

Detection of Vulnerability of Medical Students to Stress: Self-perceived role of Music Therapy in improving Coping Ability

Ronak Reshamwala¹, Sarmishtha Ghosh^{2*}

ABSTRACT

Background: Medical students have been known to undergo tremendous stress during various stages of the MBBS course; some break down while others can cope with the same.

Objective: The study aimed to assess medical students' vulnerability to stress by identifying alterations in cardiovascular parameters under stress and their resilience score. It was also aimed to find out the personal view of students in considering music therapy for improving their stress coping ability or resilience.

Methods: Orthostatic and mental stress were imparted in first-year medical students by quick change of posture and reading and presenting an unknown scientific article within a fixed time, respectively. Cardiovascular parameters were measured by standard techniques and sources of stress with stress coping strategies and resilience were done by a structured questionnaire. Music therapy was imparted after college hours with Mozart's Symphony. All data were expressed as Mean \pm SEM and statistical significance was assessed by using Student's t-test and correlation.

Results: 100% of students considered academic factors as the primary source of stress, while 52-60% considered physical, emotional and social factors. Talking to friends was rated to be the most efficient relieving strategy. The subjects were resilient to a considerable extent and their reaction time was within the normal range. Both orthostatic and mental stress caused increases in the cardiovascular parameters as compared to rest, with mental stress causing more significant changes. Subjective responses showed that 78.3% rated music to be highly effective in improving coping ability.

Conclusions: First-year medical students considered academic stress as the most important stress inducer in the first year of their medical course. Talking to friends was identified as the most effective stress relieving mode. Both orthostatic and mental stress induced significant increases in cardiovascular parameters, mental stress causing more change than the orthostatic one. The majority of students under study perceived and reported music therapy as an effective means of stress coping.

Keywords: Stress, autonomic activity, music therapy

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INTRODUCTION

Medical school can be an exciting and challenging time for students. Along with excitation comes a hoard of sources of anxiety and stress since medical education is workload and emotionally difficult. College students, especially freshmen, are particularly prone to stress due to the transitional nature of college life.¹ They must adjust to being away from home for the first time, maintain a high level of academic achievement and adjust to a new social environment. Stress results from the interaction between stressors and the individual's perception and reaction to such stressors² Studies have shown that communication abilities may contribute to cardiovascular risk mediating the relationship between coping and stress.³ A study of stress in medical students in Seth G.S. Medical College, India by AN Supe had shown that medical students undergo tremendous stress during various stages of the MBBS course. First MBBS students were more stressed by emotional factors. The study also showed that stress was not trait oriented & was process oriented.⁴ Stress is an emotional and physiological response to a stressor that triggers the sympathetic division of the autonomic nervous system into preparation for change according to Hayes, 1994.⁵ Reactivity hypothesis of cardiovascular diseases suggest that some people show

¹Menzies Health Institute Queensland, Griffith University, Australia.

^{2*}Department of Physiology, Faculty of Medicine, MAHSA College, Kuala Lumpur, Malaysia

***Corresponding author:** Sarmishtha Ghosh, Professor, Health Professions Education, Bhaikaka University, Gujarat, India Email: essjee63@gmail.com

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characteristically greater cardiovascular reactivity than others to behaviorally stressful situations and this greater reactivity marks an increased risk for cardiovascular disease.⁶ It has also been suggested that a cardiovascular hypersensitivity under stress may promote atherogenesis, thus indicating a link between behavioral factors and atherosclerotic diseases.⁷

Psychophysiological investigations involving human subjects reveal that individuals differ markedly in the magnitude of their autonomic responses to stress.⁸ Relaxing music has been shown to prevent stress induced increases

Table 1: Cardiovascular parameters at Rest

	N=23
Pulse [beats/min]	78.09 ± 1.37
Systolic blood pressure [mm Hg]	116.65 ± 2.9
Diastolic blood pressure [mm Hg]	70.39 ± 1.91
Pulse pressure [mm Hg]	46.26 ± 1.62
Mean Arterial Pressure [mm Hg]	85.81 ± 2.16

in subjective anxiety, systolic blood pressure, and heart rate in healthy males and females and music can also facilitate blood pressure recovery from stress.⁹

The autonomic responses vary individually in different individuals upon physical and mental stress. The resilience capacity to recover following a stress is also highly individualized and has a very complex mechanism of operation. But the association of orthostatic and mental stress in causing a change in the cardiovascular parameters was not clear so as to identify the individual's vulnerability to mental stress.

OBJECTIVES

The aim of the study was to assess the vulnerability to mental stress amongst medical students and find out efficacy of music therapy towards improving their ability to cope

MATERIAL AND METHODS

Twenty-five healthy students of medical undergraduate course of 17-20 were selected for the randomized, experimental, cohort study. The inclusion criteria included no family history of psychiatric disorders like anxiety, depression, schizophrenia, no personal history of psychiatric illness, no personal history of any other illness in the last three months and not under any chronic medication.

Parameters measured were :

Physiological measurements :

- Pulse rate and Blood Pressure
- Reaction time

Questionnaire assessment :

- GHQ-12 and Resilience Test
- Self perceived sources of stress in student life
- Stress Coping ability

All parameters were measured by standard techniques at rest.

The subject was asked to stand up very quickly from his lying down position to cause orthostatic stress, following which his pulse and blood pressure were immediately measured.

The mental stress was applied by means of asking the subject to read an unknown scientific article for 5 minutes and presenting it in front of the experimenter and 3 members of his own class.

All twenty-five students were subjected to music therapy for 21 days, Monday through Friday, 30 minutes each. This was done after college hours. A music CD of Mozart's Symphony was played and none of the students had any prior exposure to western music. Two students dropped out of the schedule; therefore, 23 students were considered for data analysis.

All data were expressed as Mean ± SEM and statistical significance was assessed by using Student's t-test and correlation.

Written informed consent was obtained from all subjects prior to the study and the study protocol was sanctioned and approved by the institutional Human Research Ethics Committee.

RESULTS

Table 1 shows the physiological parameters of all 23 subjects which are within normal ranges for the particular age group.

Table 2 shows the self-perceived sources of stress and coping strategies adopted by the students on their own. All students considered academic factors, namely lesson load, examinations, competition and academic achievements as the primary source of stress in the medical course, while 60% considered physical and emotional factors as the major source and 52% considered social factors to be the most stress inducers. Among the relieving strategies, talking to friends was rated to be the most efficient strategy adopted by one for relieving one's stress while few rated gym/exercise/ personal hobbies/co-curricular activities and peer or teacher help to be most efficient method adopted by them.

Table 3 shows the resilience score to be 77.43 +/- 7.63 which means that the subjects under study were resilient to a considerable extent and the reaction time of 0.267 +/- 0.03 falls within the normal range of 0.2 to 0.4 milliseconds

Table 4 shows that both orthostatic and physical stress change the cardiovascular parameters in an individual as compared to that in the rest. A significant increase was observed in the pulse rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure of the subjects

Table 2: Self-perceived Sources of Stress and Coping strategies

Sources of stress		Coping/relieving strategies	
Source	Number of students	Strategy	Number of students
Academic	23	Friends	21
Physical factors-environment	14	Gym/ Exercise/ personal hobbies/ co-curricular	17
Emotional factors	14	Peer help	17
Social factors	12	Teacher's help	18

Table 3: Resilience Score and reaction time of the students

	Values
Resilience Score	77.43 ± 7.63
Reaction time [seconds]	0.267 ± 0.03

upon application of both orthostatic and mental stress while the alteration in the pulse pressure was found to be insignificant. The difference between orthostatic stress and mental stress was also found to be significant in case of pulse, mean arterial pressure and systolic blood pressure.

The subjective responses of the students under study regarding the efficacy of music therapy in improving their stress relieving ability were elicited by the research worker on an informal interview pattern which showed that 78.3% rated it to be highly effective, 8.7% rated it to be somewhat effective and 13% rated it to be not effective at all. (Table 5)

DISCUSSIONS

Doctor's stress begins during the medical training. As a consequence of increased stress medical students experience an alarming amount of stress associated anxiety, depression, substance abuse and even suicide. Chronic stress is also known to influence memory and learning, especially problem-solving abilities which require flexible thinking. Our study indicated that most first year students consider academic factors such as lesson load, examinations, competition and academic achievements as the primary source of stress in the medical course while physical, emotional and social factors are considered by some as the major source of stress. This is corroborated by the study of Supe,⁴ however, a study by Bughi et al (2006)¹⁰ reported that maximum stress in medical profession is encountered by the students in their third and fourth year. The probable reason freshmen undergo stress is that they need to adjust to a new environment and keep up to their parents' expectations by performing well in academics. Among the relieving strategies, most students reported that talking to friends was an efficient method adopted by them to relieve stress. Some resorted to Gym/exercise/personal hobbies/co-curricular activities and others looked up to peers or teachers to help them relieve their stress.

All students in this study had normal blood pressure and were otherwise healthy. However, none of them showed any indication of being depressed by the GHQ assessment. Also, the resilience score showed that they were all highly resilient. Psychological analysis did not identify any subjects as anxious

Table 4: Alteration of BP & Pulse upon orthostatic and mental stress :

	Rest	Physical stress	Mental stress
PULSE (bpm)	78.09 ± 1.37	95.83 ± 1.74*	100.3 ± 2.13*
SBP (mmHg)	116.65 ± 2.36	130.83 ± 3.35*	142.48 ± 2.9*
DBP	70.39 ± 1.91	81.09 ± 2.03*	92.09 ± 2.03*
PP (mmHg)	46.26 ± 1.62	49.74 ± 2.63	50.39 ± 2.24
MAP	85.81 ± 2.16	97.67 ± 2.22*	108.88 ± 2.11*

* indicates significant difference.

or depressed at the time of the experiment.

Sympathetic nervous system is the main regulatory mechanism of the cardiovascular system. Studies have reported that if a patient experiences more than a 20% increase in blood pressure due to mental stress, there is an abnormal activation of the sympathetic nervous system that could damage blood vessels and vital organs.¹¹ Our study showed quite a number of subjects, though being normotensive at rest suffered more than 20% rise in blood pressure upon giving mental stress. This makes them vulnerable to mental stress-induced breakdown and in the long run may affect their autonomic system in regulating the cardiovascular system. Studies have also reported that vagal modulation of heart appears to be sensitive to the recent experience of persistent emotional stress regardless of the person's disposition toward experiencing anxiety.¹² Studies have shown that stressors induce an increase in blood pressure compared to the baseline¹³. The present study also showed the same; there has been a significant increase in blood pressure under orthostatic and mental stress compared to the resting values.

Study by Steptoe et al. (1999)¹⁴ assessed the influence of abdominal obesity and work stress on ambulatory blood pressure in school teachers and found that baseline blood pressure was positively associated with waist/ hip ratio in men. Our study in contrast, found a better positive correlation between body fat % and blood pressure. This may probably be due to the age group difference between the two studies. But it may be stated that abdominal obesity or body fat percentage can be characterized by a tendency towards a heightened stress-induced physiological activation.

Research has shown that music profoundly affects your body and psyche. In fact, there's a growing field of health care known as Music Therapy, which uses music to heal. Music Therapy may be commonly defined as the structured use of music and activities geared toward helping individuals with disabilities meet musical and non-musical goals. Music therapy goals may be based on behavioral, physical, cognitive, social, emotional, or language and communication. Music is a proven relaxation technique as well as a stimulant. Those who use music therapy often experience positive changes. Rhythmic music may change brain function and treat a range of neurological conditions, including attention deficit disorder and depression.

The use of music to induce positive emotions and subsequent relaxation has been studied extensively by researchers. A great deal of this research has centered on the use of music as a means of reducing feelings of anxiety and stress as well as aiding in the relief of numerous pathologies. The precise mechanism responsible for these mediated effects has never been truly determined. In the current report we propose that nitric oxide (NO) is the molecule chiefly responsible for these physiological and psychological relaxing effects.¹⁵ The present study also showed that music therapy was accepted as an effective method of personal well-being by most students who said that the half an hour

Table 5: Subjective response of students regarding the efficiency of music therapy in relieving stress.

Rating	Responses n[%]
Real effective	18 [78.3%]
Somewhat effective	2 [8.7%]
Not effective	3 [13%]

session proved beneficial in helping them develop their stress relieving capacity.

CONCLUSIONS

First-year medical students consider academic stress as the most important stress inducer in the first year of their medical course, followed by physical, emotional and social factors. The most effective stress relieving mode adopted by self was talking to friends, exercising, and personal hobbies; the least adopted was taking help from the peer group and teachers. Both orthostatic and mental stress-induced significant increases in heart rate, systolic and diastolic blood pressures in the individuals, with mental stress causing more change than the orthostatic one. The majority of students under study perceived and reported music therapy as an effective means of stress relieving, though they were not much acquainted with the quality and understanding of the type of music they listened to.

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CONFLICT OF INTEREST

None

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