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The Effects of Auditory Perception and Musical Preference on Anxiety in Naive Human Subjects

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The effects of auditory perception and musical preference on anxiety in naive human subjects

Authors' Contribution:

- A** Study Design
- B** Data Collection
- C** Statistical Analysis
- D** Data Interpretation
- E** Manuscript Preparation
- F** Literature Search
- G** Funds Collection

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Summary

Background:

The use of music as a method of relieving anxiety has been studied extensively by researchers from varying disciplines. The abundance of these reports focused on which genre of music best aided in the relief of stress. Little work has been performed in the area of auditory preference in an attempt to ascertain whether an individual's preferred music type aids in their anxiety reduction at levels greater than music that they have little or no propensity for.

Materials/Methods:

In the present report we seek to determine whether naive human subjects exposed to music of their preference show a decrease in anxiety, as measured by systolic and diastolic blood pressure values. We furthermore contrast these values to those obtained during non-preferred music listening.

Results:

We found statistically significant reduction of anxiety levels only when subjects were exposed to their preferred musical selections.

Conclusions:

Students participating in the study already had knowledge of what genre of music would best relax them. It is our belief, that within the general population, many people do not have this self understanding. We conclude that music therapy may provide a mechanism for this self-understanding and subsequently help alleviate anxiety and stress.

key words:

music • preferred music • anxiety • stress • music therapy

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BACKGROUND

When music is defined within a theoretical framework, it is best to refer to its physical definition as the production of varying pitches inside a rhythmic framework. It has long been known that this simple harmonic motion can have an abundance of psychological and physical effects [1,2]. From the moment an auditory stimulus is perceived a cascading series of events is set into motion. Beginning with the compression of air molecules within the external auditory canal and arrival at the tympanic membrane and final translation by the cochlea followed by somatosensory area innervations, music triggers an abundance of psychobiological processes along this traveled route. It is along this route where many of the proposed effects of musical listening have their origins, from the altering of moods by increasing pleasure center neurotransmitters, to the lowering of blood pressure and anxiety reduction by modifying medulla oblongata innervations [3,4].

It is further believed that emotional stress, coupled with a negative mental attitude, can manifest itself in physical form as illness. Since music is linked to the psychobiological state of humans, it is believed that this connection, can be utilized to have a profound impact on relieving pathologies [5-7]. In our study we attempt to explore the nature of this symbiotic relationship between music and pathology relief by exploring the use of music as a means of reducing blood pressure and anxiety. We demonstrate that individuals poses keen knowledge as to which genre of music best relaxes them. We observed a significant decrease in both systolic and diastolic blood pressure when individuals are exposed to their preferred music genre, in stark contrast to their exposure to music of alternate genres which show a slightly elevated blood pressure. In this regard, the present study is in direct corroboration with other studies demonstrating that preferred music can alter blood pressure parameters to a state indicative of relaxation [8,9].

MATERIAL AND METHODS

Participants

A group of 16 subjects ranging in age from 18-30, without any reported health problems were randomly selected from a population of students at the Long Island Conservatory (LIC, Albertson, NY) to participate in this study. These students were predominately of Asian descent and clearly expressed their preference for classical music. Individuals who reported participating in prior experiments of an auditory nature were excused, thus maintaining naivety amongst subjects. Signed consent forms were received from all participants prior to inclusion and the Institutional Review Board at LISMA Foundation, NY, approved the experimental protocol.

Apparatus

Auditory stimulus was provided by Labtec Spin-45 speakers attached to a Dell Pentium 4 computer running RealOne Player (Version 2.0) via Windows XP operating system. The blood pressure measurements were made

using a Lumiscope comfort line blood pressure monitor (Model 1097), with measurements being made in the classic systolic/diastolic fashion with mmHg as the preferred unit of measurement. The musical selections chosen for this experiment were from the rock band 'ZZ Top' as well as classical selections by Johann Sebastian Bach. The ZZ Top recording used was 'ZZ Top - Greatest Hits' (ASIN: B000002LSV) with the following tracks played in random order; (1) Gimme All Your Lovin' (2) Sharp Dressed Man (3) My Head's in Mississippi. The selections from Bach were taken from 'Bach: For Relaxation' (ASIN: B000003G7C), with the following pieces played in random order; (1) Jesu, Joy of Man's Desiring (2) Suite BWV1012: Allemande (3) Brandenburg Concerto No. 6: Adagio ma non tanto (4) The Well Tempered Clavier, Book 1: Prelude in C (5) Trio Sonata No. 4, BWV1079: Andante (6) Violino solo e Basso l'accompagnato. These pieces were chosen based on pilot studies which indicated that the rock music selected was most contrary to the preferred music and the classical pieces selected were found to be most relaxing, as indicated by the pilot participants, respectively.

Procedure

We utilized a classic before and after (AB) design. Subjects were randomly assigned to one of two groups with eight participants in each. Each participant was shown to the laboratory individually and asked to sit stationary on a comfortable chair while a blood pressure cuff was placed on their arm in the manner prescribed by the manufacturer. An initial confederate measurement was made with the intention to relax the subject in an effort to ease the apprehension of latter measurements and reduce the incidence of 'white coat hypertension'. Subjects were then told to sit and maintain a relaxed posture for 20 minutes, after such time an initial baseline measurement was made and recorded. This was followed by the playing of 'ZZ Top' rock music or the more desired classical music, dependent on which group the subject was assigned to. The music was played at a comfortable and homogeneous volume level for 20 minutes, upon which time a second measurement was obtained in the above mentioned fashion. Subsequent to treatment all the subjects in the classical music group relayed their enjoyment of the pieces played to the experimenter and reported being in a relaxed state, while subjects in the rock group reported being agitated and despondent of the music selections, thus further substantiating their preference for classical works. All obtained data was transferred to Sigma-Plot and Sigma-Stat (Jandel, San Rafael, CA) for graphic representation and evaluation.

RESULTS

Four separate paired t tests were used in this analysis in an effort to maintain statistical clarity, examining the before and after systolic and diastolic data obtained from both groups with $n=8$ for each. For the classical music group the initial mean systolic was $M=119.875$ mmHg with $SD=5.817$, for the post test $M=112.5$ mmHg and $SD=3.854$, $t(7)=3.477$ $p \leq 0.01$ ($p=0.01$) (Figure 1). For the diastolic pressure the initial test had a $M=83.25$

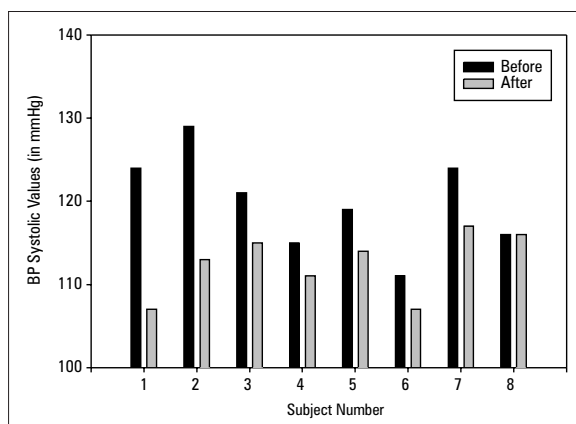


Figure 1. Systolic values for before and after classical music listening. The mean 'Before' systolic value with $n=8$ was 119.875 mmHg ($SD=5.817$), for the 'After' test we observed a mean of 112.5 mmHg ($SD=3.854$), yielding significant results. Note the dramatic decrease in systolic pressure subsequent to subjects' exposure to their preferred classical music, a clear indication of relaxation response onset.

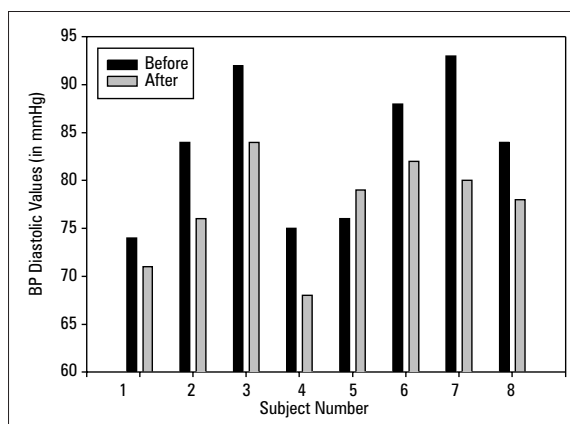


Figure 2. Diastolic values for before and after classical music listening. The mean 'Before' diastolic value with $n=8$ was 83.25 mmHg ($SD=7.573$), for the 'After' test we observed a mean of 77.25 mmHg ($SD=5.418$), yielding significant results. Once again we observe the dramatic decrease in blood pressure, by looking at diastolic values subsequent to subject's exposure to their preferred classical music, another clear indication of relaxation response onset.

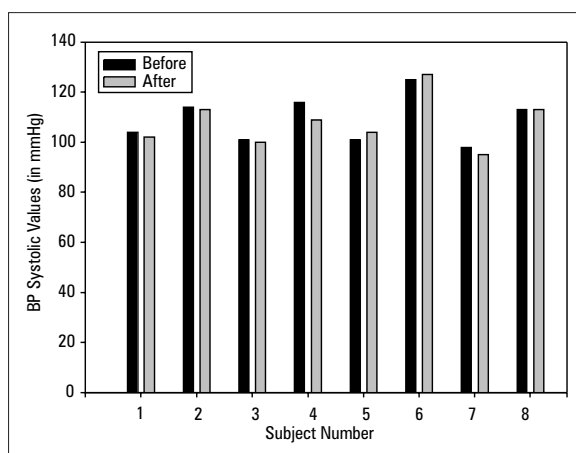


Figure 3. Systolic values for before and after rock music listening. The mean 'Before' systolic value with $n=8$ was 109.0 mmHg ($SD=9.411$), for the 'After' test we observed a mean of 107.875 mmHg ($SD=9.978$), yielding statistically insignificant results. Note that there is virtually no difference between the before and after measurements.

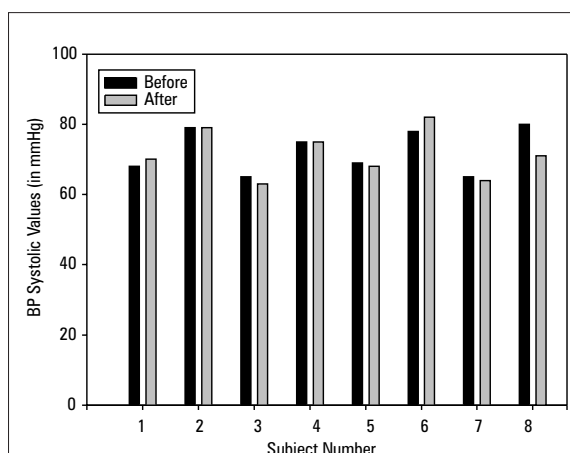


Figure 4. Diastolic values for before and after rock music listening. The mean 'Before' diastolic value with $n=8$ was 72.375 mmHg ($SD=6.323$), for the 'After' test we observed a mean of 71.5 mmHg ($SD=6.782$), yielding statistically insignificant results. Thus we once again observe no significant decrease in pressure when taken prior to and subsequent to unpreferred rock music listening.

mmHg and $SD=7.573$, with a post test $M=77.25$ mmHg and $SD=5.418$, $t(7)=3.69$ $p<0.01$ ($p=0.007$) thus there was a significant decrease in both systolic and diastolic blood pressure and the measurable onset of the relaxation response (Figure 2).

Participants in the rock music group had an initial systolic pressure of $M=109$ mmHg with $SD=9.411$, and a post test $M=107.875$ mmHg $SD=9.978$, $t(7)=1.029$ $p>0.05$ ($p=0.337$) (Figure 3.). The diastolic pressure of the initial test yielded a $M=72.375$ mmHg with $SD=6.323$, and a post test $M=71.5$ $SD=6.782$ with $t(7)=0.651$ $p>0.05$ ($p=0.535$) thus no significant difference was observed amongst participants in the rock music groups (Figure 4).

DISCUSSION

In the group exposed to their preferred genre of music, we observed a significant decrease in blood pressure and signs of relaxation response onset, as defined by a dramatic decrease in both systolic and diastolic blood pressure. This is in contrast with the rock music group which showed no significant relaxation effect, and a highly insignificant difference in blood pressure.

Other studies have demonstrated that music can alter blood pressure parameters as well as induce a state of relaxation [10–13]. In this regard, music has the ability to

be used as a therapeutic tool for lowering blood pressure as well as anxiety in individuals that may be hypertensive or suffer from anxiety disorders [12].

CONCLUSIONS

This study further demonstrates that the volunteer population of Long Island Conservatory students participating in the study already had knowledge of what genre of music would best relax them. It is our belief, that within the general population, many people do not have this self understanding. However, as noted by Allen and colleagues [12], many can be taught to recognize what type of stimulus relaxes them. This type of self help or realization, with the help of experts, promises to allow the bodies own healthy processes to emerge and promote a healthy state of being. In short, the study demonstrates that within our being is the power to modulate our own health. We further surmise that the pressures/stresses of everyday life divert our attention from these naturally occurring health promoting processes.

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