

Molloy University

DigitalCommons@Molloy

---

Faculty Works: Music Therapy

Music Therapy

---

9-2003

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

Seung-A Kim Ph.D., L.C.A.T., MT-BC  
Molloy College, skim@molloy.edu

Elliott Salamon

Steven R. Bernstein

Minsun Kim

George B. Stefano

Follow this and additional works at: [https://digitalcommons.molloy.edu/mustherapy\\_fac](https://digitalcommons.molloy.edu/mustherapy_fac)



Part of the [Music Therapy Commons](#)



This work is licensed under a [Creative Commons Attribution-NonCommercial-No Derivative Works 4.0 International License](#).

[DigitalCommons@Molloy Feedback](#)

---

### Recommended Citation

Kim, Seung-A Ph.D., L.C.A.T., MT-BC; Salamon, Elliott; Bernstein, Steven R.; Kim, Minsun; and Stefano, George B., "The Effects of Auditory Perception and Musical Preference on Anxiety in Naive Human Subjects" (2003). *Faculty Works: Music Therapy*. 7.  
[https://digitalcommons.molloy.edu/mustherapy\\_fac/7](https://digitalcommons.molloy.edu/mustherapy_fac/7)

This Peer-Reviewed Article is brought to you for free and open access by the Music Therapy at DigitalCommons@Molloy. It has been accepted for inclusion in Faculty Works: Music Therapy by an authorized administrator of DigitalCommons@Molloy. For more information, please contact [tochtera@molloy.edu](mailto:tochtera@molloy.edu), [thasin@molloy.edu](mailto:thasin@molloy.edu).

Received: 2003.07.01  
Accepted: 2003.07.01  
Published: 2003.09.08

## 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

Elliott Salamon<sup>ABCD</sup>, Steven R. Bernstein<sup>BC</sup>, Seung-A. Kim<sup>BC</sup>, Minsun Kim<sup>BC</sup>,  
George B. Stefano<sup>ABCD</sup>

The Long Island Conservatory, 1125 Willis Avenue, Albertson, NY 11507, U.S.A.

**Source of support:** The LISMA Foundation in part supported this work.

### 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

**Full-text PDF:**

[http://www.MedSciMonit.com/pub/vol\\_9/no\\_9/3919.pdf](http://www.MedSciMonit.com/pub/vol_9/no_9/3919.pdf)

**Word count:**

1264

**Tables:**

–

**Figures:**

4

**References:**

13

**Author's address:**

Dr. George B. Stefano, The Long Island Conservatory, 1125 Willis Avenue, Albertson, NY 11507, U.S.A.,  
email: [liconservatory@hotmail.com](mailto:liconservatory@hotmail.com)

## 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

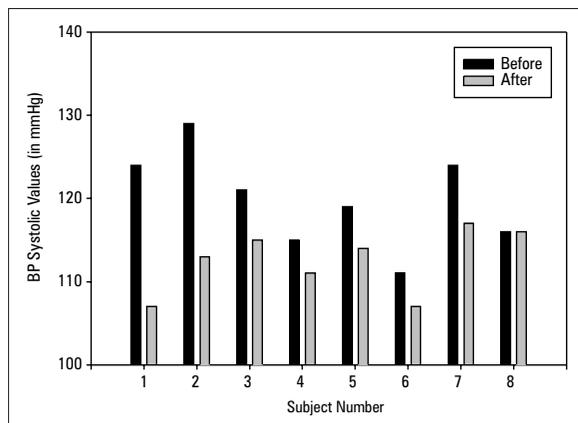
using a Lumiscope comfort line blood pressure monitor (Model 1097), with measurements being made in the classic systolic/diastolic fashion with mmHg as the preferred unit of measurement. The musical selections chosen for this experiment were from the rock band 'ZZ Top' as well as classical selections 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

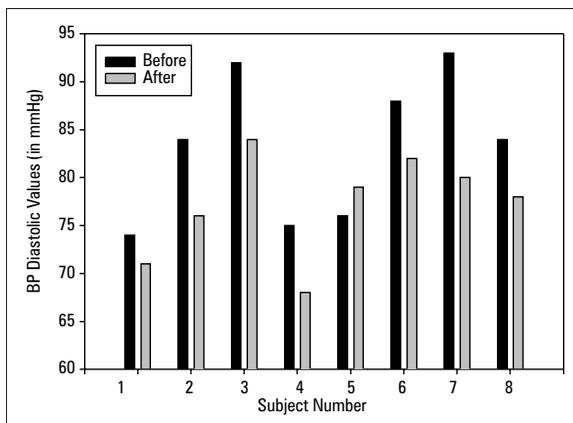
We utilized a classic before and after (AB) design. Subjects were randomly assigned to one of two groups with eight participants in each. Each participant was shown to the laboratory individually and asked to sit stationary on a comfortable chair while a blood pressure cuff was placed on their arm in 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

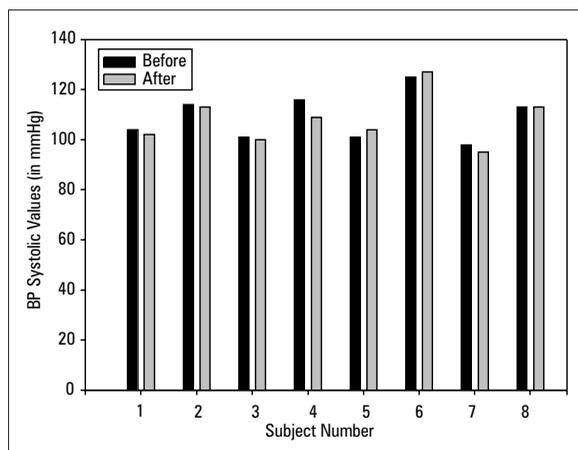
Four separate paired t tests were used in this analysis in an effort to maintain statistical clarity, examining the before and after systolic and diastolic data obtained from both groups with  $n=8$  for each. For the classical music group the initial mean systolic was  $M=119.875$  mmHg with  $SD=5.817$ , 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  $M=83.25$



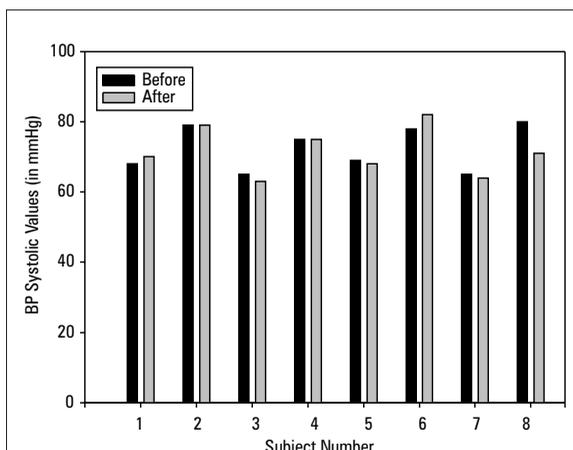
**Figure 1.** Systolic values for before and after classical music listening. The mean 'Before' systolic value with  $n=8$  was 119.875 mmHg ( $SD=5.817$ ), for the 'After' test we observed a mean of 112.5 mmHg ( $SD=3.854$ ), yielding significant results. Note the dramatic decrease in systolic pressure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

### REFERENCES:

1. Savarimuthu D, Bunnell T: Links The effects of music on clients with learning disabilities: a literature review. *Complement Ther Nurs Midwifery*, 2002; 8(3): 160-5
2. Iwananga M, Moroki Y: Subjective and physiological responses to music stimuli controlled over activity and preference. *Journal of Music Therapy*, 1999; 36: 26-38
3. Blair RW, Thompson GM: Convergence of multiple sensory inputs onto neurons in the dorsolateral medulla in cats. *Neuroscience*, 1995; 67(3): 721-9
4. Reis DJ, Ledoux JE: Some central neural mechanisms governing resting and behaviorally coupled control of blood pressure. *Circulation*, 1987; 76(1 Pt 2): 12-9
5. Selye H: History of the Stress Concept. In L. Goldberger and S. Breznitz (Eds.), *Handbook of Stress: Theoretical and clinical aspects*, 1993; 2: 7-20 Free Press
6. Pervin LA, John OP: *Personality Theory and Research* (7<sup>th</sup> ed.) New York: John Wiley and Sons, Inc, 1997
7. Salamon E, Kim M, Beaulieu J, Stefano GB: Sound therapy induced relaxation: down regulating stress processes and pathologies. *Med Sci Monit*, 2003; 9(5): RA96-RA101
8. Palakanis KC, Denobile JW, Sweeney WB, Blankenship CL: Effect of music therapy on state anxiety in patients undergoing flexible sigmoidoscopy. *Diseases of the Colon and Rectum*, 1994; 37(5): 478-481
9. Miluk-Kolasa B, Matejek M, Stupnicki: The effects of music listening on changes in selected physiological parameters in adult pre-surgical patients. *Journal of Music Therapy*, 1996; 33: 208-218
10. Knight WEJ, Rickard NS: Relaxing music prevents stress induced increases in subjective anxiety, systolic blood pressure, and heart rate in healthy males and females. *Journal of Music Therapy*, 2001; 38: 254-272
11. Uplike PL: Music Therapy for ICU patients. *Dimensions of Critical Care Nursing*, 1996; 9: 39-45
12. Allen K, Golden LH, Izzo JL Jr et al: Normalization of hypertensive responses during ambulatory surgical stress by perioperative music. *Psychosom Med*, 2001; 63(3): 487-92
13. Benson H: The relaxation response: therapeutic effect. *Science*, 1997; 278(5344): 1694-5

# Index Copernicus

Global Scientific Information Systems  
for Scientists by Scientists

[www.IndexCopernicus.com](http://www.IndexCopernicus.com)



TM

**INDEX**  
**COPERNICUS**  
**INTERNATIONAL**

**EVALUATION & BENCHMARKING**

**PROFILED INFORMATION**

**NETWORKING & COOPERATION**

**VIRTUAL RESEARCH GROUPS**

**GRANTS**

**PATENTS**

**CLINICAL TRIALS**

**JOBS**

**STRATEGIC & FINANCIAL DECISIONS**

## Index Copernicus integrates

### IC Scientists

Effective search tool for collaborators worldwide. Provides easy global networking for scientists. C.V.'s and dossiers on selected scientists available. Increase your professional visibility.

### IC Journal Master List

Scientific literature database, including abstracts, full text, and journal ranking. Instructions for authors available from selected journals.

### IC Patents

Provides information on patent registration process, patent offices and other legal issues. Provides links to companies that may want to license or purchase a patent.

### IC Conferences

Effective search tool for worldwide medical conferences and local meetings.

### IC Grant Awareness

Need grant assistance? Step-by-step information on how to apply for a grant. Provides a list of grant institutions and their requirements.

### IC Virtual Research Groups [VRG]

Web-based complete research environment which enables researchers to work on one project from distant locations. VRG provides:

- customizable and individually self-tailored electronic research protocols and data capture tools,
- statistical analysis and report creation tools,
- profiled information on literature, publications, grants and patents related to the research project,
- administration tools.

### IC Lab & Clinical Trial Register

Provides list of on-going laboratory or clinical trials, including research summaries and calls for co-investigators.