

Puzzling Music

Michaela Vandermey (T00247451), Racheal McCrea (T00615461), Supreeta Ranchod
(T00641119), Juliana Hermiston (T00636482)

Thompson Rivers University

Dr. Joanna Urban

BIOL 3550_L01 - Human Physiology 2

January 26, 2022

Hypothesis/Objective:

The objective of this study is to determine the effect of different music genres on heart rate and heart rate variability as well as the ability of a participant to accurately complete a word search puzzle under pressure while listening to a particular music genre.

Background:

Music is an influential part of everyday life for most individuals. We listen to it in the shower, in the car, while exercising and for therapy. There have been many studies conducted to assess the effects that auditory stimulation with music has on various physiological responses. One study noticed changes in both the sympathetic and parasympathetic nervous activity (1). The relationship that has been noticed was a decrease in sympathetic activity while the parasympathetic activity increased (1). Other researchers have found that an increased musical tempo has been linked to increases in heart rate and respiration (1). Additionally, varying the levels of intensity during different genres of music has shown insight into the effects of musical auditory stimulation on cardiac autonomic regulation (2).

There has also been a lot of curiosity associated with the impact of music on cognitive ability (3). Some results have found correlations between increased cognitive ability and music (3). Some experiments have focused on a particular music genre, such as classical music, and have seen similar results (3). When testing a classical music genre, one study compared two classical music pieces that had different tempos and found that the piece with the faster tempo had a higher cognitive response (3).

As students and young adults, we surround ourselves with music. It is interesting to observe the specific physiological responses we have when subjected to auditory stimulation and when under stress. Physiological responses like stress and anxiety have been known to activate the sympathetic-adrenal medullary system which regulates the body's flight or fight response (4). The intent of this study is to determine the cardiac autonomic effects of different music genres and whether they are altered when stress is added. Music may be able to provide a simple and effective method for relaxing, studying and reducing stress.

Procedure:

The study will include 15 participants, both male and female, between 17 and 30 years old. Participants will be seated facing away from the LabChart screen. ECG electrodes will

be placed on the left and right clavicles as well as on the left iliac crest, and connected to the labchart box software. Heart rate will be recorded for 1 minute prior to the start of the music. A song will play for 3 minutes through headphones that the participant will be wearing, during which the participant's heart rate will be recorded in beats per minute. Heart rate will be recorded for 1 minute after the music, and a rest period of 1 minute will follow. This procedure will be replicated for each genre of music (pop, rap, classical, heavy rock, and white noise/classroom soundtrack), 5 times in total per participant. On a separate day, participants will go through the same experimental set up as stated above with the addition of having to complete a different word search puzzle while listening to each genre of music. Word search puzzle order and song order will be randomized. The percent of completion for the puzzles will be analyzed by calculating the amount of words correctly identified during the 3 minutes of song play. Heart rate and heart rate variability will be measured and analyzed using LabChart.

Equipment:

- Headphones
- Playlist of selected songs on a portable device (phone)
- Electrocardiogram (ECG) electrodes (3 per person)
- LabChart program and software
- Alcohol wipes
- Skin preparation gel
- Word search puzzles (5 per participant)
- Pens and pencils

Research Articles:

1. Watanabe K, Ooishi Y, Kashino M. Heart rate responses induced by acoustic tempo and its interaction with basal heart rate. *Scientific Reports* 7, 2017.
2. do Amaral J, Guida H, de Abreu L, Barnabé V, Vanderlei F, Valenti V. Effects of auditory stimulation with music of different intensities on heart period. *Journal of Traditional and Complementary Medicine* 6: 23-28, 2016.

3. Schellenberg E. Music and Cognitive Abilities. *Current Directions in Psychological Science* 14: 317-320, 2005.
4. Knight W, Rickard N. Relaxing Music Prevents Stress-Induced Increases in Subjective Anxiety, Systolic Blood Pressure, and Heart Rate in Healthy Males and Females. *Journal of Music Therapy* 38: 254-272, 2001.