Original Research Paper

Volume - 12 | Issue - 02 | February - 2022 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Physiology

EFFECT OF MUSIC EXPOSURE ON SYMPATHETIC FUNCTION TESTS

Sneha M. Bhatkar* Assistant Professor, Department of Physiology, Grant Government Medical College, Mumbai. *Corresponding Author

Surendra S. Shivalkar Professor, Department of Physiology, Grant Government Medical College, Mumbai.

ABSTRACT **Background:** Music has been used since ancient times to influence the human health. Music elicits emotional and physiological responses in humans such as excitement, mood elevation, relaxation, sedation and so on. Not many studies have been done to measure the effects of music on modulation of the autonomic nervous system. This study was conducted to evaluate the effects of music exposure on autonomic nervous system by conducting sympathetic function tests. **Materials & methods:** The present study consisted of 50 clinically healthy subjects of both sexes between 18 to 30 years of age. Subjects were exposed to music with the help of headphones. Two sympathetic function tests, Cold Pressor Test (CPT) and Sustained Handgrip Test (SHG) were included in the study. Both the tests were carried out before and after exposure to 30 minutes of self-chosen, soft music and analysed statistically by Paired T test. **Result:** Cold pressor test and sustained hand grip tests showed that systolic and diastolic blood pressures during these tests were significantly reduced on exposure to music. (Paired T Test). **Conclusion:** Exposure to music affects cardiac autonomic activity. Music exposure probably decreases sympathetic activity.

KEYWORDS : Music, Cold Pressor test, Sustained Handgrip test

INTRODUCTION

In the 6th century Greek philosopher Pythagoras, considered as the father of music therapy and geometry, believed that music greatly contributed to health. Pythagoras prescribed music and specific diet to restore and maintain the harmony of body and the soul.[1]

Cardiovascular Autonomic reactivity refers to cardiovascular responses to potential stimuli, which are essentially reflexive in nature indicating cardiovascular tolerance and adaptation.[2]

The cold pressor test (CPT) devised by Hines and Brow3 is a widely used experimental technique for pain or stress induction,4 to assess the left ventricular function,5 and to evaluate cardiac autonomic functions.6 The reaction of the individual to this is measured by the change in his systolic and diastolic blood pressures after the exposure to cold stress. CPT is known to trigger a vascular sympathetic activation and an increase in blood pressure in healthy subjects.

The cardiovascular response to acute sympathetic stress was assessed by Sustained Hand Grip test (SHG), which evaluates the cardiovascular adrenergic function and is recommended as an investigational autonomic function test by the American Academy of Neurology.7 The isometric hand grip exercise activates the mechanoreceptors immediately due to the increased muscle tension. The recruitment of new motor units to maintain the muscle tension, increases the excitatory state of the central nervous system and results in a possible increase in the sympathetic outflow and a decrease in parasympathetic outflow, which explain the increase in the blood pressure response.[8]

Literature has demonstrated that music listening may have a beneficial effect on blood pressure, heart rate, respiratory rate, anxiety, and pain in persons with coronary heart disease.9 The present study was conducted to evaluate the effects of music exposure on autonomic nervous system by conducting sympathetic function tests in normal healthy subjects.

MATERIALS AND METHODS

The present study was conducted in the Department of Physiology in our institute.

The subjects were asked to refrain from ingesting any beverages containing caffeine and alcohol for at least 12 hours prior to the study. They were asked to report between 10 a.m. and 12 p.m. in the lab after an adequate night's sleep followed by light breakfast. Written informed consent was taken before the clinical examination of the subject. The subject was allowed to relax on a bed in supine position for 10 minutes and then sympathetic function tests were performed after initial 1-2 sessions of practice. Subjects were exposed to music with the help of headphones. Both the tests were carried out before and after exposure to 30 minutes of self-chosen, soft music.

Sympathetic function test:

1. Blood pressure (BP) response to cold pressor test:

After recording of baseline BP, subject was asked to immerse his hand in cold water maintained at 100C for 2 minutes; blood pressure was recorded from the other arm at the end of 2 minutes. Maximum increase in systolic and diastolic blood pressure was determined and compared before and after music exposure.

2. Blood Pressure Response To Sustained Hand Grip:

The subject was asked to exert maximal hand grip strength on hand grip dynamometer, with dominant hand. First the maximum voluntary contraction (MVC) was determined and then the subject was asked to exert 30% of MVC for 3 minutes. The Blood pressure was measured in the non-exercising hand at rest and just before the release of hand grip pressure.

The data was expressed in terms of mean and standard deviation and statistics was determined using Paired T test. P value <0.05 was considered to be statistically significant.

RESULTS

Table 1: Comparison of SBP and DBP during CPT of subjects before & after music exposure & Statistical analysis using Paired T test

	Before Music Mean ± S.D.	After Music Mean ± S.D.	P value	Significance
SBP (mmHg)	115.96±10.83	109.68±12.05	<0.0001	Statistically significant
DBP (mmHg)	83.08±8.47	77.24±10.34	<0.0001	Statistically significant

(SBP - Systolic blood pressure, DBP – Diastolic blood pressure, CPT - Cold pressor test)

Table no. 2: Comparison of SBP and DBP during SHG test of subjects before & after music exposure & Statistical analysis using Paired T test

	Before Music Mean ± S.D.	After Music Mean ± S.D.	P value	Significance
SBP (mmHg)	130.56±8.53	123.44±8.41	<0.0001	Statistically significant
DBP (mmHg)	92.72±8.14	86.56±10.09	<0.0001	Statistically significant

Table 1 & 2 showed that systolic and diastolic blood pressures during cold pressor and sustained handgrip tests were significantly reduced on exposure to music and the difference was found to be statistically significant.

DISCUSSION

In the present study there was a decrease in systolic blood pressure (115.96±10.83 vs 109.68±12.05 mmHg) and diastolic blood pressure (83.08±8.47 vs 77.24±10.34 mmHg) after music exposure during cold pressor test. Similarly there was a decrease in systolic blood pressure (130.56±8.53 vs 123.44±8.41 mmHg) and diastolic blood pressure (92.72±8.14 vs 86.56±10.09 mmHg) after music exposure during Sustained Hand Grip test. Thus both SBP and DBP were lower after music exposure and the difference was statistically significant by paired T test.

The present study is in accordance with the study done by Hyde et al, who observed that listening to music in a stressful situation produces synchronisation of body rhythm, which is thought to decrease sympathetic nervous system activity. This decrease in sympathetic tone is responsible for decrease in the blood pressure and heart rate.10

It is also in accordance with the study done by Yung et al who studied the effects of music in pre-operative anxiety subjects and observed the decrease in systolic blood pressure, diastolic blood pressure, respiratory rate and heart rate.[11]

On the other hand, da Silva AG et al observed that music with different tempos does not influence cardiac autonomic regulation in men.[12] It is believed that the anxiolytic effect of music is achieved through its suppressive action on the sympathetic nervous system, leading to decreased adrenergic activity and decreased neuromuscular arousal.[13,14] Music furthermore, triggers the limbic system in the brain to release endorphins; these neurotransmitters play an important role in enhancing a sense of well-being.[15,16]

The musical preferences of individuals are an important factor in the effect of music on them. Anxiety-reducing effects appear to be greatest when people listen to music of their choice.[9] Thus self-chosen soft music was included in our study.

CONCLUSION

The present study shows that music exposure influences cardiac autonomic activity. It probably causes generalised decreases in sympathetic activity as seen by decrease in systolic and diastolic blood pressure in response to sympathetic function tests on exposure to music.

REFERENCES

1. White JM; Music as an intervention: Notable endeavor to improve patients outcome. Nurs Clin North Am. 2001;36(1):83-92.
2. Lahiri MK, Kannankeril PJ, Goldberger JJ. Autonomic function in cardiovascular disease: physiological basis and prognostic implications. J Am Coll Cardiol. 2008;51(18):1725-1733.
3. Hines EA, Brown GE. The cold pressor test for measuring the reactivity of the blood pressure: data concerning 571 normal and hypertensive subjects. Am Heart J.1936;11(1):1–9.
4. Von Baeyer CL, Piira T, Chambers CT, Trapanotto M, Zeltzer LK. Guidelines for the cold pressor task as an experimental pain stimulus for use with children. J Pain. 2005;6(4):218–227.
5. Northcote RJ, Cooke MB. How useful are the cold pressor test and sustained isometric handgrip exercise with radionuclide ventriculography in the evaluation of patients with coronary artery disease? Br Heart J. 1987;57(4):319–328.
6. Wirch JL, Wolfe LA, Weissgerber TL, Davies GAL. Cold pressor test protocol to evaluate cardiac autonomic function. Appl Physiol Nutr Metab. 2006;31(3):235–243.
7. American Academy of Neurology. Assessment: Clinical autonomic testing report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology. Neurology. 1996;46:873–80.
8. Hietanen E. Cardiovascular responses to static exercise. Scand J Work Environ Health. 1984;10:379–402.
9. Bradt J, Dileo C. Music for stress and anxiety reduction in coronary heart disease patients. Cochrane Database Syst Rev. 2009;15;(2):CD006577.
10. Hyde, R. Bryden, Asburry J. How would patient prefer to send the waiting time before their operations. 1998;53(2):192-195.
11. Yung P, Chui Kam, French P, Chan T. A controlled trial of music and preoperative anxiety in Chinese men undergoing transurethral resection of prostate. Journal of advanced nursing. 2002;39(4):352-359.
12. da Silva Ag, Guida Hl, Antônio Am, Marcomini Rs, Fontes Am, Carlos De Abreu L et al. An exploration of heart rate response to differing music rhythm and tempos. Complement Ther Clin Pract. 2014;20 (2):130-134.
13. Chlan L. Effectiveness of a music therapy intervention on relaxation and anxiety for patients receiving ventilatory assistance. Heart & Lung 1998;27(3):169-76.
14. Gillen E, Biley F, Allen D. Effects of music listening on adult patients' pre-procedural state anxiety in hospital. International Journal of Evidence-Based Healthcare 2008;6(1):24-49.
15. Arslan S, Özer N, Özyurt F. Effect of music on preoperative anxiety in men undergoing urogenital surgery. Australian Journal of Advanced Nursing 2008;26(2):46-54.
16. Lee O, Chung Y, Chan M, Chan W. Music and its effect on the physiological responses and anxiety levels of patients receiving mechanical ventilation: a pilot study. Journal of Clinical Nursing 2005;14(5):609-20.