

Correlation between Different Selected Stress Biomarker and Slow Music Intervention among First Year Medical Students

Abul Hasan Md Shahidullah^{1*} Momtaz Begum² Shahin Akhter³ Sheley Akter⁴
Debjane Barua⁵ Fatima Sadia⁵

Abstract

Background: Stress is the most common human experience. Excessive stress cause psychosocial health problems. It reduces self-confidence, academic performances and healthy development of an individual. The education in medical college is stressful due to vastness of academic syllabus. Beside this language problem, frequency of examination and high parental expectation may cause stress. Music plays an important role to improve person's quality of life. It alters the mood and behavior. It can affect central and autonomic nervous system. The objective of the study to find out the correlation between Perceived Stress Scale (PSS) score change with systolic and diastolic blood pressure, serum cortisol and fasting blood sugar change after slow music intervention among first year medical college students.

Materials and methods: This experimental study was conducted in the Department of Physiology, Chittagong Medical College, Chattogram. Total 60 subjects of first year MBBS, with equal number of male and female, studying in Chittagong Medical College, Chattogram, were included by stratified random sampling method according to inclusion and exclusion criteria. Selected stress biomarkers - systolic and diastolic blood pressure, Perceived Stress Scale (PSS) score, serum cortisol and fasting blood sugar were recorded before and after 15 minutes of music intervention for 15 days.

Results: Result was compiled and compared after data collection by using SPSS-25. Pearson correlation coefficient was done to assess the relationship between changes in PSS score with changes of other stress biomarkers-systolic and diastolic blood pressure, serum

cortisol and fasting blood sugar. $p < 0.05$ was considered as statistically significant. Systolic and diastolic blood pressure, perceived stress scale score, serum cortisol and fasting blood sugar were decreased after music intervention in the study subjects. But correlation between these parameters only significant in PSS change and systolic blood pressure change.

Conclusion: This study concludes that regular listening to slow music can be an effective measure for reduction of stress and improvement of quality of life.

Key words : Biomarker; Music, Perceived Stress Scale (PSS); Stress.

Introduction

Stress is the most common human experience.¹ Excessive stress cause psychosocial health problems. It reduces self-confidence, academic performances and healthy development of an individual. The education in medical college is stressful due to vastness of academic syllabus. Beside this language problem, frequency of examination and high parental expectation may cause stress. Lack of time for recreation and new environment may result in negative thought and perception.² Factors causing stress seems more pronounced in first year.³

Music plays an important role to improve person's quality of life. It alters the mood and behavior.⁴ It can affect central and autonomic nervous system.⁵ Music acts on our mind before transforming into thought and feeling. It stimulates good vibrations in the nerves of the listeners and brings a sense of mental well-being. It enhances the concentration level of children. It improves the capacity of planning, clarity of cognition and exhibition of emotions.⁶ Music listening have been associated with decrease of physiological arousal, heart rate, blood pressure and reduction of cortisol level.⁷ These three outcomes have been identified in neurobiology as distinct stress biomarkers.⁷ The objective of the study to find out the correlation between Perceived Stress Scale (PSS) score change with systolic and diastolic blood pressure, serum cortisol and fasting blood sugar change after slow music intervention among first year medical college students.

1. □ Lecturer of Physiology
□ Chittagong Medical College, Chattogram.
2. □ Professor of Physiology
□ Chittagong Medical College, Chattogram.
3. □ Associate Professor of Physiology
□ Chittagong Medical College, Chattogram.
4. □ Assistant Professor of Physiology
□ Chittagong Medical College, Chattogram.
5. □ Assistant Professor (C.C) of Physiology
□ Chittagong Medical College, Chattogram.

*Correspondence: A H M Shahidullah

□ Cell : 01710 88 06 22
□ E-mail: drshahidrpmc@gmail.com

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Material and methods

This experimental study was done in Department of Physiology, Chittagong Medical College from January 2020 to December 2021. Total 60 first year medical college students of Chittagong Medical College who fulfills the inclusion and exclusion criteria were recruited in this experimental study. Sampling was done by stratified random sampling method. Subjects were participated in listening of slow music 15 minutes daily for 15 days.

Inclusion criteria

- Apparently healthy first year medical college students of both gender, willing to participate
- Perceived Stress Scale (PSS) score ≥ 14

Exclusion criteria

1. History of hearing difficulties
2. Perceived Stress Scale (PSS) score less than 14
3. Irregular students who are not available at the time of data collection
4. Interest on one genera of music, aversion towards music, practicing yoga or music and musical instrument
5. History of any systemic or psychiatric illness or recent medication such as - anti-hypertensive, anti-arrythmatic, anti-diabetic, anti-epileptic, sedatives and anti-psychotic drugs.

Permission was taken from medical college authority to perform the study on first year medical students. The aims, objectives and procedure of the study was explained in details to all. They were ensured that all data would be confidential and used for research purpose only. Informed written consent was taken from each student and they were allowed to withdraw themselves from the study at any time.

Each day 10 students were selected for recording physiological parameters. Total 9 days were needed to record all the physiological parameters. General examination was done to see the general health condition. Rinne and weber's test were done by tuning fork to detect any hearing problem for exclusion purpose.

The stress level was assessed by Perceived Stress Scale (PSS) score. PSS score assess the feelings and thoughts of the subject during the last month.

- Scores from 0-13 : Low perceived stress
- Scores from 14-26 : Moderate stress
- Scores ranges 27-40: High perceived stress.

Perceived Stress Scale (PSS) score ≥ 14 were selected for music intervention.

Stratified random sampling was done by using lottery method. Total 78 subjects were recruited. Out of primarily selected 78 subjects, 18 students were dropped out due to irregularities. Finally, 60 subjects were selected, out of which 28 were male and 32 were female.

Systolic (SBP) and Diastolic Blood Pressure (DBP) were measured by standard clinical procedure. Each day blood samples were collected from 20 students for estimation of serum cortisol before music intervention. They were informed previously over telephone to present on the specific day of sample collection. They were instructed not to drink or eat anything after 10 pm of previous night. Data was collected 3 days in a week between 8:00am-9:00 am before their class started. Analysis was done by Electro-Chemi Luminescence Immune Assay (ECLIA) technology (Cobas-e 411, UK). Fasting blood glucose was measured on the same day by using biochemical auto-analyzer (Evolution-3000, Italy). This device performs analysis according to hexokinase-glucose -6-phosphate dehydrogenase method. Reagent to be used with this instrument was Flex reagent cartridge.

After taking all baseline data, all the subjects were asked to participate in music intervention. The subjects were advised to come with a mobile phone capable of playing mp3 music. Preselected relaxing slow music-“The weightless” (Most relaxing song of 2011) was uploaded in their mobile. They were asked to listen this slow music for 15 minutes for 15 days in sitting posture with the aid of mobile head phones every day. The headphones used in music intervention were personal. The music intervention was given in class room from 11.05.am to 11.20 am at break hour.

After completing 15 days music intervention, data regarding-blood pressure (Systolic and diastolic), PSS score, serum cortisol and fasting blood sugar (FBS) at 8 to 9 am were taken again on 16th day from all subjects. All data were documented on data sheet and analyzed by SPSS-25.

Results

Table I Comparison of selected stress biomarkers before and after music intervention (n=60)

Variables	Before music intervention (n=60)	After music intervention (n=60)	p value
	Mean \pm SD	Mean \pm SD	
SBP(mm of Hg)	114.83 \pm 6.44	106.67 \pm 6.68	<0.001
DBP(mm of Hg)	75.23 \pm 6.89	68.58 \pm 5.37	<0.001
PSS score	25.08 \pm 5.86	19.27 \pm 5.73	<0.001
FBS (mg/dl)	81.48 \pm 9.29	77.88 \pm 7.41	0.002
S Cortisol (mcg/dl)	15.14 \pm 4.13	13.64 \pm 4.70	0.001

Paired 't'-test was done to compare selected stress biomarkers before and after music intervention.

Table I showed significant difference in the mean values of selected stress biomarkers when comparing before and after music intervention.

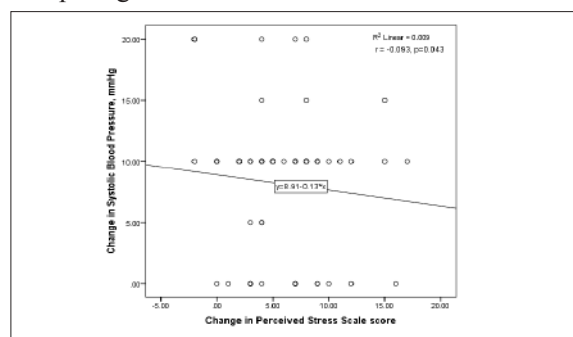


Figure 1 Correlation between PSS change and Systolic Blood Pressure (SBP) change

A Pearson correlation coefficient was computed to assess the relationship between changes in PSS score and SBP. There was a very weak, negative correlation between the two variables, $r = -0.093$, $n = 60$ and the relationship was significant statistically ($p = 0.043$). The change in PSS score appeared to be associated with the change of SBP.

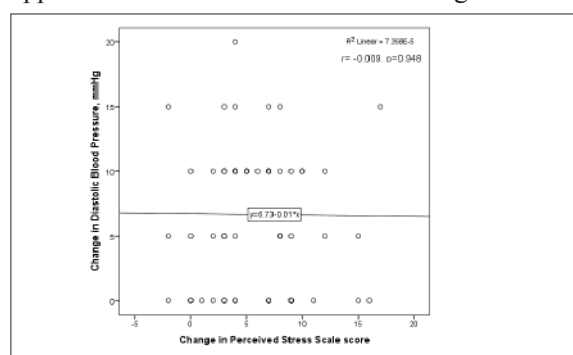


Figure 2 Correlation between PSS change and Diastolic Blood Pressure (DBP) change

A Pearson correlation coefficient was done to assess the relationship between changes in PSS score and DBP. There was a very weak, negative correlation between the two variables, $r = -0.009$, $n = 60$, however, the relationship was not significant ($p = 0.948$). The change in PSS score did not appear to be associated with the change of DBP.

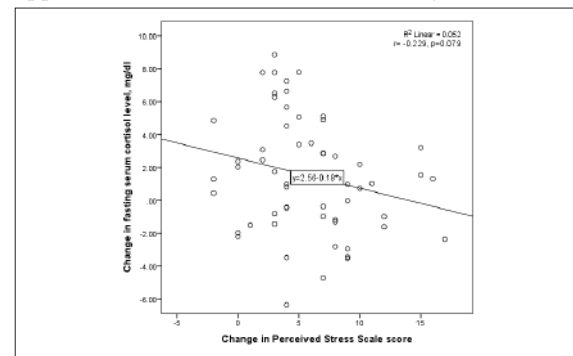


Figure 3 Correlation between PSS change and serum cortisol change

A Pearson correlation coefficient was computed to assess the relationship between changes in PSS score and serum cortisol level. There was a very weak, negative correlation between the two variables, $r = -0.229$, $n = 60$. The relationship was not significant ($p = 0.079$). The change in PSS score did not appear to be associated with the change of serum cortisol level.

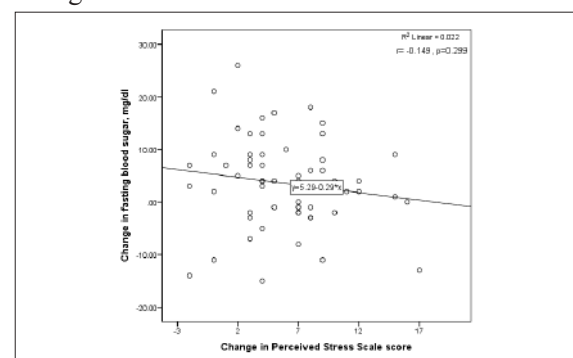


Figure 4 Correlation between PSS change and Fasting Blood Sugar (FBS) change

A Pearson correlation coefficient was done to assess the relationship between changes in PSS score and FBS level. There was a very weak, negative correlation between the two variables, $r = -0.149$, $N = 60$; however, the relationship was not significant ($p = 0.299$). The change in PSS score did not appear to be associated with the change of FBS level.

Discussion

A statistically significant correlation between Perceived Stress Scale (PSS) score and systolic blood pressure change observed in this study ($p = 0.043$) (Figure 1).

Some investigators found similar significant correlation between PSS and Systolic Blood Pressure (SBP).⁸

The possible explanation might be due to chronic mental stress related to activation of sympathetic-adreno-medullary axis and increased circulating adrenalin and noradrenalin.⁸

Some previous study found no significant correlation between PSS and SBP.⁹ According to Walveker SS et al. the correlations are influenced by other factors, duty hour and sleep time.⁹

In this study, significant correlation between PSS and SBP may be due to reduction of stress by neuro-modulation.

No significant correlation of Perceived Stress Scale (PSS) score with other stress bio-marker- diastolic blood pressure, serum cortisol and fasting blood sugar observed in this study. (Figure 2 to 4)

Our findings simulates with previous researchers.^{8, 9, 10, 11}

Possible explanation might be due to many other stress related factors or variability in perception of stress and social support which can influence stress reactions and coping strategies.^{9,10}

Our findings dissimulates with previous study.^{8,10}

According to Walvekar SS, secretion of cortisol is related to stressful condition and stress related disorder.^{9, 10}

In present study, non- significant relation of PSS with other stress biomarker may be due to variability in perception of stress, other stress related factors and short period of music intervention.

Limitations

- Short period of time with shorter duration of intervention.
- Small sample size that might not represent the whole community.
- Study was done in limited age group.

Conclusion

In present study, slow music intervention for 15 minutes among stressful young individuals for 15 days brought improvement in different stress biomarkers. Systolic and diastolic blood pressure,

perceived stress scale score, serum cortisol and fasting blood sugar were significantly decreased after music intervention in the study subjects. But correlation between these parameters only significant in PSS change and systolic blood pressure change. This study concludes that regular listening to slow music can be an effective measure for reduction of stress and improvement of quality of life.

Recommendations

From this study, some recommendations can be made for further study such as similar study with larger sample size in different age groups for longer duration can be conducted. Respiratory rate, oxygen saturation and serum catecholamine can be measured before and after music intervention.

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Contribution of authors

AHMS-Conception, design, acquisition of data, drafting & final approval.

MB-Interpretation of data, design, critical revision and final approval.

SA-Acquisition of data, data analysis, drafting & final approval.

DB-Interpretation of data, drafting & final approval.

FS-Acquisition of data, data analysis, drafting & final approval.

SA-Conception, critical revision, manuscript writing & final approval.

Disclosure

All the authors declared no competing interest.

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