Motivation: Heart rate variation (HRV) is the measure of time between each heartbeat. It is controlled by the autonomic nervous system, and is influenced by many external factors. [1] A decrease in heart rate variation has been linked with increases in both emotional strain [2], and elevated anxiety [3]. Using different genres of music to induce or reduce stress will influence a subject's HRV, according to the level of stress perceived.In a time where the effect of mental stress on general health is becoming increasingly clear, having clinical methods to measure this stress is important for providing optimal care.

Literature Review: Humans have been utilizing music as a form of auditory stimulus since we discovered how to make a beat. It is evident that it evokes some level of change within the human body. Research has been done to determine the kinds of physiological changes that occur when people listen to music. One study that is of relevance to our groups proposed research is that of a study performed at the Sri Venkateshwaraa Medical College Hospital in India [4]. The study utilized the frequency domain parameters of Heart Rate Variability (HRV) to determine the underlying stress levels of the participants. Heart Rate Variability being defined as the variation of time intervals between heart beats [5]. The Results indicated that participants that were in the music group had much higher HRV Variability than those who were in the control group. A higher HRV meaning that the individual has a better tolerance for stress which indicate a lower overall stress level. In summary the study indicated that music did cause a physiological change within the human body in the form of higher HRV.

Objective: This research aims to answer the relation between heart rate variability and induced psychological stress. There are two goals for this research, a long term and a short term goal. The short term goal is define whether or not there is a correlation between the two. The long term goal is to apply this information to sports, both individual and team based, to effectively use music to get ready for the game. By using music to prepare for games, athletes can reduce anxiety and emotional strain [2], meaning they can focus on what is important, the game.

Methodology: The experiment will take place in a laboratory setting on the Carleton University campus. The experiment will consist of a participant wearing noise cancelling headphones that will have different genres of music playing through. The two genres that will be used is classical music and rock music. A BioRadio will be used to measure an ECG by placing electrodes on both wrists. Information from the radio will be sent to a computer where the data will be collected. Data will be displayed on a computer in the form of a heart waves at each beat. The experiment begins by using the ECG to measure the participant's heart rate at rest as a control. Then, soft and calming classical music will be played for 5-7 minutes followed by intense rock music. After 5-7 minutes with this type of music the experiment will be

complete and the participant will be compensated with candy. The volume used for the music will be decided by asking the participant when the volume is comfortable for them. This is due to every participant having a different comfort range for volume. The entire participant interaction should last about 25 minutes. After all experiments are complete, the data will be analyzed by measuring the distance of the R-R interval between heart beats to determine the variability.

There will be 10 male participants and 10 female participants for a total of 20 participants. This number was chosen as 20 people is a large enough sample size for the data that we are collecting. Participants must have no flu like symptoms due to the repeated use of headphones between participants, no known heart conditions as the heart will be tested by adding stressors, and no known hearing problems as the stressor is auditory. Any unexpected changes in the participants health will cause the experiment to stop and CUSERT to be called. Lotion will be given to participants who experience any skin irritation as well.

Impact: A varying heart rate is an indication of a healthy cardiovascular system and autonomic nervous system that controls bodily functions. Heart rate variability is used as a way of detecting the response of the autonomic nervous system. If heart rate variability is low, the body is responding in a fight-or-flight method. If heart rate variability is high, the body is at a generally relaxed state. Therefore, the relaxed body response or higher heart rate variability is favorable [5]. The results of this study will provide insight on how mentally induced stress due to music can reduce or increase heart rate variability. People will gain knowledge on the effect of mental stress on heart rate variability and learn to reduce this effect by taking proper precautions. Furthermore, the study will demonstrate the type of music and its associated induced stress that will increase heart rate variability; this would motivate people to listen to the type of music that creates favorable heart rate variability.

Citations:

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