COMPARATIVE STUDY OF HEART RATE, BLOOD PRESSURE AND SELECTIVE ATTENTION OF SUBJECTS BEFORE AND AFTER MUSIC

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ABSTRACT

Introduction

Studies have shown different views regarding the effect of music in vitals e.g Heart rate (HR), Blood pressure (BP) and attention. The effect of preferred music with lyrics in vitals and reaction time in stroop test has not been performed in Nepalese students so, we conducted the study.

Objective

To find out the change in HR, BP and reaction time in Stroop test before and after their preferred music with lyrics.

Methodology

Thirty male medical and paramedical students aged 25.27 ± 2.0 participated in study. The vital signs and reaction time in Stroop test before and after music was taken.

Results

Paired-t test was used to compare means before and after exposure to music. The means are expressed as Mean ± SD. Heart rate (HR) increased after exposure to music (66.33±9.51 Vs 67.2±8.44) ($p<.05$). The error in Stroop test was less after music (.66±.49 Vs.63±.66) ($p<.05$). The reaction time after error correction decreased post exposure to music (24.117±4.61Vs23.29±4.45) ($p<.05$).

Conclusion

The heart rate increased after exposure to music. The errors decreased after listening to music which also decreased reaction time.

KEYWORDS

Error, heart rate, music, reaction time

INTRODUCTION

The tranquilising effect of music is accepted for many centuries. Many cultures have their own unique music. Music is shown to affect the person emotionally which suggests people listen to music to maintain mood, arousal, attain self awareness and to express social relatedness.[1] Not only this, music is even claimed to change the vital parameters as heart rate (HR), Blood pressure (BP) and respiratory rate (RR). Systolic blood pressure (SBP), Diastolic blood pressure (DBP) and HR is shown to decrease significantly with music therapy.[2] Some researchers have also shown that the type of music which the person listens determines the change in Blood pressure and heart rate. They suggest HR is higher in response to exciting music compared with tranquilizing music.[3] For the reason clearly not understood, listening to music while studying is common trend amongst scholars. In a study conducted among 200 Malaysian students, 120 prefer hearing to music while studying whereas 80 students did not prefer listening music.[4] Many studies have been performed to find out the relationship of music with attention, cognition and Spatial ability. The Mozart is a classical music. The study conducted on Mozart effect showed listening to Mozart especially with piano caused increase in spatial ability for short term.[5] It is supported by other author Who showed better spatial performance after music exposure when interpreted with EEG.[6] But it became controversial as some other researchers showed there is no difference in score before and after exposure to music[7]. Music is seen to affect attention also. Authors have claimed that the background music without lyrics is better in attention performance while music with lyrics has negative impact on performance of workers[8]. Similar study shows the test score of attention in schizophrenics is even better in popular background music[9]. The fondness of music is also seen to affect task performance. The study on visual awareness showed enhanced visual awareness when tasks were performed under preferred music conditions compared to unpreferred music or in silence[10]. The relationship of music with vital signs and task performance is still not settled. The Stroop Color-Word Test (Fig: 1) is a test of selective attention.[11] In this test, subjects should name the color of the word which increases the reaction time (e.g the word red written in blue has to be read as blue). The written words are automatically encoded along with visual colors. This causes visual verbal inconsistency because of automatic processing of written language over years of practice[12]. From the above background, it is seen that the controversies still exist about the effect of music on vital parameters and task performance. So, we conducted the study to find out whether the subject's preferred music with lyrics has significant effect on heart rate, blood pressure and reaction time in Stroop test.

OBJECTIVES

To find out difference in heart rate and blood pressure before and after preferred music with lyrics and the also to find out the reaction time in Stroop test before and after same music.

METHODOLOGY

This cross-sectional study was conducted on thirty healthy male medical and paramedical students aged (25.27±2.0) of Nobel Medical College between October 2017 to October 2018. Subjects having abnormal eyesight, color blindness or any medical illness were excluded from the study. Subjects were familiarized with the test to be conducted and asked to relax. Written informed consent was taken. Detailed medical history and physical examination was done. Subjects were asked if they prefer to listen music while doing any concentrating activities and only those students who told they listen to music during or before studying were included in the study. Anthropometric measurement was done with standard instruments. Height was measured by height measuring scale which was indigenously designed and calibrated in both centimetres and inches. Weight was measured by calibrated weighing machine in kilograms (kg). Blood pressure was measured by sphygmomanometer and stethoscope. Heart rate was measured with Polar V800. The reaction time was calculated with Stroop card. (e.g the word red written in blue has to be read as blue) (Fig: 1). Stroop cards were printed in A3 size paper with font size 28 for each word. The errors were checked with check card. The check card was substituted with word matching the color subject had to speak e.g., (if the experimental card contained red written in blue ink, the check card had blue word written in it). Errors made were checked by comparing with check card.[12]

During reading of Stroop card, Subjects were asked to sit down comfortably on a chair. The Card was kept in front of subject at about 50 cm from eye level. The subjects were instructed to read aloud Stroop card on hearing the signal "123 go". They were asked to correct the error if they realize it. Errors were checked with check card and uncorrected errors were noted. Reaction time to read the Stroop card was taken with stop watch. After completing the test subjects were asked to relax for half an hour. The experiment was performed on the same day and not delayed because it could have changed the mood of the subject which would have affected the vital signs. After rest, with the help of headphone subject were exposed to their preferred music with lyrics for 15 minutes in eyes closed condition and instructed not to sleep. After the music exposure blood pressure and heart rate were taken immediately and also instructed to read the Stroop card again. The reaction time for Stroop test after music was also taken. The errors made were noted. In the card, two types of errors were encountered. One is failure to see the error and the other is leaving uncorrected error.[12]

RED	BLUE	GREEN
ORANGE	BLACK	PINK
GREEN	BROWN	PURPLE
BROWN	PURPLE	RED
PURPLE	RED	BLUE
RED	BLUE	GREEN
BLUE	GREEN	BROWN

Figure 1: Stroop card

Statistical analysis: The total time taken to read the whole card was taken as reaction time for each card. Average time for each word was calculated by dividing the total reaction time divided by number of stimuli. For any uncorrected error, twice the average response time per item was added to a subject's total reaction time for all uncorrected error[12]. Then these values were exported to SPSS. Since our data was normally distributed paired- t test was used to compare the means of heart rate, blood pressure and reaction time between two condition.

RESULTS

The Mean ± SD of the anthropometric variables are tabulated in (Table 1). HR, BP, reaction time before and after music were tabulated as Mean ± SD. (Table: 2) When comparison was done between two states, there was significant increase in heart rate after music exposure whereas no significant change in in either systolic or diastolic blood pressure was seen in post music condition. The errors made in stroop test after exposure to music were significantly less compared to baseline condition. The reaction time in Stroop test before correction of error was not statistically different but the reaction time after addition of corrected error was significantly less in post music exposure.

Table 1 : Anthropometric variable of subjects	
Variables	Mean ± SD
Age(yrs)	25.27±2.0
Height(cms)	166.10±7.1
Weight (kgs)	59.29±11.64
BSA(m^2/kg)	1.64±.172

Table 2: Comparison of variables before and after music			
Variables	Before music Mean±SD	After music Mean±SD	p-value
HR	66.33±9.51	67.2±8.44	0.037
SBP	115.20±9.55	115.07±8.55	0.848
DBP	74.4±4.91	74.00±.89	0.649
Rxn time before correction	22.73±3.64	22.57±4.09	0.305
Error in stroop test	0.66±.49	0.63±0.66	0.009
Rxn time after correction of error	24.117±4.61	23.29±4.45	0.000

HR-Heart rate, SBP-Systolic blood pressure, DBP-Diastolic blood pressure, Rxn time-reaction time

DISCUSSION

The study was conducted on healthy male medical and paramedical students aged 25.27±2.0 yrs with the aim to find out change in heart rate, blood pressure and reaction time in Stroop test before and after exposure to preferred music with lyrics. Only those students who had habit of listening to music before or during any concentration activities like during studies, problem solving etc. were chosen. This is to reduce the bias because if the students who were disturbed by music during attention had been selected it would have increased confounding factors. Some studies suggest music cause increase in heart rate[2] while other studies show, the change in vitals is determined by the music type the person listens.[3] Since the change in vital parameters with the fondness of music is still not clear, it is plausible to measure the change in blood pressure and heart rate after music exposure of their own choice. Studies suggest a large number of students prefer listening to music while studying.[4] In many studies background music was played while the subject is performing the task but, in our study,, selective attention test was performed after music exposure. The reason was, in our experiment the music with lyrics was used and studies have shown that the music with lyrics has negative impact on task performance, so we wanted to reduce this effect by administering the test after music exposure.[8] However, some studies even claim there is no difference of either soft or rock music in cognitive performance.[13] Since studies show preferred music increases task performance[9,10], we exposed our subjects with their preferred music. The reaction time was taken with Stroop card. We chose the Stroop card as it measures the selective attention. [12] There are many studies which suggest reaction time in Stroop test is affected by age, gender and education [14]. So, to reduce the confounding factors we selected male, medical and paramedical students having similar age and level of education. Statistical analysis was done with SPSS. Our result showed increase in HR after listening to music but there was no change in blood pressure before and after music. (Table: 2). It is different from the study which showed decrease in heart rate and blood pressure with music[2]. But it is comparable to the studies which showed the type of music determines the increase in decrease in heart rate. According to other study heart rate is higher in response to exciting music compared with tranquilizing music.[3] In our study the students might have listened to exciting music which needs further study. The non-significant result in blood pressure might be because of small sample size. When errors were compared between two groups, errors were significantly less in post exposure condition. There was no change in reaction time before error correction but after addition of corrected error the reaction time was significantly less (Table:2). The decreased reaction time and less error in post music exposure condition suggest improved selective attention after listening to music. This finding is similar to the studies which tell task performance is better in popular background music or preferred music but our study was not done on background music rather it was done immediately after hearing the music. It suggests that after effect of music also increases selective attention (Table: 2).However,during the procedure, the same congruent card was read by the subjects both before and after music with half an hour interval between both. So, errors might have been less due to learning effect. Changing whole set of cards after music could have given even good results. It needs further study. In brief, our study shows that if the preferred music is given to subjects before test who have habit of listening to music, errors made are less in selective attention test. Though studies suggest negative impact of background music with lyrics in task performance[8], our study shows if selective attention test is administered after listening to the music, performance is better.

CONCLUSION

Preferred music with lyrics increases the heart rate but no change in either systolic or diastolic blood pressure was seen. Though the reaction time before error correction in stroop card was not significant, errors were significantly less as well as reaction time after error addition was also less. It suggests preferred music can increase heart rate and also improves the selective attention.

LIMITATION OF THE STUDY

Due to the lack of volunteers and resources the study was done on small sample size. Large sample size would have been better.

RECOMMENDATION

If the type of music which the subject prefers to hear is known, it will also give clue about the change in vitals with different types of music.

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CONFLICT OF INTEREST
None

FINANCIAL DISCLOSURE
None

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