean of the intrapersonal and interpersonal EC scores.

Assessment of perceived stress: Perceived stress was assessed using the Perceived Stress Scale (PSS-10), a commonly used tool for evaluating stress, was employed to gauge stress perception levels among the participants in present study [25]. This self-report scale measures how individuals recognise various situations in their lives as stressful. The items were developed to assess respondents' sense of unpredictability, lack of control, and the extent to which they find their lives overwhelming nature. This scale showed good internal consistency, as indicated by a Cronbach's alpha value of 0.85. Scores are measured on a scale from 0 to 40, with higher values representing an increased perception of stress.

STATISTICAL ANALYSIS

Data analysis was performed using Statistical Package for the Social Sciences (SPSS) for Windows (version 29.0; SPSS Inc., Chicago, IL, USA). Continuous variables were checked for normality, and the results were expressed as Mean±Standard Deviation (SD). An independent sample t-test was utilised to examine gender variations in the assessed variables.

Correlations were assessed using Spearman's correlation test. Multiple regression analysis was performed to predict the level o perceived stress based variables such as on chronotype, EC, and personality traits (Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism). Statistical significance was set at $p<0.05$.

RESULTS

The descriptive statistics of the study participants and gender differences in the study parameters are shown in [Table/Fig-1]. The mean age of the participants was 18.75±0.64 years, of which 80 (70.2%) were females and 34 (29.8%) were males.

Variables	Mean±SD (n=114)	Male (n=34) Mean±SD	Female (n=80) Mean±SD	Std. error	t-value	p-value
Chronotype	52.12±9.97	52.78±10.67	51.51±9.52	2.02	-0.62	0.53
Openness	3.57±0.42	3.56±0.32	3.57±0.45	0.08	0.11	0.90
Conscientiousness	2.83±0.66	2.53±0.48	2.96±0.60	0.12	3.70	<0.001**
Extraversion	2.71±0.72	2.81±0.91	2.65±0.60	0.14	-1.10	0.27
Agreeableness	3.65±0.62	3.66±0.47	3.65±0.67	0.13	-0.07	0.93
Neuroticism	3.27±0.96	3.09±0.83	3.34±1.00	0.20	1.28	0.20
Intrapersonal EC	3.12±0.59	3.29±0.62	3.03±0.56	0.12	-2.19	0.03*
Interpersonal EC	3.12±0.59	3.21±0.59	3.14±0.50	0.11	-0.64	0.52
Global EC	3.14±0.47	3.26±0.50	3.09±0.43	0.09	-1.83	0.06
Perceived stress	23.32±7.19	24.32±8.06	22.9±6.81	1.47	0.96	0.32

[Table/Fig-1]: Descriptive statistics and gender differences in the measured variables.
Independent sample t-test *Significant at the level of p-value≤0.05 **Significant at the level of p-value≤0.01

The mean score of perceived stress in the study population was 23.32±7.19. The data indicated that most participants were of the intermediate type 69 (60.5%), followed by the morning 31 (27.2%) and evening 14 (12.3%). The highest and the lowest-scored personality traits, agreeableness (3.65±0.62) had the highest mean score, while extraversion (2.71±0.72) respectively.

Independent sample t-test was utilised to examine gender disparities in the assessed variables. Women exhibited higher scores on conscientiousness (d=0.79), and men presented higher intrapersonal EC (d=0.44). A medium effect size was found for conscientiousness, and a small effect size for intrapersonal EC.

The correlation between perceived stress and all study variables has been depicted in [Table/Fig-2]. A significant, strong positive correlation was observed between neuroticism and perceived stress (r=0.74, p<0.001). Significant negative correlations were found between perceived stress and the measured variables: chronotype (r=-0.25, p=0.01), conscientiousness (r=-0.35, p<0.001), extraversion (r=-0.49, p<0.001), agreeableness (r=-0.27, p<0.001), intrapersonal EC (r=-0.53, p<0.001), interpersonal EC (r=-0.29, p<0.001), and global EC (r=-0.52, p<0.001).

Variables	Correlation coefficient	p-value
Chronotype	-0.25	0.01*
Openness	-0.11	0.27
Conscientiousness	-0.35	<0.001**
Extraversion	-0.49	<0.001**
Agreeableness	-0.27	<0.001**
Neuroticism	0.74	<0.001**
Intrapersonal EC	-0.53	<0.001**
Interpersonal EC	-0.29	<0.001**
Global EC	-0.52	<0.001**

[Table/Fig-2]: Correlation between perceived stress and other variables.
Spearmann's correlation test * Significant at the level of p-value ≤ 0.05; **Significant at the level of p-value ≤0.001

Multiple regression analysis was conducted on all variables, except openness, to determine the predictors of perceived stress within the study population [Table/Fig-3]. Extraversion is evidently a significant negative predictor, whereas neuroticism is a significant positive predictor of perceived stress.

DISCUSSION

The current study aimed to identify the association between individual trait difference factors such as chronotype, personality, and EC and perceived stress in medical students.

Looking into the gender variations in perceived stress, there was no significant difference in the perceived stress levels of male. Contrary to the findings of the present study, Brougham RR et al., reported higher perceived stress among female medical students compared to their male counterparts [26]. The underlying reasons for this trend could be attributed to the competitive nature of female medical students, who often prioritise hard work to achieve higher grades, exhibit greater concern for academic performance, overstate emotional distress, and engage in less physical activity [27].

In the present study, female students demonstrated significantly higher levels of conscientiousness, consistent with findings from several previous studies [28,29]. From a biological perspective, this difference may be attributed to inherent gender-based variations, whereas the social–psychological perspective suggests that such disparities arise from societal expectations regarding the thoughts, emotions, and behaviours of men and women [30].

Intrapersonal EC was found to be higher among male students, aligning with the findings of Min MC et al., [31]. This may be attributed to better emotional self-regulation among males, shaped by prevailing societal norms [27].

Coefficients					
	Unstandardised coefficients		Standardised coefficients		
Model	B	Std. Error	Beta	t value	Sig.
Constant	25.46	5.77	-	4.41	<0.001
Chronotype	-0.01	0.05	-0.02	-0.25	0.80
Conscientiousness	-0.69	0.78	-0.06	-0.88	0.38
Extraversion	-1.89	0.74	-0.19	-2.58	0.01*
Agreeableness	-0.76	0.76	-0.07	-1.00	0.32
Neuroticism	4.25	0.62	0.57	6.81	<0.001**
Intrapersonal EC	-0.92	1.06	-0.08	-0.87	0.39
Interpersonal EC	-0.84	0.98	-0.06	-0.85	0.39

[Table/Fig-3]: Multiple regression analysis to identify the predictors of perceived stress.
Multiple regression analysis *Significant at the level of p-value ≤0.05; Dependent variable: Perceived stress **Significant at the level of p-value ≤0.01

In the study population, almost 60% of the students belonged to the intermediate chronotype. This finding is in coherence with the previous studies conducted among medical students [32,33]. The continual adaptation to changing schedules in medical education causes chronotype desynchronisation, possibly promoting a higher incidence of intermediate chronotypes among students [34].

The results of present study highlight a significant negative correlation between chronotype scores and the perceived stress scale. With respect to morningness–eveningness, individuals who lean towards eveningness tend to report higher perceived stress, aligning with findings from a previous study [35]. Evening types revealed a greater propensity for difficulty in adapting to the school setting and managing an early sleep routine [11].

The results also indicated that agreeableness was the most prevalent personality trait, while extraversion was the least common. This is in agreement with the existing literature [36]. Agreeableness is characterised by traits such as empathy, compassion, and cooperation, which are highly valued in healthcare professions [37]. A significant tendency towards introversion emerges throughout the academic progression of a medical student, possibly due to escalating stress and increased encounters with critical health conditions and patient fatalities [38].

The current study found a significant negative correlation between perceived stress and all personality traits except neuroticism, which was the only variable to showed a positive correlation. This observation is consistent with findings from studies on medical students [39]. High level of openness can result in the pursuit of additional resources to effectively manage stressful circumstances [40]. Conscientious individuals tend to evade anticipated stress and demonstrate enhanced management skills, viewing life situations as opportunities for growth instead of threats [41]. Similar to the observation in the present study, Wang S et al., noted that emotional burnout was negatively impacted by the levels of agreeableness [42]. Students exhibiting agreeable traits are more likely to garner social support, which in turn facilitates the resolution of their issues.

The regression analysis revealed that extraversion and neuroticism were significant predictors of perceived stress. These effects were such that students with higher levels of neuroticism and lower levels of extraversion tended to perceive greater stress. This finding is in accordance with a study conducted among adolescents that determined the predictors of perceived stress [43]. Connected with high neuroticism the propensity for strong emotional reactions, negative feelings, and struggles to regain stability in challenging situations, results in a heightened perception of stress in life [44]. As observed by Chu X et al., among school teachers, extraversion was found to be a significant negative predictor of stress [45].

The EC levels were found to be negatively correlated with perceived stress, and the correlation was statistically significant. This is similar to the observations of You M et al., among university students [39]. Although medical students often endowed with high emotional intelligence, they are at risk of burnout when they endure chronic and excessive psychological stress. This is identified as a wear and tear phenomenon, caused by the depletion of emotional reserves in dealing with extended psychological pressures [46].

The findings suggest the need for routine stress screening among medical students, along with targeted interventions for those exhibiting high neuroticism, low extraversion, evening chronotypes, and lower EC levels, as these factors were associated with higher perceived stress.

The study showed a significant correlation between perceived stress and other study variables, namely, chronotype, personality, and EC among undergraduate medical students; therefore, the null hypothesis is rejected.

Limitation(s)

The limited sample size may restrict the generalisability of the study findings. Conducting research involving a broader sample size would result in a more thorough insight into the various stresses experienced by medical students linked to their personality traits. As this was a cross-sectional study, it could not establish causal relationships between the examined variables. Furthermore, the study relied on self-reported questionnaires, which may be subject to response bias or social desirability effects.

CONCLUSION(S)

Evening chronotype and lower levels of EC were associated with greater perceived stress. Personality traits—particularly extraversion and neuroticism—emerged as significant predictors of perceived stress. These findings may assist in formulating more individualised stress management techniques for medical students, adapted to their unique chronotypes and personality traits. The results may encourage medical educators to take a more holistic view of student wellbeing, considering individual differences in personality and circadian preferences alongside academic factors. This research could spark further studies into how these factors impact not only perceived stress but also academic performance, clinical skills, and career outcomes among medical students.

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Authors' contributions: VC conceived and designed the study. VC and PP collected the data. VC and PS analysed the data. VC, PP, and PS interpreted the results and drafted the manuscript. VC, PP, and PS contributed to the critical revision and approval of the final manuscript. All authors have read and approved the final manuscript.

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