

A Study to Correlate Stress Score with Heart Rate Variability among MBBS Students at a Tertiary Care Center, Jaipur

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Abstract

Introduction: Medical students have high levels of stress that could be due to stressors related to the academic workload, time pressure competency, professionalism, physical, mental, and emotional issues. This study aimed to find out subjective assessment of stress, stressors, and coping strategies and objective assessment of stress with heart rate variability (HRV) and correlate subjective and objective assessment of stress scores among 1st year MBBS students at RUHS College of Medical Sciences. **Materials and Methods:** Institutional ethical clearance (EC-P-21/RUHS) was obtained after that study was conducted among a total of 150 1st year MBBS students. The students were asked to fill out a validated general health questionnaire (GHQ-12), “medical student stress questionnaire 40,” and a brief COPE inventory to assess stress, stressors, and various coping strategies for subjective assessment and objective assessment done by time and frequency domain parameters of HRV. **Results:** The mean age was 20.85 ± 1.56 . The severity of stress categorized as mild, moderate, high, and severe were 17%, 40%, 13%, and 10%, respectively. The most affected stressor was academic contributed to 80% followed by teaching–learning related, social, intra- and interpersonal, group activities, drive, and desire-related stressors 78%, 75%, 73%, 70%, and 68%, respectively. Overall, the students’ coping strategies were mostly avoidant followed by emotional and problem based. HRV is measured by time domain, i.e., PNN50, standard deviation of normal to normal RR intervals, root mean square of successive differences, and “frequency domain parameters,” i.e., low frequency (LF), high-frequency (HF), and LF/HF ratio. **Conclusion:** In the present study, a positive correlation was observed between HRV and stress score. More than 75% of RUHSCMS 1st year medical students were suffering from measurable academic stress. Time domain and frequency domain parameters were positively correlated with stress score.

Keywords: Academic, coping strategies, domains, GHQ-12, heart rate variability, medical student stress questionnaire, stress score

INTRODUCTION

A state of physiological and psychological imbalance is known as stress occurs when a person perceives the situation demands to be greater than their ability to satisfy it. It is the natural reaction to an unexpected incident that happens in a person’s life. This reaction may be mental, physical, or emotional.^[1]

According to medical definitions, stress occurs when a person perceives a situation as threatening and their body responds accordingly. The body releases hormones to get ready for action. Increased blood pressure and heart rate, enhanced blood flow to the muscle and heart. Reduced blood flow occurs in less critical areas, like the digestive system. Under stress, dizziness, palpitations, and nausea were reported.^[2] Stress can have both positive and negative effects on us. Positive stress

can spur us to action, while negative stress can cause feelings of worry, discomfort, rage, and sadness that can worsen our mental and physical health.^[3] It has been recognized that the medical curriculum’s vast and demanding nature has a stressful and detrimental effect on students’ well-being.^[4] According to earlier research, medical students faced significant stress during their medical education, which had a negative effect on their academic performance as well as their social, physical, and mental health.^[5,6]

Gupta *et al.*^[7] reported prevalence of stress was 91.1% in India and the most common stressor (94.9%) was academic reasons.

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Stress experienced by medical students begins in the 1st year of the MBBS course.^[8] Supe^[9] reported that academic, emotional, physical, and social factors as the important stressors in India. Muhamad *et al.*^[10] reported six principal domains namely academic, social, teaching and learning-related, drive and desire related, interpersonal and intrapersonal, and group activities-related stressors (GARS) using “medical students stress questionnaire” (MSSQ-40). To function at their best, everyone requires a certain level of stress, but when pressures increase and the person is not able to cope that leads to stress. Several stressors including workload, time pressures, having various roles emotional, physical, and mental issues were associated with the health profession. Frequent exposure to environmental stress influences the physical and mental well-being of medical students. These negative stresses not only impair their capacity to care for patients as well as their ability to deal with everyday problems.^[11]

Medical students who experience stress may develop psychological issues such as depression and anxiety, and a negative effect on academic performance and ultimately jeopardize patient care in the workplace.^[12]

The deliberate, voluntary effort to control one’s feelings, ideas, and actions in reaction to stress is known as coping. Students in medical education employ a variety of coping mechanisms to reduce stress and get through the circumstances. To deal with the difficulties, the majority of medical students resort to avoidant coping mechanisms.^[13] Stress will persist, though, even among the 1st year MBBS students becoming an intern who take on the additional duty of caring for their patients as interns.^[12,13]

The assessment of stress is done using stress questionnaires and assessed by physical responses. Assessment of physical and physiological symptoms that are objectively brought on by stress can also be done by testing the immune system, endocrine function, and “autonomic nervous system” (ANS). Heart rate variability (HRV) is a noninvasive, objective way to measure sympathetic and parasympathetic activity statistically.^[14] An increase in sympathetic activity and a decrease in parasympathetic activity brought on by prolonged stress can alter the ANS, which can then disrupt the metabolic balance and cause obesity, insulin resistance, dyslipidemia, and hypertension.^[15]

Stress has been an important issue for medical students. However, this is the first study in our constituent college of Rajasthan University of Health Sciences, Jaipur. This study aimed to find out the subjective assessment of stress, stressors, and coping strategies by questionnaires and objective assessment of stress by HRV and correlate subjective and objective assessment of stress among 1st year MBBS students at “RUHS College of Medical Sciences.” The gap area for the previous study was to analysis and correlation of stress by subjective and objective assessment. This study was carried out to collect baseline data for further extension of the study and it would be pertinent to administrative

authorities of the college could address to academic and teaching learning-related stressors to provide a conducive medical education environment. There is a need for cognitive behavior stress management programs to educate students on the management of stress and foster coping skills.

MATERIALS AND METHODS

Study design

This cross-sectional study was conducted among 1st year MBBS students at “RUHS College of Medical Sciences.”

Study setting

The study was conducted from July to September 2022 after obtaining institutional ethical clearance (EC-P-21/RUHS) and written permission from the medical college authority to collect data on the stress levels of medical students. A total of 140 students age group of 18–25 years who were given written informed consent were recruited. This study follows the guidelines laid down in the “Declaration of Helsinki.”

Sample size

The sample size was calculated using following formula $n = Z^2 \times p \times q/e^2 = (1.96)^2 \times 0.209 \times 0.791/(0.07)^2 = 129.61$. Add 10% dropouts, or 142, rounding to 150, where n is the necessary sample size and Z is 1.96 at 95%. Confidence interval, P denotes prevalence is estimated by Satpathy *et al.*^[6] to be 20.9%; $q = 1 - p$; $e = 7\%$ margin of error. To account for the nonresponse rate, this number was increased by 10%, resulting in a sample size of 150 medical students for this study.

Inclusion and exclusion criteria

Subjects who have chronic diseases such as hypertension, diabetes, renal disease, pregnant and lactating mothers, known history of any cardiovascular, pulmonary, neurological disease, musculoskeletal disorders, and any other abnormality detected during the physical examination that might have adversely affected the participant’s health were excluded.

Questionnaire

The students were asked to fill out a predesigned and validated questionnaire. The questionnaire comprised four sections, first: sociodemographic characteristics; second: general health Question (GHQ-12);^[15,16] third: The medical student stressor questionnaire^[17]; and fourth: section brief coping inventory.^[18]

The students were required to complete a validated and predesigned questionnaire. The survey was divided into four sections: First “sociodemographic characteristics,” followed by the “General Health Question (GHQ-12)” in sections,^[15,16] and the Medical Student Stressor Questionnaire in third sections,^[17] and a brief Cope Inventory in the fourth section.^[18]

In sociodemographic characteristics, age, sex place of birth, religion, caste, ethnicity, marital status, type of family, family members, occupation income, socioeconomic status, accommodation scholarship, and student loans were included in this study.

The General Health Questionnaire (GHQ-12) had six positive items (1, 3, 4, 7, 8, 12) and six negative items (2, 5, 6, 9, 10, 11) that were related to a person’s psychological well-being. Each question was answered by the subjects selecting one of four options: “Not at all, not more than typical, somewhat more than typical, and significantly more than typical” There was a binary recording system in operation.^[15,16] The “MSSQ” was used to determine stress. Forty statements that have been scored on a four-point Likert scale as the cause of stress are included in the MSSQ. The MSSQ assesses stress in six domains, academic-related stressors (ARS) are defined as academic, educational, student, and events that result in stress for students. Intrapersonal and interpersonal-related stressors (IRS) are referred to as any type of relationship between and within individuals that causes stress. Teaching- and learning-related stressors (TLRs) generally have to do with how suitable the assignments teachers assign to their students and how they are capable of supervising, how well they provide feedback, how much they acknowledge and assist their students, and how clearly the learning objectives they set for them are stated. Any type of social relationship that results in stress is referred to as a social-related stressor (SRS). The term drive and desire-related stressors (DRS) describe any internal or external factors that affect a person’s mindset, actions, feelings, and thoughts and so lead to stress. Any group interactions and activities that result in stress are referred to as GARS. For every response, there was a score of 0–4 on the MSSQ. A response of zero, one, two, three, and four points for no stress, mild, moderate, high, and severe stresses, respectively.^[18,19]

Brief Cope-28 was used to evaluate coping mechanisms. Medical students’ various coping behaviors are evaluated using the coping inventory. There are 28 items total, and each is given a 4-point Likert scale rating. The instrument has been validated and its Cronbach’s alpha values fall between 0.50 and 0.90. Coping strategies are two types active and passive. Active strategies are centered on emotions and problems. Passive strategies were avoidant-focused while high scores in problem-focused strategies demonstrated psychological fortitude, tenacity, and a realistic approach to positive results. A high score denotes an attempt to withdraw from the stressor, either physical or cognitive efforts to disengage from the stressor.^[17,20]

Heart rate variability analysis

The electrodes were placed on the pad of the finger pulse transducer. The HRV analysis in time and frequency domain reflects the variation in heart rate. Electrocardiogram (ECG) signals were recorded by a digital physiograph (AD instrument). The signals filtered and extracted QRS peaks which reflect the R-R intervals. These QRS peaks were detected and reviewed for R-wave determination and ectopic beats. Areas of ectopic beats were excluded. The time and frequency domain indices were assessed from 5-min segments.^[14] Excluded were ECG regions where ectopic beats could be identified. The 5-min segments were used to evaluate the time and frequency domain indexes.^[14]

The aim and objectives of the study and questionnaires were explained and discussed verbally and in the participant information sheet and were circulated to the 1st year medical students in a lecture. The participants were allowed 45 min to complete the questionnaire, if a participant had not submitted the questionnaire pro forma in timelines, then he/she was not included in the study and counted as a dropout from the study. Statistical Package for the Social Sciences (SPSS), also known as IBM SPSS Statistics, is a software package used for the analysis of statistical data. To find mean differences, descriptive statistics and an independent *t*-test were performed. Pearson correlation analysis was performed for the correlation of HRV and stress score.

RESULTS

A total of 150 students were enrolled and questionnaires were distributed out of 140 responded. Among them, 78 (55.71%) were male and 62 (44.28%) were female.

A majority 92.85% (*n* = 130) were Hindus, 1.4% (*n* = 2) were Muslim, 1.4% (*n* = 2) were Christian, and 4.28% (*n* = 6) were others. One hundred percent of students were single. In addition, 35.71% (*n* = 50) of students live in a hostel, 42.85% (*n* = 60) live with parents, and 30% (*n* = 30) in a rental home [Table 1].

Figure 1 depicts MSSQ-based grading of stress scores among 1st year MBBS students, 17% of students were mild, 40% were moderate stress, 13% high, and 10% were severe stress.

Table 2 depicts the mean (Standard deviation [SD]) of the positive item GHQ-12 was 2.52 ± 0.61, the negative item 2.60 ± 1.2, overall mean ± SD GHQ-12 was 2.56 ± 0.61. Out of 140 students, 41% (58) felt their concentration was the same as before, 45% (64) felt that they had played a useful part in medical college, 40% (57) felt they could make a good

Table 1: Sociodemographic determinants among 1st year medical students

Parameters	Variables	<i>n</i> (%)
Age (years)	>20	60 (42.8)
	<20	80 (57.1)
Gender	Male	78 (55.7)
	Female	62 (44.3)
Year of study (%)	1 st -year	100
Religion	Hindu	130 (92.9)
	Muslim	2 (1.4)
	Christian	2 (1.4)
	Others	6
Marital status	Single	140 (100)
	Married	0
Accommodation	Hostel	50 (35.7)
	Parenteral	60 (42.9)
	Rental home	30 (21.4)
Schooling	Public	60 (42.8)
	Private	80 (57.1)

Table 2: Results of General Health Questionnaire-12 among study participants

Questions: Have you recently	Mean ± SD	Mean ± SD
Been able to concentrate on what you are doing?	2.11±0.71	Positive items (2.52±0.61)
Felt that playing a useful part in things	2.43±0.51	
Felt capable of making decisions	2.49±0.65	
Been able to enjoy day-to-day activities	2.73±0.49	
Been able to face problems	2.56±0.72	
Been feeling happy	2.84±0.61	Negative items (2.60±1.2)
Lost much sleep due to worry	2.86±1.22	
Felt constantly under strain	2.77±1.12	
Felt unable to overcome difficulties	2.52±1.05	
Been feeling unhappy, depressed	2.63±1.4	
Been losing confidence in yourself	2.54±1.18	
Been thinking you are as a worthless person	2.29±1.23	
Total GHQ		2.56±0.61

SD: Standard deviation, GHQ: General Health Questionnaire

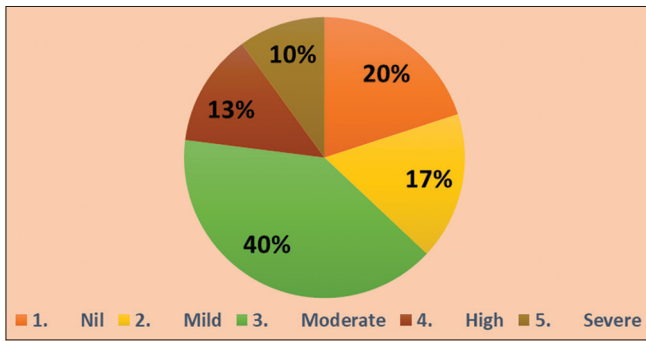


Figure 1: Grading of stress score among 1st year MBBS students. MSSQ: Medical student stressor questionnaire

decision, 41% (58) reported that they enjoy daily activities, and 49% (69) were able to face their problems. In addition, 55% (78) were happy and 30% (41) did not lose their sleep. However, 23% (32) felt they were constantly under stress and 36% (50) could overcome difficulties. In contrast, 25% (35) felt unhappy and depressed, 39.1% (55) were not losing confidence, and 52.3% (73) did not feel they were worthless.

Figure 2 depicts the MSSQ-based grading of different domains. The most affected domain was ARS 80% followed by TLR, SRS, IRS, activities related stressor, and DRS 78%, 75%, 73%, 70%, and 68%, respectively.

Table 3 shows the mean score calculated by the addition of scores from all the MSSQ items divided by 40 which was an indicator of overall stress. Mean scores for each student were calculated. Academic stressors were the most important stressor for increased stress among 1st year students. Lack of time to review, vast content to be learned, assessments, examinations, and frequent interruptions of work were the important determinants of stress.

Table 4 depicts the results of various coping strategies in males and females. In the males and females, the mean score of avoidant coping strategies was highest followed by emotional-focused and then problem-focused. Results were nonsignificant in males and females.

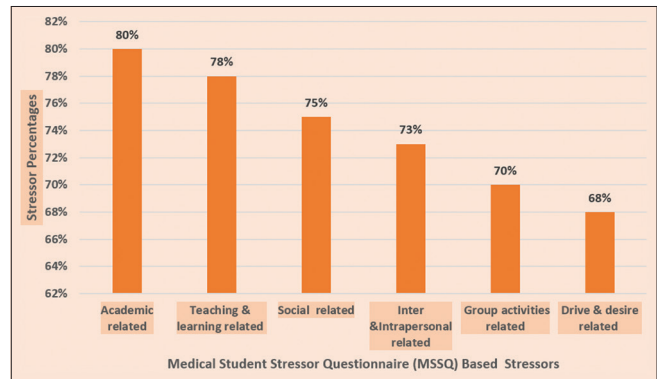


Figure 2: Medical student stressor questionnaire based grading of various Stressors among 1st year MBBS students. MSSQ: Medical student stressor questionnaire

Table 5 depicts “time domain parameters,” i.e., standard deviation of normal to normal RR intervals (SDNN), root mean square of successive differences (RMSDD), PRR50, frequency domain indices low frequency (LF), high frequency (HF), and LF/HF ratio among 1st year students.

Table 6 depicts a correlation analysis of GHQ-12, MSSQ, coping strategies, time, and frequency domain indices of HRV. Results show ARS, TLR, SRS, IPR, group activities related (GAR), and DRS were negatively correlated with problem-focused and avoidant-based strategies had a significant positive correlation with ARS, TLR, SRS, IPR, GAR, and DRS. GHQ-12 and MSSQ domains, i.e., ARS, TLR, SRS, IPR, GAR, and DRS were positively correlated with time domain and “frequency domain parameters,” i.e., SDNN, PRR50, RMSDD, and LF/HF ratio, respectively.

DISCUSSION

Usually, successful candidates have excellent academic achievement after the stressful competitive “National Eligibility Cum Entrance Test” examination enters the medical course. This cross-sectional study aimed at measuring stress, stressors, and coping strategies among 1st year MBBS students

Table 3: Grading of stressors based on the Medical Student Stressor Questionnaire

Rank	MSSQ items	Mean ± SD score
Mild stress	Talking to patients about illness	0.51±0.67
	Need to do well	1.54±1.16
	Not enough study material	1.44±1.15
Moderate stress	Learning context	1.64±1.26
	Teacher does not have teaching skills	1.80±1.42
	Unable to answer the queries from patients	1.76±1.11
	Illness and death of patients	1.63±1.19
	Not able to answer questions from the teachers	1.73±1.12
	Conflict with other students	1.46±1.12
	Physical and verbal abuse by other students	1.57±1.26
	Parental wish to study medicine	1.57±1.28
	Lack of guidance from teachers	1.74±1.25
	Feeling of incompetence	1.75±1.42
	Uncertainty of what is expected of me	1.53±1.35
	Not having medical skill practice	1.76±1.25
	Lack of time for friends and family	1.95±1.42
	Inappropriate assignments	1.82±1.29
	Having difficulty understanding the contents	1.87±1.58
	Poor motivation	1.78±1.43
	Need to do well (imposed by others)	1.64±1.36
High stress	Unjustified grading process	1.88±1.53
	Working with computers	1.22±1.31
	Quota system in examination	1.406±1.44
	Need to do well (self-expectation)	1.82±1.38
	Lack of guidance from teachers	1.64±1.35
	Conflict with teachers	1.76±1.40
	Unwillingness to study	1.49±1.38
	No feedback from teachers	1.78±1.28
	Getting poor marks	2.15±1.25
	Physical or verbal abuse by teachers	2.17±1.28
	Heavy workload	2.19±1.26
Severe stress	Lack of recognition for work	2.26±1.31
	Physical and verbal abuse by personnel	2.34±1.34
	Family responsibilities	2.48±1.39
	Class presentation participation	2.50±1.19
	Lack of time to revised subjects	2.46±1.45
	A vast amount of content to be learned	2.50±1.50
	Test/examinations	2.45±1.46
	Frequent interruption of work	2.86±1.26
Falling behind in reading schedule	2.66±1.30	

SD: Standard deviation, MSSQ: Medical Student Stress Questionnaire

Table 4: Result of brief cope inventory

Coping strategies	Males	Females	P	Inference
Problem-focused	1.01±0.38	1.05±0.38	0.5030	NS
Emotion-focused	1.70±0.59	1.85±0.572	0.7270	NS
Avoidant focused	2.78±0.28	2.61±0.26	0.5370	NS

NS: Nonsignificant

at RUHSCMS. In this study, a response rate of participants was 93% which was similar to the studies conducted by Raj *et al.*,^[19] Somnath^[21] In the present study total prevalence of

stress was 80%. According to the MSSQ score severity of stress was graded as mild, moderate, high and severe stress range were 17%,40%,13%, and 10% respectively [Figure1]. Prevalence was in range to reported in previous studies.

Of 140 students, 41% (58) felt their concentration was the same as before, 45% (64) felt that they had played a useful part, 40% (57) felt they could make a decision, 41% (58) observed that they enjoy daily activities, 49% (69) were able to face their problems similar to studies conducted by Yusoff *et al.*,^[22] Saipanish^[23] In contrast, 25% (35) felt unhappy, 39.1% (55) were not losing confidence, and 52.3% (73) did not feel that they were worthless similar to the study reported by Yusoff *et al.*^[22] [Table 2].

In the present study, the prevalence of stress was higher among female students (87.09%) compared to males (76.92%). This was similar to the study conducted by Somnath^[21] and Inam,^[24] on the contrary, Cohen *et al.*^[25] reported no statistically significant difference was observed between male and female students' stress scores.

In this study, academic-related stress is the most dominant [Figure 2] around 80% followed by social, interpersonal and intrapersonal, teaching and learning related, group activities, and drive- and desire-related stress at 78%, 75%, 73%, 70%, and 68%, respectively. Academic stressors refer to any scholastic, educational, college, or student events that cause stress. These include academic schedules, examination patterns, assessment methods, grading methods, and various student activities. A high score of around 80% reported in the present study indicates that academic matters were an important source of stress similar to a study conducted by Supe,^[9] Raj,^[19] Ghosal and Behera,^[26] and, Eva *et al.*^[27]

TLRs contributed around 78%. It was the second important cause of stress in this study. It was associated with the teachers' competency to guide students, tasks given by teachers to students, grading, and feedback given by teachers to students to achieve objectives. A similar finding was observed by Ghosal and Behera,^[26] Garg *et al.*^[28]

SRSs 75% contributed were ranked third next to TLRs in this study. It was related to work interruption by others not being able to spend time with friends and family, and college work in the private time. This reflects that students have problems spending their time in social activities results were similar to studies reported by Garg *et al.*,^[28] Nebhinani *et al.*^[29]

In this study prevalence of interpersonal and intrapersonal stress was 73% which was fourth ranked in all stressors. This might be due to most of them being day scholars, meaning there was less room sharing and interaction beyond college hours. Results of the present study are contrary to studies conducted by Pancho *et al.*,^[30] where IRS ranked after ARS.

In the present study, the most common coping strategies were avoidant in males and females followed by emotional- and problem-based [Table 4] results were similar to studies.^[27-30]

In the present study, all stressors academic related stressor(ARS),teaching learning related (TLR),social related stressor(SRS), and interpersonal and intrapersonal stress(IPS), were significantly positively correlated with avoidant strategies, and a negative correlation was observed with problem-based strategies similar to previous studies.^[31,32] GHQ-12 and MSSQ domains, i.e., ARS, TLR, SRS, IPR, GAR, and DRS were positively correlated with time domain and frequency domain indices, i.e. SDNN, PRR50, RMSDD, and LF/HF ratio, respectively, similar to previous studies conducted by Collins *et al.*,^[31] Riese *et al.*^[32] [Table 6].

In the present study, both subjective and objective assessments observed that academic stress was reported to be the most important stressful domain by RUHSCMS 1st year students. Most medical students cope with stress with avoidant strategies. Therefore, administrative authorities need to address this problem and execute stress management programs to educate students to achieve healthy stress-coping strategies for the conduction of smooth medical education and high-quality doctors and patient care in India.

CONCLUSION

In the present study, positively correlated subjective and objective assessment of stress by different validated stress

questionnaires and HRV, respectively. Given the significance of this subject, a better understanding of stressors encountered by medical students as well as their coping strategies is required. The prevalence of stress was 80% among 1st year MBBS students at “RUHS College of Medical Sciences.” The most important MSSQ domain was academic stressors. Factors contributing to academic stress were difficulty in understanding many topics in physiology, biochemistry, anatomy, heavy workload, and lack of time to revise topics, assessments, tutorials, and part-completion tests were the factors contributing to academic stress. In this study, all stressors were positively correlated with avoidant coping strategies and negatively correlated with problem-based strategies. The present study investigates the need for interventions for stress management in medical education and educates students about coping strategies so that they would not avoid challenges rather than solve them with a positive attitude. Student counseling with psychologists and teacher mentorship programs may help students to adopt positive coping strategies for relieving stress. Stress management lectures, relaxation techniques such as meditation, yoga, visualization, and time management at the admission of a student in medical college would be helpful.

Limitations

Stress a well-known entity among medical students is yet to be explored further in research studies. A comparative study of stress levels in different years of MBBS with different medical colleges will be a future extension of this study.

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Conflicts of interest

There are no conflicts of interest.

Table 5: Results of time domain and frequency domain variables of heart rate variability

Time domain parameters	Mean±SD	Frequency domain parameters	Mean±SD
SDNN	35.57±4.95	LF	65.72±11.44
RMSDD	34.48±3.88	HF	36.40±11.75
PRR50	17.67±2.76	LF/HF ratio	2.18±1.09

SDNN: Standard deviation of normal to normal RR intervals, RMSDD: Root mean square of successive differences between normal heartbeat, PRR50: Percentage of differences higher than 50 ms in RR interval, LF: Low frequency, HF: High frequency, SD: Standard deviation

Table 6: Correlation analysis of stress scores (General Health Questionnaire-12, Medical Student Stress Questionnaire) and coping strategies (brief cope inventory-28) and heart rate variability

Strategies	GHQ-12		ARS		TLR		SRS		IPR		GAR		DRS	
	r	P	r	P	r	P	r	P	r	P	r	P	r	P
Problem-based	0.05	0.52	-0.54	0.05	-0.33	0.004	-0.38	0.023	-0.44	0.057	-0.39	0.11	-0.37	0.008
Emotion-based	-0.02	0.80	-0.01	0.83	0.28	0.001	0.28	0.005	0.25	0.018	0.13	0.09	0.27	0.007
Avoidant based	-0.06	0.90	0.45	0.05	0.58	0.001	0.48	0.004	0.55	0.001	0.63	0.05	0.47	0.005
SDNN	0.467	0.01	0.866	0.001	0.679	0.001	0.567	0.01	0.667	0.01	0.567	0.001	0.367	0.01
RMSDD	0.432	0.01	0.766	0.001	0.567	0.001	0.422	0.01	0.532	0.01	0.456	0.001	0.232	0.01
PRR50	0.542	0.01	0.887	0.001	0.765	0.001	0.642	0.01	0.442	0.01	0.678	0.001	0.442	0.01
LF/HF ratio	0.675	0.01	0.894	0.001	0.688	0.001	0.475	0.01	0.375	0.01	0.568	0.001	0.475	0.01

P<0.05 significant. GHQ-12: General Health Questionnaire-12, ARS: Academic-related stressor, TLR: Teaching- and learning-related stressors, SRS: Social-related stressors, GAR: Group activities related stressor, DRS: Drive- and desire-related stressor, IPR: Interpersonal and intrapersonal related stressor, SDNN: Standard deviation of normal to normal RR intervals, RMSDD: Root mean square of successive differences between normal heartbeat, PRR50: Percentage of differences higher than 50 ms in RR interval, LF/HF ratio: Low frequency/high-frequency ratio

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