

Effect of Slow Music on Selected Cardiorespiratory Parameters among Stressful Young Individuals

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Abstract

Background: Stress is an unavoidable universal phenomenon in modern life. Music reduces stress. Music is used by therapist, psychologists and psychiatrist as a therapeutic intervention. It has beneficial and therapeutic effects on cardiac and respiratory function in normal and diseased subjects. It probably works by modification of autonomic nervous system centrally. This study was done with the objective to assess the effects of music intervention on cardio-respiratory function in young individuals leading a stressful life.

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. A questionnaire along with general information, about previous diseases, medical and family history were filled up by the subjects. Physiological parameters-pulse, systolic and diastolic blood pressure, Respiratory Rate (RR) and oxygen saturation (SPO₂) 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. Paired 't'-tests were done to compare differences between pre and post-intervention values of different outcome parameters. $p < 0.05$ was considered as statistically significant. The physiological parameters-pulse, systolic and diastolic blood pressure and respiratory rate were reduced and oxygen saturation was significantly increased after 15 days music intervention.

Conclusion: Slow music intervention causes significant improvement of cardio-respiratory parameters in stressful young individuals.

Key words: Cardiorespiratory parameters; Slow music, Young peoples.

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Introduction

Stress is the integral part of modern life.¹ Stress is one of the most common human experiences.² Excessive stress causes psychosocial health problems as well as it reduces self-worth, academic performances and healthy development of an individual.³

The prevalence of stress related diseases like obesity, diabetes, hypertension, ischemic heart disease and stroke has been increased gradually due to modernization.⁴

Preventive programs like yoga, breathing exercise, aerobic exercise, meditation, life style modification and listening to music have been advocated to minimize the development of CVD.⁴ Music has preventive and promotive effect on cardiorespiratory function in healthy and diseased individual.⁵

The relaxing music relieves pain through endorphins secreted from the pituitary gland and affects cerebral cortex and limbic system, thereby improve quality of life.⁶ Music reduces symptoms by increasing dopamine secretion in psychiatric patient.⁷ It is an effective stress burner and also helps in decreasing pain and anxiety.^{8,9} It reduces sympathetic activity with simultaneous activation of parasympathetic drive along with the reduction of stress hormone level.⁶ It reduced the levels of IL-6, TNF, epinephrine and norepinephrine.¹⁰

According to Noguchi K et al amygdala activated by fast music resulting to increase in respiratory rate and slow music can decrease respiratory rate.¹¹ Oxygen saturation levels were found increased after listening slow music.^{12,13}

The prime objective of the study to assess the effects of music intervention on cardio-respiratory function in young individuals leading a stressful life.

Materials and methods

This experimental study was done in Department of Physiology, Chittagong Medical College from January 2020 to December 2021.

Total 60 first year students of Chittagong Medical College who fulfills the inclusion and exclusion

criteria were recruited in this experimental study. Subjects were participated in listening of slow music 15 minutes daily for 15 days. Stratified random sampling method was obtained.

Inclusion criteria

- Apparently healthy first year medical students within 18 to 21 years of both gender, willing to participate
- Moderate and severe stressed subjects (Perceived stress scale score ≥ 14).

Exclusion criteria

- Individuals below 18 year and above 21 years
- People with history of hearing difficulties
- Mild stressed subjects (Perceived stress scale score less than 14)
- Irregular students
- Interest on only one genre of music
- Treated with anti-hypertensive, anti-arrhythmic, anti-diabetic, anti-epileptic, sedatives, anti-psychotic drugs.
- Known systemic illness and psychiatric illness
- Aversion towards music
- Practicing yoga or musical instrument.

Permission from the medical college authority was taken to perform the study on first year medical students. The study was done during college leisure period. The aims, objectives and procedure of the study was explained in details to all. Voluntary participation were encouraged.

The stress level was assessed by perceived stress scale. There were ten questions in the scale reflecting feelings and thoughts of the subject during the last month.

- Scores from 0-13 was considered as low perceived stress
- Scores from 14-26 was considered as moderate stress
- Scores ranges 27-40 was considered as high perceived stress.

Perceived stress scale score ≥ 14 were selected for music intervention.

Students were primarily selected on the basis of inclusion and exclusion criteria. 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.

Radial pulse, systolic and diastolic blood pressure and respiratory rate were measured by standard clinical procedure. Oxygen saturation was measured by pulse oximeter.

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.²⁴ Preselected slow music-“The weightless” (Most relaxing song of 2011) was uploaded in his/her mobile.²⁵ They were asked to listen this slow music for 15 minutes for 15 days in sitting posture with the aid of mobile head phones everyday. 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 – pulse, blood pressure (Systolic and diastolic), respiratory rate and oxygen saturation (SPO₂) 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 cardiac parameters of the study subjects before and after music intervention (n=60)

Cardiac variables	Before music intervention (n=60) Mean \pm SD (Range)	After music Intervention (n=60) Mean \pm SD (Range)	p value (t value)
Pulse (Beat/min)	81.08 \pm 8.07 (60-90)	77.73 \pm 7.93 (62-92)	<0.001 (4.10)
SBP (mm of Hg)	114.83 \pm 6.44 (100-125)	106.67 \pm 6.68 (90-120)	<0.001 (10.73)
DBP (mm of Hg)	75.23 \pm 6.89 (60-85)	68.58 \pm 5.37 (60-80)	<0.001 (9.68)

Paired ‘t’-test was done to compare cardiac parameters before and after music intervention.

Table I shows the significant changes in the mean values of all cardiac parameters after music intervention.

Table II Comparison of respiratory parameters of the study subjects before and after music intervention (n=60)

Respiratory Variables	Before music intervention (n=60) Mean ± SD (Range)	After music Intervention (n=60) Mean ± SD (Range)	p value (t value)
RR (Breaths/min)	17.57±1.89 (12-20)	16.28±2.27 (12-22)	<0.001 (4.75)
SPO ₂ (%)	98.77±0.43 (98-99)	98.98±0.13 (98-99)	<0.001 (4.04)

Paired 't'-test was done to compare respiratory parameters before and after music intervention.

Table II shows the significant changes in the mean values of respiratory rate and SPO₂ after music intervention.

Discussion

In present study, cardiac and respiratory parameters before and after music intervention were compared. It showed significant reduction from their baseline values after music intervention ($p < 0.05$) (Table-I, II).

These findings are similar with some previous studies.^{1,14-17}

According to their study, possible explanation might be due to effects of music on the central nervous system, autonomic nervous system and endocrine system.⁴ Slow music may cause reduction of stress hormone and sympathetic activity with simultaneous activation of parasympathetic drive.⁴ Saritus et al stated that music causes changes within the body by affecting limbic system.^{18,19} Actively listening to soothing music can increase listener's level of oxytocin and endorphin that helps in social attachment, pleasure and relationships in humans, causing stress reduction.^{18,19} According to Gupta et al, heart rate directly relates to tempo of the music. Slow beat music produces a slower and more natural homeostatic rhythm.²⁰ Brain catches the rhythm of music and sends signals to different organs of the body, including heart and pancreas.¹⁸ The song "Weightless begins with a beat of 60 beats/minute and gradually to 50 beats/minute. It was supposed that heart rate slowly comes down to match the beat."^{21,18} Sutoo DE et al stated that pleasurable music increases regional cerebral blood flow with increased dopamine secretion with receptor activation.²²

Slow music can cause neuromodulation, thus it decreases pulse rate, blood pressure, respiratory rate with simultaneous increase in oxygen saturation.^{4,12, 13,23} According to Adhana R et al, music improves oxygen saturation with relaxation of respiratory muscles by influencing emotion and thought.²⁴

Some investigators found non-significant changes in physiological parameters after music intervention which is dissimilar with present study.^{10, 17, 25-28}

According to U Nilsson et al and Golino AJ et al it might be due to influence of drug on CNS and CVS or due to discrepancies of subjects.^{20,27} Tseng YF stated that this might be due to the stress factors in their study period.²⁸

In present study, the significant reduction of pulse, systolic and diastolic blood pressure, respiratory rate and oxygen saturation might be due to decrease sympathetic activity and reduction of stress by relaxing slow music. Our subjects were very joyful and attentive in listening the music. They were very relaxed during music session.

Limitation

- Short period of time with shorter duration of intervention.
- Small sample size that might not represent the whole community.
- Study was done with limited age group.
- Conducted on medical students of first year only.

Conclusion

In present study, slow music intervention for 15 minutes among stressful young individuals for 15 days brought significant improvement in selected physiological parameters. Pulse, systolic and diastolic blood pressure, respiratory rate were significantly decreased and SPO₂ was significantly increased after music intervention. This study concludes that regular listening to slow music can be an effective measure for reduction of stress and improvement of cardiorespiratory endurance and function.

Recommendation

Similar study with large sample size in different age groups for longer duration can be conducted and measurement of serum cortisol and catecholamine can be done before and after music intervention.

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Contribution of authors

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

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

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

Disclosure

All the authors declared no competing interest.

References

- Latha R, Srikanth S, Sairaman H, Dity NRE. Effect of music on heart rate variability and stress in medical students. *International Journal of Clinical and Experimental Physiology*. 2014;1(2):131-134. doi:10.4103/2348-8093.137409
- Baste BS, Gadkari JV. Study of stress, self-esteem and depression in medical students and effect of music on perceived stress. *Indian J PhysiolPharmacol*. 2014 Sept; 58(3):298–301.
- Chauhan HM, Shah HR, Chauhan SH, Chaudhary SM. Stress in medical students: A cross sectional study. *International Journal of Biomedical And Advanced Research*.2014;05(06):292-294.
- Siritunga S, Wijewardena K, Ekanayaka R, Mudunkotuwa P.Effect of music on blood pressure, pulse rate and respiratory rate of asymptomatic individuals: A randomized controlled trial. *Health*. 2013;5(4A):59-64.
- Okada K, Kurita A, Takase B, Otsuka T, Kodani E, Kusama Y et al. Effect of music therapy on autonomic nervous system activity, incidence of heart failure events, and plasma cytokine and catecholamine levels in elderly patients with cerebrovascular disease and dementia. *International Heart Journal*. 2009;50:95-110.
- Siritunga S, Wijewardena K, Ekanayaka R, Mudunkotuwa P. Effect of music on quality of life in stable angina: A randomized controlled trial. *International Journal of Clinical Medicine*. 2015;6:307-313.
- Menon V, Levitin DJ. The rewards of music listening: Response and physiological connectivity of the mesolimbic system. *NeuroImage*. 2005;28:175-184.
- Imran S, Moosabba MS, Alphonsa A. Effects of music therapy on anxiety, blood pressure and respiratory rate in patients undergoing chemotherapy. 2017; 2(6):156-158.
- Harikumar R, Raj M, Paul A, Harish K, Sunil Kumar K, Sandesh K et al. Listening to music decreases need for sedative medication during colonoscopy: A randomized, controlled trial. *Indian Journal of Gastroenterology*. 2006;25:1-5.
- Bora B, Krishna M, Phukan KD. The Effects of Tempo of Music on Heart Rate, Blood Pressure and Respiratory Rate-A Study in Gauhati Medical College. *Indian J PhysiolPharmacol*. 2017;61(4):445–448.
- Noguchi K, Masaoka Y, Kanako S, Katoh N, Homma I. Effects of music on emotion and respiration. *Showa University Journal of Medicine and Science*. 2012;24(1):69-75.
- Weeks BP, Nilsson U. Music interventions in patients during coronary angiographic procedures: A randomized controlled study of the effect on patient's anxiety and well-being. *European Journal of Cardiovascular Nursing*. 2011;10:88-93.
- Sar tas SC, Arac B. The effect of music therapy on the vital signs of patients in a surgical intensive care unit. *Int J Med Invest*.2016;5(2):54-59.
- Aktan ZD, Yarar O. A study on perceived stress of university Students: whether reed music reduces stress. *ICESL'14. International Conference on Economics, Social Sciences and Languages*; 2014;14-15.
- Sharma M, Rajnee, Mathur KC. Effects of music therapy on clinical and biochemical parameters of metabolic syndrome. *J Bangladesh Soc Physiol*. 2011;6(2):108-115.
- McEwens BS. Protective and damaging effects of stress mediators. *New England Journal of Medicine*. 1998;338(3):171-179.
- Nilsson U, Unosson M, Rawal N. Stress reduction and analgesia in patients exposed to calming music postoperatively: A randomized controlled trial. *European journal of anaesthesiology*. 2005;22(2):96-102.
- Kosfeld M, Heinrichs M, Zak PJ, Fischbacher U, Fehr E. Oxytocin increases trust in humans. *Nature*. 2005;435:673-676.
- Chatterjee S, Mukherjee R. Evaluation of the effects of music therapy using todi raga of hindustani classical music on blood pressure, pulse rate and respiratory rate of healthy elderly men. *Journal of Scientific Research*. 2020;64(1).
- Gupta U, Gupta BS. Gender differences in psychophysiological responses to music listening. *Music and Medicine*. 2016;8(1):53-64.
- Agrawal A, Makhijani N, Valentini P. The effect of music on heart rate. *J Emerging Investigators*.2013;25:1-5.
- Sutoo DE, Akiyama K. Music improves dopaminergic neurotransmission: demonstration based on the effect of music on blood pressure regulation. *Brain research*. 2004;1016(2):255-262.
- Moran CA, de Oliveira Cacho R, Cacho EW, Sousa KG, de Souza JC, da Fonseca Filho GG, Pereira SA. Use of music during physical therapy intervention in a neonatal intensive care unit: a randomized controlled trial. *Journal of Human Growth and Development*. 2015;25(2):177-181.

24. Adhana R, Gupta R, Dvivedi JY, Ahmad S, Dvivedii J, Ahmad S. The influence of the 2: 1 yogic breathing technique on essential hypertension. *Indian J Physiol Pharmacol.* 2013;57(1):38-44.
25. Mittal K, Sirohi P, Mathur KC, Agrawal RP, Agrawal V. Effect of mind body therapy (yoga, meditation & music) on elderly hypertensive people. *Journal of Community Health Management.* 2016;3(3):108-112.
26. Chlan LL, Engeland WC, Anthony A, Guttormson J. Influence of music on the stress response in patients receiving mechanical ventilatory support: A pilot study. *American Journal of Critical Care.* 2007;16(2):141-145.
27. Golino AJ, Leone R, Gollenberg A, Christopher C, Stanger D, Davis TM, et al. Impact of an active music therapy intervention on intensive care patients. *American Journal of Critical Care.* 2019;28(1):48-55.
28. Tseng YF, Chen CH, Lee CS. Effects of listening to music on postpartum stress and anxiety levels. *Journal of clinical nursing.* 2010;19(7 8):1049-1055.