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Evaluation of academic stress and its effect on visual reaction time in undergraduate medical students

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Abstract
Medical students face a lot of academic stress during their period of professional training; if this stress is severe it can have a negative effect on the academic performance of students. Reaction time (RT) is a simple and noninvasive test which can be used to assess central and peripheral neural structures. The aim of the present study was to assess the level of stress in first year undergraduate MBBS medical students during their routine normal academic schedule and secondarily during period of increased mental stress when they were appearing for practical exam. The reaction time was also measured during routine normal academic schedule days and again during practical exam time to assess the effect of mental stress on reaction time. For assessment of stress STAI (Y1)– Speilberger's State Trait Anxiety Inventory for Adults (STAI-A) FORM Y- 1 questionnaire was used. Visual reaction time (VRT) was assessed by online reaction time test. We have observed a high score of mental stress in medical students which was even further increased statistically when the students faced examination stress (P <0.001). Comparison of VRT between the study groups in situation of normal academic schedule and during practical exam stress showed VRT significantly reduced (p< 0.001) during period of mental stress. We conclude that medical students face a lot of academic anxiety which is increased even further during examination days. This necessitates intervention measures so that students can learn to cope with the pressure induced by medical education.
Keywords: *Medical students, stress, VRT, STAI-1.*

Introduction

Stress is defined as any change in the environment of an organism that changes or threatens to change the prevailing homeostasis of the organism. [1,2] This indicates the failure of an organism, human, or animal to respond appropriately to emotional or physical threats whether is either actual or imagined. [3, 4]Medical students face a lot of academic stress during their period of professional training. This stress is basically mental in nature. Mental stress are the changes in reference to the psychophysiological state that people experience when they endure prolonged periods of demanding cognitive activity that requires sustained mental effort.[5] The first year undergraduate MBBS students face a major academic challenge and mental stress as there is a dramatic change in the syllabus and teaching

compared to their school education years. This is more so during practical examination, where the students have to face "viva - voce" for the first time. This academic stress among undergraduate medical college students is considered normal, but if the stress is very severe it can have a negative effect on the academic performance of students as well. The main mediators of the stress response are sympathetic nervous system and the Hypothalmus pituitary adrenal axis (HPA).[6] The basic neuroendocrine core of stress responses triggers release of hypothalamic corticotrophin-releasing hormone (CRH) which stimulates the release of ACTH from the anterior pituitary, which, in turn, stimulates the adrenal cortex to release corticosteroids, especially cortisol or corticosterone. [7]Some previous studies have reported that stress has a negative influence on cognitive functions.[8, 9, 10] Mental fitness includes reaction time. Reaction time (RT) is a simple and noninvasive test which can be used to assess central and peripheral neural structures. Reaction time is an index of sensory motor performance. It is an indicator of biological efficiency of central nervous system. Reaction time is defined as an interval of time between presentation of stimulus and appearance of appropriate voluntary response in a subject.[11, 12]

Aim of Study

The aim of the present study was to assess the level of stress in first year undergraduate MBBS medical students during their routine normal academic schedule and secondarily during period of increased mental stress when they were appearing for practical exam. The reaction time was also measured during routine normal academic schedule days and again during practical exam time to assess the effect of mental stress on reaction time.

Materials and Methods

The present study was carried on in the first year undergraduate MBBS medical students of our institute. The students were informed in detail about the study and informed consent was taken for participation in the study. The study was approved by the institute ethical committee. 52 students of first year MBBS participated in the study.

The inclusion criteria was: first year MBBS student. The exclusion criteria was presence of acute or chronic illness, colour blindness, psychiatric disease, substance addiction or unchecked refractive error.

For assessment of stress STAI (Y1)– Speilberger's State Trait Anxiety Inventory for Adults (STAI-A) FORM Y- 1 questionnaire was used. It has 20 questions that assess the state anxiety status of the individual in a particular situation. Each question has 4 responses. The final score is calculated by using the scoring key provided. The questionnaire was given as a printout, self – administered and filled anonymously by the students. The mental stress was assessed twice – during normal routine academic schedule days and again when they had come to appear in the 2nd terminal practical examination in Physiology department.

Visual reaction time (VRT) was assessed by online reaction time test. The students were described and demonstrated the procedure of the test. Students were made to sit in front of computer screen, keeping their finger on the mouse and asked to respond immediately by clicking the mouse when they saw test object color change from green to red. Three readings were taken and the average of the 3 was noted. The colour of the test object was kept the same to avoid any bias on the test based on different colours.VRT was also done twice: during normal routine academic schedule days and again when they had come to appear in the 2nd terminal practical examination in Physiology department. Out of 52 students enrolled for study, two were absent on day of practical exam, so the data was analysed for remaining 50 students. For uniformity, all the readings were taken between 10 am and 12 noon.

Results

The age of the study group ranged from 18 to 22 years. The study included both girls and boys. There were 38 girl participants and 12 boy participant in the study. The data was analysed by using SPSS version 17 for windows (p value ≤ 0.05 was considered significant*). Paired t test was used to

compare the stress (anxiety) level and the VRT of students during normal academic schedule and during practical examination stress. Table 1 shows the stress level comparison in the two situations.

Table 1: Anxiety Levels in normal academic schedule versus exam

GROUP	Normal Academic Schedule (N=50)	Appearing In Practical Exam (N=50)	
Mean ±SD	39.74 ± 7.61	46.40 ± 8.56	t= 7.47, df ==49 p<0.001*
Standard Error of Mean (SEM)	1.08	1.21	

Table 2 shows the comparison of VRT in students during normal academic schedule and in period of mental stress during practical examination

GROUP	NORMAL ACADEMIC SCHEDULE (N=50)	APPEARING IN PRACTICAL EXAM (N=50)	
Mean ± SD	640 ± 233.55 (msec)	507 ± 161.47 (msec)	t= 6.48, df=49, p<0.001*
Standard error of mean (SEM)	33.03	22.84	

Discussion

We have assessed the mental stress level and VRT of first year undergraduate MBBS medical students. The same set of students was assessed during the normal academic schedule days and again when they were appearing in Physiology 2nd terminal examination and were under examination stress. Since the same individual was examined twice so the study groups were age and gender matched.

We have observed a high score of mental stress in medical students which was even further increased statistically when the students faced examination stress ($p< 0.001$) (Table 1).

Some other studies have documented high stress levels of medical students. In our present study, the comparison of VRT between the study group in situation of normal academic schedule and during practical exam stress (Table 2) it was seen that the VRT was significantly reduced ($p < 0.001$) during period of mental stress of practical examination. In contrast, some previous researchers have documented a significant increase in the auditory and visual RTs in pre-examination period in both male and female control groups.[13, 14]

On the other hand some other studies have documented that stress in the form of regular study and exam held for medical students had no significant effect on sensory-motor fitness and reaction time.[15] Some other authors have also concluded that stress leads to a decrease in reaction time. [16, 17] The reaction time gives an idea about the integrity and processing ability of Central Nervous System.[18] It is postulated that psychological stress increases release of epinephrine due to increased sympathetic activity.[19]This increased level of adrenaline during period of stress translates into reticular activation which increases the processing speed of CNS and hence leads to decrease in reaction time in period of stress. [20]

Conclusion

We conclude that medical students face a lot of academic anxiety and stress during their training period which is increased even further during examination days. This necessitates intervention measures that need to be introduced, so that students can learn to cope with the pressure induced by medical education. Mentoring programme between students and faculties should be encouraged so that the signs of stress can be detected and addressed at the earliest. Recreation and sports facilities should be provided within the campus for students as these help reduce stress. Yoga, meditation and psychological counselling can also be advised to relieve stress among medical students.

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Declaration

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