Listening to calm music and emotional songs reduces blood pressure and heart rate in healthy young female adults

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Abstract

Music has been known for ages to have a strong influence on humans. It has been reported to enhance memory, increase endurance, brighten the mood, and reduce anxiety and depression. Therefore, this study was designed to investigate the effect of calm music and emotional songs on blood pressure and heart rate in healthy female subjects. 30 female subjects were randomly divided into three groups: the control group, the calm music group, and the emotional song group, with each group having 10 subjects. All the subjects were comfortably seated in a restricted room devoid of external noise. Prior to the experiment, the subjects were allowed to rest for 15 minutes. The control group sat down without listening to any music for the duration of the study. The calm music and emotional song groups listened to calm music and emotional song, respectively, for 60 minutes. A digital sphygmomanometer was used for measuring the blood pressure and heart rate at 15 minutes, 30 minutes, 45 minutes, and 60 minutes. The study recorded a significant decrease in systolic blood pressure, diastolic blood pressure, and mean arterial pressure in the test groups compared to the control group, but there was no significant change in heart rate. In conclusion, listening to calm music and emotional songs has the potential to reduce blood pressure in healthy female individuals.

Keyword: Emotional song; Calm music; Blood pressure; Heart rate

1. Introduction

Music is the art of arranging and combining sounds or tones in sequence to create a harmonious composition (Wallin et al., 1999; Davies, 2012). Music has been known for ages to have a strong influence on humans. It has been reported to enhance memory, increase endurance, brighten the mood, reduce anxiety and depression (Ellis and Brighouse, 1952; Davis and Thaut, 1989; Iwanaga et al., 1996; Evans, 2002; Salimpoor et al., 2009; Salimpoor et al., 2011). The world is enriched with different people with their peculiar cultures, which bring about assorted musical genres. It is almost impossible to compile a list of all the musical genres from all over the world because there is no one-size-fits-all classification of musical genres. However, the most popular recorded music genres in the world include classical, hip-hop, oldies, pop, rap, blues, and rock (Tagg, 1982;

Rentfrow et al., 2011). People all over the world, regardless of their culture and age, use music as an instrument of expression and communication.

Listening to music, singing, and playing instruments, either alone or together, are common hobbies for the vast majority of people. Music is an entertaining activity; however, its influence extends beyond mere entertainment. Music has powerful therapeutic effects that positively affect the emotional and mental health of individuals. Meditating to music is a common practice worldwide, and people tend to forget all their troubles, struggles, and pains when they listen to music (Welch et al., 2020).

Studies have shown that listening to music reduces anxiety, pain, and blood pressure (Sung et al., 2010; Rohit and Rohit, 2012; Darki et al., 2022; Burrai et al., 2020; Harney et al., 2023). In addition, it has been reported to improve sleep quality, mental clarity, and memory (Hernández-Ruiz, 2005; Harmat et al., 2008; De Niet et al., 2009; Peck et al., 2016; Jespersen et al., 2019). Music has a special influence on human emotions and has been documented as one of the most effective tools to manage stress (Khalfa et al., 2003; Thoma et al., 2013; Lata and Kourtesis, 2021). Making music and listening to it can both reduce mild and persistent stress. The human brain is a complicated structure with different parts activated by different stimuli, and these different segments of the brain regulate and control different body functions. Music is one factor that has been documented to modulate different sections of the brain, from the autonomic nervous system to the limbic system (Oliver, 2006). Musical sounds send vibrations through the atmosphere, enter the ears, and activate the eardrums. The inherent mechanisms within the eardrums turn the vibrations into electrical signals, which are transmitted by the sensory nerve to the brainstem. In the brainstem, these electrical signals are recomposed into music for perception (Peterson et al., 2022). The electrical signals transmitting musical sounds simultaneously activate neurons from different parts of the brain; these include the auditory cortex, motor system cortex, brain pleasure site (the dopaminergic reward system), and so on (Särkämö et al., 2013). These networks of pathways activated by musical sounds are suggested to be responsible for the impacts of music on humans.

Music interacts with both the autonomic nervous system and the limbic system. The mood of individuals has been documented to be modulated by music (Stewart et al., 2019). Listening to positive music can change a person's mood, and for sad or depressed people, music can make them feel better. This effect has been attributed to the release of the reward hormone (dopamine). It has been reported that listening to music, especially a favourite, triggers the release of dopamine in the brain (Blood and Zatorre, 2001; Ferreri et al., 2019). Music triggers the release of neurotransmitters such as dopamine, serotonin, and endorphin, and this could help reduce anxiety and pain (Chanda and Levitin, 2013). Music induces sleep, and listening to relaxing music through headphones enhances restful and peaceful sleep. This is attributed to the ability of music to distract the mind from worries and exhausting thoughts that bring about anxiety. Music also increases the levels of serotonin and endorphin. These neurotransmitters are known to induce sleep and reduce anxiety (Jouvet, 1999; Ursin, 2002; Anderson and Shivakumar, 2013; Shehata et al., 2021).

Music has been reported to modulate heart rates, blood pressure, and breathing rates (Ellis and Brighouse, 1952; Ellis et al., 2012; Rohit and Rohit, 2012; Darki et al., 2022); besides, it has also been shown to modulate heart rate variability (Young, 2010). These effects of music were connected to the fact that the processing of musical sounds begins in the brainstem, which also regulates and controls the cardiovascular and respiratory systems (Ellis et al., 2012; Rohit and Rohit, 2012). This link has been put forth as an explanation for how music could reduce blood pressure, heart rate, and breathing rate.

Music's benefits to humanity are enormous. Music can be employed as an alternative therapeutic intervention instead of expensive drugs with potential side effects. Nowadays, calm or relaxing music, such as piano piece or rain sound, is used to induce sleep, while slow music with love lyrics, specifically romantic love, is used to combat feelings of loneliness and heartbreak. This study therefore assessed the impact of relaxing music and emotional songs on blood pressure and heart rate in healthy young adults studying at the University of Uyo.

2. Materials and Method

2.1 Subject selection/subject selection criteria

The female volunteers were selected at random from the University of Uyo. The volunteers had an age range of 18 to 23 years, a weight range of 45 to 70 kg, and a height range of 1.50 m to 1.75 m.

50 female participants were recruited for the study, and they were all duly informed about the protocol of the study. The study was approved by the University of Uyo teaching hospital, and written consent was obtained from all volunteers before screening.

The criteria listed below were used to accept a subject as fit for the study;

- Subjects should not have any history of cardiovascular disorder such as hypertension, cardiac failure or cardiac arrest.
- Blood pressure must not be above 120/80. The blood pressure of all the volunteers was measured to ensure that it was within the acceptable range.
- Subjects should not be on any special medication
- Subjects must be medically fit
- No alcohol intake
- No smoking history
- Be readily available and cooperate adequately during the period of the experiment; the duration and procedures of the experiment were properly explained to the subjects.

After prior examination, 30 female subjects were certified fit to participate in the study.

2.2 Experimental design

The experiment was carried out at the Medical Physiology Lab of the University of Uyo, Annex Campus, Uyo, Akwa-Ibom State. The 30 certified volunteers were randomly divided into three groups. Group A was the control group; Group B was the test group exposed to relaxing music (rain sound and panio music); and Group C was the test group exposed to emotional song (collections of love songs). Each group was made up of 10 subjects. After this protocol, the subjects were allowed to rest for 15 minutes while comfortably seated before the commencement of the experiment.

Baseline blood pressure and heart rate were measured after the 15-minute rest. The subjects in group A were not exposed to any music; subjects in groups B and C were exposed to relaxing music and emotional song, respectively, via earphones. All subjects were confined to a restricted room devoid of external sound or noise. The subjects were exposed for 60 minutes, and their blood pressure and heart rate were measured at 15 minutes, 30 minutes, 45 minutes, and 60 minutes using a digital sphygmomanometer.

2.3 Blood pressure and heart rate measurement

The blood pressure and heart rate measurements were taken using a digital sphygmomanometer with a cuff size of 12 x 26 cm. The handcuff of the digital sphygmomanometer was wrapped around the left arm of the subject,

one inch (2–3 cm) away from their cubital fossa, and the arm was held close to the heart. The subjects were asked to remain calm and composed and not move their arms or talk during the measuring process, so as not to alter the readings. The switch of the digital sphygmomanometer was pressed, and in about 1–2 minutes, the cuff was inflated and deflated automatically, displaying the blood pressure and heart rate simultaneously on the screen of the sphygmomanometer. The blood pressure and heart rate were measured three consecutive times at a 1-minute interval between measurements, and the average was recorded.

2.4 Statistical analysis

The data were presented as mean ± SEM. Analysis of variance (ANOVA) was used to analyze the data using Graphpad Prism 7.01 (Graphpad Software, Inc., USA). Turkey's test was used to perform the post-hoc comparison following the ANOVA analysis. The level of significance for all the results was $P < 0.05$.

3. Results

Change in systolic blood pressure (SBP)

The study recorded a significant decrease in systolic blood pressure in the groups that listened to calm music and emotional song, respectively, at 45 minutes and 60 minutes compared to the control group ($P<0.05$) (Figure 1).
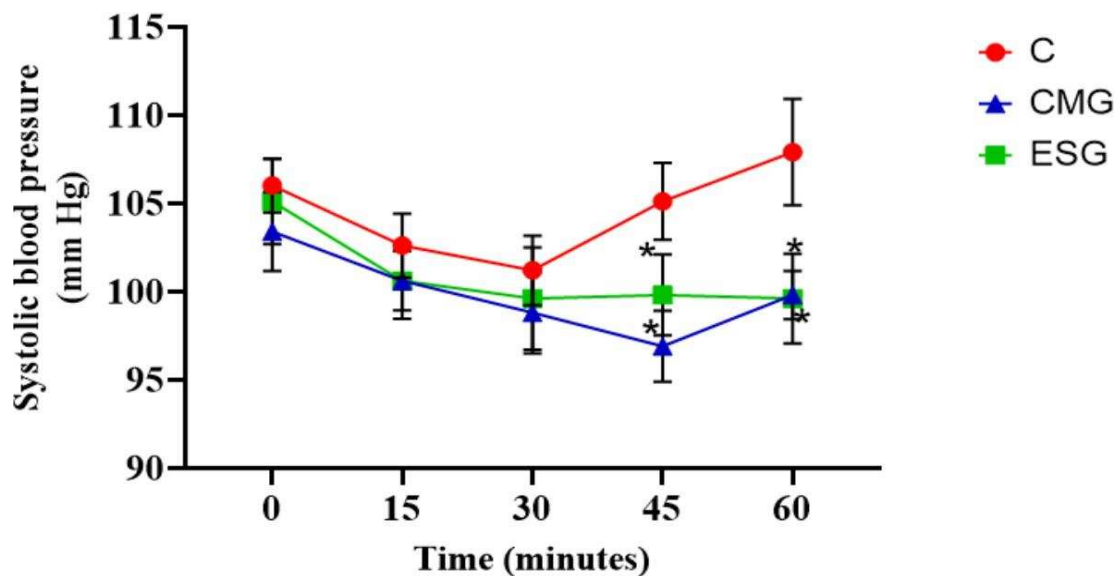

Figure 1: Systolic blood pressure (SBP)

The subjects were allowed to sit comfortably for 1 hour in the control group, while in the test groups, the subjects listened to calm music and emotional songs, respectively, for 1 hour sitting comfortably. * =p<0.05 compared to the control group.

Change in diastolic blood pressure (DBP)
A significant decrease in diastolic blood pressure was observed in the group that listened to calm music at 60 minutes of the study compared to the control group (P<0.05) (Figure 2).
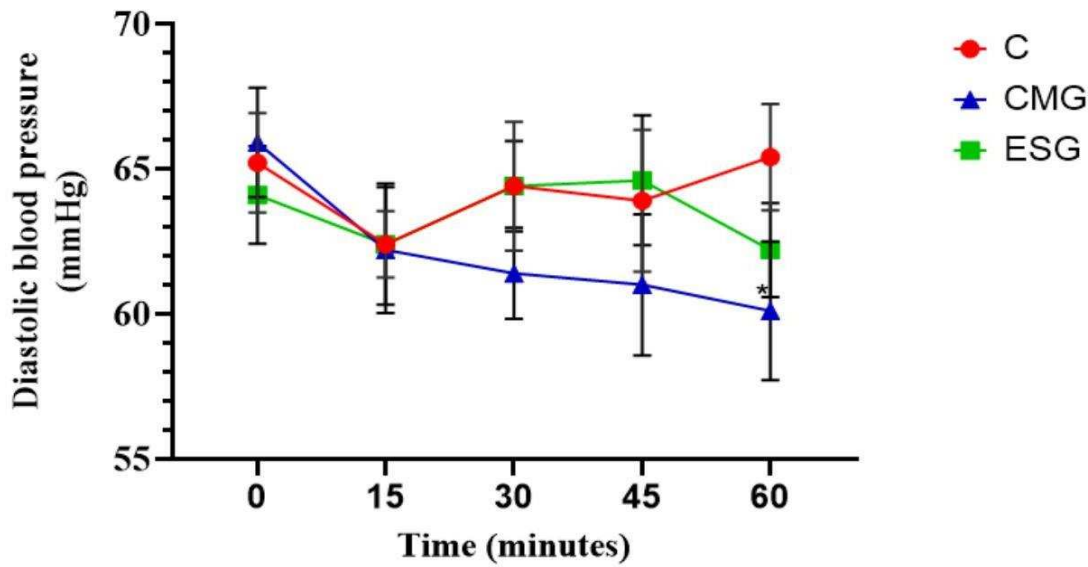

Figure 2: Diastolic blood pressure (DBP)
The subjects were allowed to sit comfortably for 1 hour in the control group, while in the test groups, the subjects listened to calm music and emotional songs, respectively, for 1 hour sitting comfortably. * =p<0.05 compared to the control group.

Change in mean arterial pressure (MAP)
The study recorded a significant decrease in MAP pressure in the group that listened to calm music at 45 minutes and 60 minutes compared to the control group (P<0.05) (Figure 3). In the group that listened to emotional song a significant decrease was observed only at 60 minutes of the study compared to the control group (P<0.05) (Figure 3).
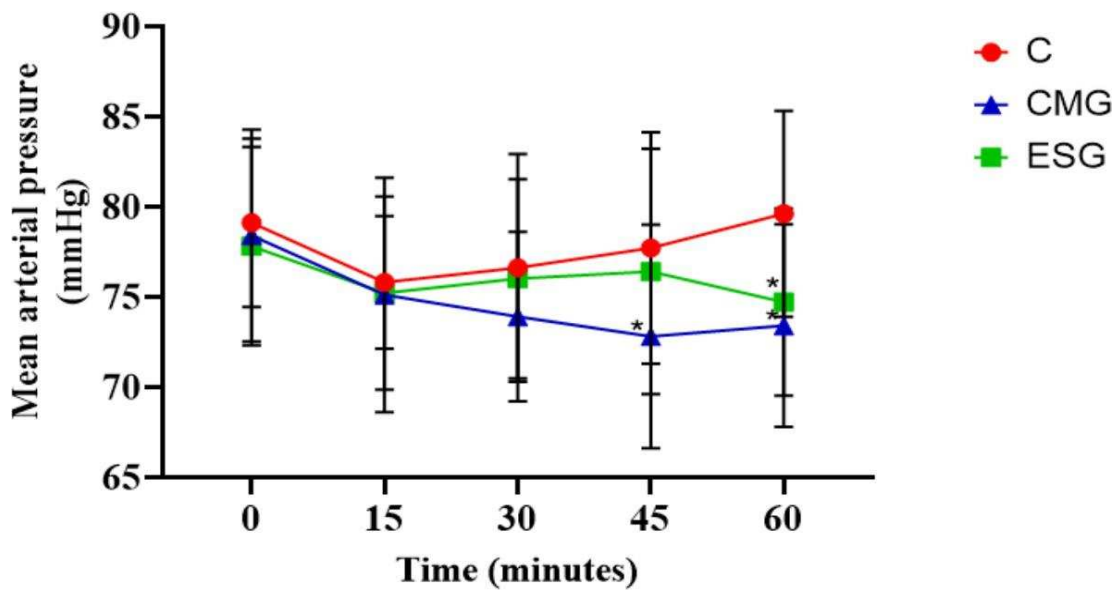
Figure 3: Mean arterial pressure (MAP)

The subjects were allowed to sit comfortably for 1 hour in the control group, while in the test groups, the subjects listened to calm music and emotional songs, respectively, for 1 hour sitting comfortably. * =p<0.05 compared to the control group.

Change in heart rate (HR)

The study recorded no significant change in HR in the test groups compared to the control group throughout the 1 hour duration of the study (Figure 4).
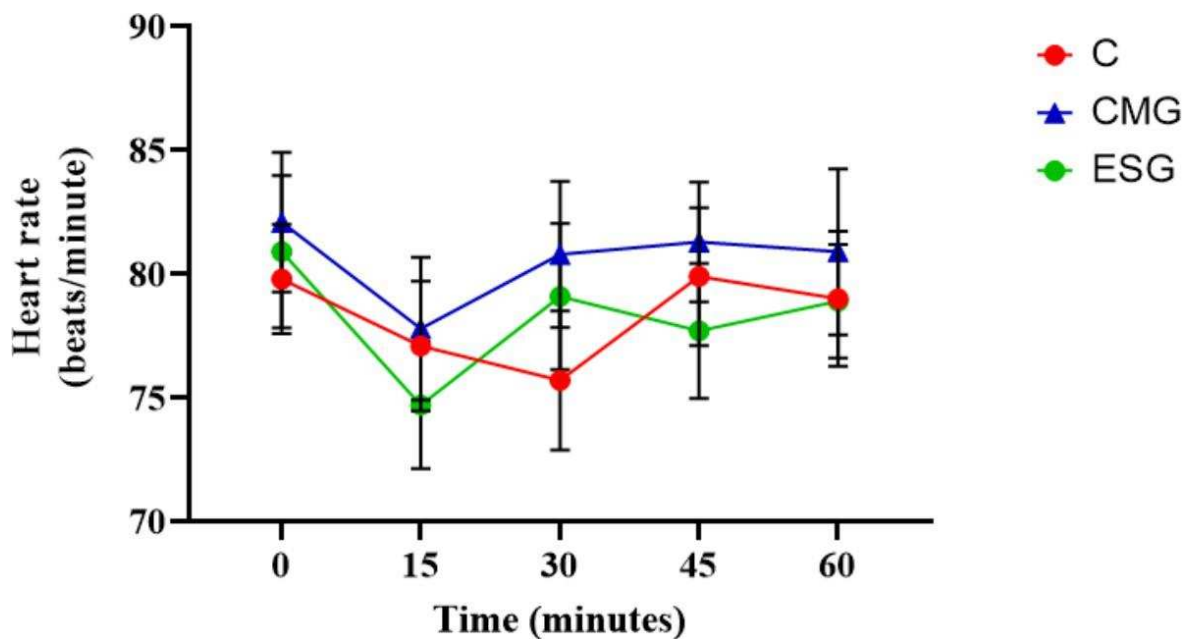
Figure 4: Heart rate (HR)
The subjects were allowed to sit comfortably for 1 hour in the control group, while in the test groups, the subjects listened to calm music and emotional songs, respectively, for 1 hour sitting comfortably.

4. Discussion

The influence of music on human behaviour has been known for centuries. Music has been shown to enhance memory, increase endurance, brighten the mood, reduce anxiety, depression, and blood pressure (Salimpoor et al., 2011; Darki et al., 2022). The benefits of music to humanity are enormous. Music can be employed as an alternative therapeutic intervention. Nowadays, calm or relaxing music, such as piano piece or rain sound, is used to induce sleep, while slow music with love lyrics, specifically romantic love, is used to combat feelings of loneliness and heartbreak. This study therefore assessed the impact of relaxing music and emotional songs on blood pressure and heart rate in healthy young female adults studying at the University of Uyo.

The study showed a significant decrease in systolic blood pressure, diastolic blood pressure, and mean arterial pressure in the groups that listened to calm music and emotional songs, respectively, compared to the control group. However, the study recorded no significant change in heart rate in the test groups compared to the control group. The result of this study is similar to the findings of Suguna and Deepika (2017), who reported that listening to slow music resulted in a reduction in blood pressure and pulse pressure in young adults. Another study reported that listening to classical music resulted in a decrease in blood pressure and heart rate and suggested that classical music has a positive impact on the cardiovascular system and has potential emotional benefits (Darki et al., 2022). The studies of Suguna and Deepika (2017) and Darki et al. (2022) reported that relaxing music and classical music, respectively, decreased the heart rate; this is in contrast to our study, which recorded no significant change in heart rate. However, the study by Ohlendorf et al. (2023) demonstrated that different music genres, which include classical, relaxation, and heavy metal, recorded no significant change in heart rate, and they concluded that listening to music has no systematic influence on decreasing or increasing the heart rate.

The impact of listening to calm music and emotional song on blood pressure might be due to the influence of music on the brain. Music is one factor that has been documented to modulate different sections of the brain, from the autonomic nervous system to the limbic system (Oliver, 2006). It has been suggested that the electrical signals transmitting musical sounds simultaneously activate neurons from different parts of the brain; these include the auditory cortex, motor system cortex, autonomic nervous system, brain pleasure site (the dopaminergic reward system), and so on (Särkämö et al., 2013). The activation of these networks of neurons has been connected to the impact of music on people. The cardiovascular effects of music have been linked to multiple potential mechanisms, which include the autonomic nervous system, particularly the parasympathetic nervous system, which responds to musical vibrations by prompting the body to relax (Darki et al., 2022).

5. Conclusion

The findings of this study showed that listening to calm music, which is a compilation of panio sound and rain music, as well as emotional songs, resulted in a reduction in systolic blood pressure, diastolic blood pressure, and mean arterial pressure but no significant change in heart rate. We can infer that listening to relaxing music and emotional songs might be a potential therapeutic approach for lowering blood pressure. Nevertheless, additional research is still required to support this assertion.

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