Atherosclerosis 240 (2015) 184–189

Contents lists available at ScienceDirect

Atherosclerosis

journal homepage: www.elsevier.com/locate/atherosclerosis

Music decreases aortic stiffness and wave reflections

Charalambos Vlachopoulos*, Angelos Aggelakas, Nikolaos Ioakeimidis, Panagiotis Xaplanteris, Dimitrios Terentes-Printzios, Mahmoud Abdelrasoul, George Lazaros, Dimitris Tousoulis

Peripheral Vessels and Hypertension Units, 1st Cardiology Department, Athens Medical School, Hippokration Hospital, Athens, Greece

ARTICLE INFO

Article history:
Received 16 January 2015
Received in revised form
6 March 2015
Accepted 9 March 2015
Available online 14 March 2015

Keywords:
Aortic stiffness
Wave reflections
Music
Pulse wave velocity
Augmentation index

ABSTRACT

Objective: Music has been related to cardiovascular health and used as adjunct therapy in patients with cardiovascular disease. Aortic stiffness and wave reflections are predictors of cardiovascular risk. We investigated the short-term effect of classical and rock music on arterial stiffness and wave reflections.
Methods: Twenty healthy individuals (22.5 ± 2.5 years) were studied on three different occasions and listened to a 30-min music track compilation (classical, rock, or no music for the sham procedure).
Results: Both classical and rock music resulted in a decrease of carotid-femoral pulse wave velocity (PWV) immediately after the end of music listening (all $p < 0.01$). Augmentation index (AIx) decreased with either classical or rock music in a more sustained way (nadir by 6.0% and 5.8%, respectively, at time zero post-music listening, all $p < 0.01$). When music preference was taken into consideration, both classical and rock music had a more potent effect on PWV in classical aficionados (by 0.20 m/s, $p = 0.003$ and 0.13 m/s, $p = 0.015$, respectively), whereas there was no effect in rock aficionados (all $p =$ NS). Regarding wave reflections, classical music led to a more potent response in classical aficionados (AIx decrease by 9.45%), whereas rock led to a more potent response to rock aficionados (by 10.7%, all $p < 0.01$).
Conclusions: Music, both classical and rock, decreases aortic stiffness and wave reflections. Effect on aortic stiffness lasts for as long as music is listened to, while classical music has a sustained effect on wave reflections. These findings may have important implications, extending the spectrum of lifestyle modifications that can ameliorate arterial function.

© 2015 Elsevier Ireland Ltd. All rights reserved.

1. Introduction

Aortic stiffness, as well as the magnitude and timing of wave reflections, are important determinants of cardiovascular performance [1–3] and independent predictors of cardiovascular morbidity and mortality [4–7]. On the other hand, they are influenced by cardiovascular risk factors [8] and they are affected by a magnitude of lifestyle components in a positive [9,10] or a negative way [11–13].

Recent evidence suggest that mental stress is directly associated with cardiovascular disease [14,15], and especially with the progression of atherosclerosis and the occurrence of coronary artery disease [16–18]. We and others have previously shown that mental stress instigates arterial dysfunction as assessed by arterial stiffness indices, central hemodynamics and flow-mediated dilatation [19–21]. Even just a brief period of mental stress can have an enduring effect on arterial stiffness and it remains significant during and after the stressful event [19,20]. On the other hand, we have demonstrated that a positive psychological stimulus results in a significant and long lasting decrease both of pulse wave velocity (PWV) and augmentation index (AIx), indicating a decrease in aortic stiffness and wave reflections [20].

Music is directly associated with mental health [22]. Despite the amount of data regarding the effect of music on cardiovascular performance, the impact of music on arterial stiffness and wave reflections has not been investigated. In the present study we investigated the short-tem effect of music on aortic elasticity and wave reflections. We also sought to determine whether music genres, such as rock and classical music, might have a differential effect on arterial stiffness indices.

* Corresponding author. 1st Cardiology Department, Athens Medical School, Hippokration Hospital, Profiti Elia 24, Athens 14575, Greece.
E-mail address: cvlachop@otenet.gr (C. Vlachopoulos).

http://dx.doi.org/10.1016/j.atherosclerosis.2015.03.010
0021-9150/© 2015 Elsevier Ireland Ltd. All rights reserved.

2. Methods

2.1. Study population

We studied 20 healthy individuals on three separate sessions, (60 sessions, mean age 22.5 ± 2.5 [standard deviation, SD] years, range = 19–31 years, 10 males), who were free from cardiovascular risk factors except from smoking (10%). They had not had any bacterial or viral infection for the last 2 months. The study protocol was approved by our Institutional Research Ethics Committee, and all subjects gave their written informed consent.

2.2. Study design

The study consisted of three arms, which were carried out according to a randomized, single-blind, crossover, sham procedure-controlled design. Each participant visited our unit on three different occasions and they listened to a 30-min compilation of classical or rock music (2 separate sessions), while during the sham procedure nothing was played back for the same amount of time. List of tracks is available on the Supplemental material. The order of music genre/sham sessions was randomized. To eliminate possible carry-over effects, the three sessions were conducted at least 2 days apart from each other. On arrival to the hospital, volunteers chose one of three closed envelopes that contained a paper with the name of the music genre/sham procedure, and listened accordingly. The measurements were performed in a quiet, temperature-controlled room at 23 °C; the subjects had fasted for at least 6 h before each session. Baseline measurements for evaluation of aortic stiffness, central pressures and wave reflections indices were taken after a 30-min rest period in the supine position. The music tracks were played back through headphones (the volume was preset to a comfortable level and was stable for all the participants) while the volunteers were in the supine position. Measurements were made immediately (0 min) and 30 min after the end of music playback. At the end of each session, participants were asked to fill in the same questionnaire consisting of four questions that evaluated how relaxing and pleasant was each music session, as well as how irritating and tiring it was. Answers were given in a scale from 1 to 10 (Likert scale) [23] and the volunteers were separated into two groups, the classical aficionados and the rock aficionados, according to their music preferences.

2.3. Evaluation of aortic elastic properties, wave reflection indices and central pressures

Carotid-femoral pulse wave velocity (PWV), an established index of aortic stiffness [2,24,25], was calculated using a validated noninvasive device (Complior, Artech Medical, Pantin, France) [2,24,25]. Central (aortic) pressures, AIx and AP were measured by using a validated, commercially available system (SphygmoCor, AtCor Medical, Sydney, Australia), as previously described in detail [9,19,20,26]. AIx was averaged from 10 to 12 successive waves and was corrected for a steady heart rate of 75 beats/min (AIx_{75}) [27].

2.4. Statistical analysis

The sample size was based on previous data from our unit [20], according to which the standard deviations (SDs) of PWV and AIx for healthy subjects with characteristics similar to those of the present study population were 0.5 m/s and 5% respectively. Therefore, we estimated that 18 patients would provide 80% power at the 5% level of significance to detect a difference of 0.5 m/s in PWV in a crossover design study. This sample size would provide 80% power to detect an absolute difference of 5% in AIx. To provide better confidence we finally decided to include 20 patients.

Numeric data are expressed as the mean ± standard error of the mean. All variables were tested for homogeneity of variance and normal distribution, using the Kolmogorov–Smirnov criterion. At baseline, numerical parameters between the study arms (classical music, rock music, placebo) were compared by one-way analysis of variance (ANOVA).

The effect of an intervention (music in this case) is best described by reporting response, defined as net active intervention effect minus sham procedure effect at each time point. Response was calculated as follows: (mean at a time point for each of the music sessions minus mean at baseline for the same music session).

To evaluate the composite effect of classical, or rock versus placebo over time on all the measured variables, a 3 × 2 analysis of variance for repeated measures was performed [three time points (baseline, 0 and 30 min) x two study arms (classical, or rock vs placebo)]. Values of $p < 0.05$ were considered statistically significant.

Data analysis was performed using the SPSS statistical package for Windows (Version 17.0, SPSS Inc., Chicago, Illinois).

3. Results

3.1. Levels of perceived satisfaction and irritation

The volunteers found the classical music pleasant (mean score = 6.8 ± 2.5) and relaxing (mean score = 6.5 ± 2.3), but not tiring (mean score = 1.4 ± 0.5) or inducing irritation (mean score = 0 for all). The volunteers also found rock music pleasant (mean score = 6.4 ± 2.2) and modestly relaxing (mean score = 4.8 ± 1.9); furthermore, rock music was neither perceived as irritating (mean score = 1.2 ± 0.4) nor as tiring (mean score = 1.5 ± 0.6) by the volunteers.

3.2. Total study population

There were no significant differences in all baseline measurements at each of the three arms of the protocol (Table 1).

3.2.1. Peripheral and central pressures

Classical music did not significantly alter peripheral (systolic pressure: $F = 0.45$, $p = 0.45$, diastolic pressure: $F = 0.28$, $p = 0.68$), or central pressures (systolic pressure: $F = 0.23$, $p = 0.64$; diastolic pressure: $F = 0.20$, $p = 0.76$) when compared with sham procedure (Fig. 1). Likewise, rock music had no significant effect on peripheral (systolic pressure: $F = 1.24$, $p = 0.18$, diastolic pressure: $F = 0.35$, $p = 0.53$), or central pressures (systolic pressure: $F = 0.86$, $p = 0.35$; diastolic pressure: $F = 0.27$, $p = 0.62$) when compared with sham procedure (Fig. 1). Similarly, classical and rock music had no significant effect on heart rate.

Table 1
Baseline characteristics of the study population.

	Placebo	Classical music	Rock music	P Value
Heart rate	73 ± 8	74 ± 8	70 ± 7	0.87
Peripheral SP	113 ± 11	113 ± 11	112 ± 10	0.77
Peripheral DP	73 ± 9	73 ± 9	69 ± 8	0.64
Peripheral PP	40 ± 8	40 ± 8	42 ± 9	0.36
Central SP	98 ± 10	99 ± 10	98 ± 8	0.78
Central DP	74 ± 9	74 ± 9	70 ± 8	0.75
Central PP	24 ± 5	25 ± 5	28 ± 5	0.44
AIx (%)	3.08 ± 9.19	5.13 ± 11.40	5.85 ± 11.76	0.25
AP (mmHg)	0.84 ± 1.98	1.44 ± 2.37	1.73 ± 2.54	0.18
PWV (m/s)	5.77 ± 1.14	5.98 ± 1.19	5.99 ± 1.22	0.37

Download English Version:

https://daneshyari.com/en/article/5945157

Download Persian Version:

https://daneshyari.com/article/5945157

Daneshyari.com