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To determine the effect of audio-visual stimulus on autonomic nervous system: A comparative study

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Abstract
Aim: To determine the effect of audio-visual stimulus on autonomic nervous system.
Materials and Methods: The present prospective comparative study was conducted among patients visited the OPD, Darbhanga Medical College and Hospital, Bihar, India. 30 patients of either sex were included. The participant's vitals (respiration rate, blood pressure, and heart rate) were measured before and after intervention
Results: Mean age of the study population was 32.15 years. Mean heart rate, blood pressure, and respiration rate were found statistically lower in group II as compare to group I ($p \leq 0.05$) respectively.
Conclusion: The findings of the present study concluded that the positive impacts of music in terms of reducing blood pressure, respiratory rate and heart rates.

Keywords: autonomic nervous system, audio-visual, vitals

Introduction
The human body reacts to fear and anxiety in quantifiable physiological ways. The emotional experiences of fear and nervousness act to make the body aware of risk or danger. This evokes versatile reactions in the physiological working of the body through a perplexing coordination of the cerebrum, hormones, and the cardiovascular framework [1].
As an active coping method, the sympathetic nervous system is engaged through the release of epinephrine and norepinephrine from the adrenal glands as the brain perceives a threat to the body. The release of these hormones results in many physiological actions; "respiration deepens; the heart beats more rapidly; the arterial pressure rises; the blood is shifted away from the stomach and intestines to the heart and central nervous system and the muscles" [2].
Many of the existing epidemiological and psychological studies have shown that the use of music in hospitals can facilitate patient's healing processes, and improve mental illnesses, social cognitive performance, and communication skills [3, 4]. Moreover, music enhances sleep quality, decreases preoperative patient's pain and anxiety levels and lowers tension [5, 6].
Despite the fact that there is an incredible assortment of writing on the utilization of music and music medication to help arrive at recuperating objectives in emergency clinic settings, there is similarly restricted proof-based examination supporting the effect of negative and positive sounds, and the sentiments that the impression of relieving music summons on wellbeing in medical clinic spaces. To address this, the paper fundamentally centers around the effect of audio-visual stimulus on autonomic nervous system.

Materials and Methods
The present prospective comparative study was conducted among patients visited the OPD, Darbhanga Medical College and Hospital, Bihar, India.

Inclusion Criteria
1. Patients between 20-40 years of age of either sex
2. Those who give informed consent

Exclusion Criteria
1. Patients suffering any acute or chronic systemic illness
2. Patients taking anti-hypertensive or asthmatic medication
3. Patients who have not signed the informed consent

The study protocol was reviewed by the Ethical Committee of the Hospital and granted ethical clearance. After explaining the purpose and details of the study, a written informed consent was obtained.

Sample selection
The sample size was calculated using a prior type of power analysis by G* Power Software Version 3.0.1.0 (Franz Faul, Universitat Kiel, Germany). The minimum sample size was calculated, following these input conditions: power of 0.80 and $P \leq 0.05$ and sample size arrived were 30 participants.

Methodology
After taking detailed history and recording demographic data, a comprehensive clinical examination of each patient was done. Participants were first outfitted with blood pressure monitor (Omron Automated Blood Pressure Monitor), respiration belt (Biopac Respiration Belt), and pulse oximeter (Monin Pulse Oximeter) while sitting with

relaxed posture in a chair. They were also asked to wear a pair of noise-canceling headphones. The participant's vitals (respiration rate, blood pressure, and heart rate) were measured before and after intervention.

Statistical Analysis

The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 20 (IBM SPSS Statistics Inc., Chicago, Illinois, USA) Windows software program. The variables were assessed for normality using the Kolmogorov Smirnov test. Descriptive statistics included computation of percentages, means and standard deviations. Statistical test applied for the analysis was student t-test. Level of significance was set at $p \leq 0.05$.

Results

Table 1: demographic and clinical profile

Age (years)	**32.16±3.61**
Gender (M/F)	16 (53.3%)/14 (46.7%)
Weight (Kgs.)	63.21±3.87

Table 2: comparison of parameters before and after intervention

Variables	**Mean±SD**		**p-value**
	Group 1	**Group 2**	
Resting Heart rate	74.61±2.27	79.38±3.01	0.021 (Sig.)
Respiratory rate	17.41±1.21	15.43±1.37	0.037 (Sig.)
Systolic Blood Pressure	120.81±12.31	118.24±10.81	0.048 (Sig.)
Diastolic Blood Pressure	69.23±7.18	77.79±6.41	0.001 (Sig.)

Test applied: paired t-test

Discussion

The purpose of this study was to understand the relationship between auditory and visual stimuli and their relationship to emotional physiological responses. Our hypothesis was that calming music would cause no change in heart rate, blood pressure, and respiration rate. Although the data showed trends opposite to our predictions, after conducting paired T-tests, we found that the trends were statistically significant ($p \leq 0.05$). This was found in agreement with the meta-analysis conducted by Iyendo TO (2016) found a positive correlation between relaxing music and a decrease in stress [2].

Sinha *et al*. (1992) performed a study to measure the response of the cardiovascular system to perception of different emotions. The study concluded that there was an increase of the systolic blood pressure and the heart rate of the participants that experienced fear in their imagery session. However, there was little change in the diastolic pressure mediated by a low peripheral vascular resistance in these same participants. This was attributed to a sympathetic response of the nervous system and a release of epinephrine [7]

One study done by le Roux *et al*. (2007) tested the effects of Bach's Magnificat on the cortisol levels of patients suffering from infectious lung conditions. The study showed a significant decrease in the stress hormone in the patient group that listened to the classical music compared to the group that did not listen to the music, who experienced a significant increase in plasma cortisol levels. This finding indicates that the patients who received music therapy as part of their treatment experienced lower stress levels and decreased negative emotions in comparison to their counterparts [8].

Conclusion

The findings of the present study concluded that the positive impacts of music in terms of reducing blood pressure, respiratory rate and heart rates. To reinforce the findings of our study, further experimentation using alternative methodologies should be conducted.

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