

RESEARCH ARTICLE

MUSIC - THE UPCOMING SYMPHONIES ANTIDOTE TO STRESS

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ABSTRACT

Introduction: Music therapy has been claimed to be a useful aid in physical discomfort especially in the younger generation by improving physiological parameters and improving mental health.

Materials and Methods: The stress levels and the physiological effects of music on 88 healthy students of both genders in our medical college were assessed. Information related to demographics and their usage of music was collected along with their responses on the Perceived Stress Scale (PSS) Questionnaire. The physiological parameters were measured before, during and immediately after listening to music of their choice for 15 minutes. All collected data was analysed by SPSS 25 software.

Results and Discussion: All the parameters pertaining to the respiratory system and cardiovascular system improved after listening to music. The decrease in respiratory rate and diastolic blood pressure was significant ($p < 0.05$). VRT improved significantly ($p < 0.05$) when done while listening to music especially in students with moderate levels of stress.

Conclusion: Our study underlined the beneficial effects of music in reducing stress and improving performance in students and should be advocated as an effective and easy method of stress relief.

KEYWORDS: Music; Symphonies; Antidote; Stress.

INTRODUCTION

Life can be incredibly stressful for a student in the healthcare sector. Hence, it is important to have a healthy coping mechanism. A lot of students rely on music as their source of comfort. Music is effective for relaxation and stress management. Many researchers confirmed these personal experiences with music. People tend to listen to music while working, studying or driving in daily life. It is believed that music may help alleviate mental fatigue and improve work efficiency. Music has also shown to significantly improve moods and many studies

have been done in the field of medicine, specifically related to music therapy(1-3).

In addition to the already existing stresses of life, the COVID-19 pandemic brought rapid changes to travel, learning environments, work conditions, and social support, which caused stress for many university students. Research with young people has revealed music listening to be among their most effective strategies for coping with stress. Music listening was among the most effective stress coping strategies, and was as effective as exercise, sleep, and changing location (4).

Research has shown that music may influence central physiological variables like blood pressure, heart rate, respiration, EEG measurements, body temperature and galvanic skin response. It is also known to have influences on the immune and endocrine function.

Current researchers are delving into the vast potential music carries to alleviate physical pain, nausea, anxiety, stress, fatigue and depression but it has come to notice that there is limited data regarding certain aspects of the healing properties of music, for example, the amount of music that is needed for effects to be seen physically. If these kinds of queries can be solved, we can tap into the limitless potential that music holds in certain clinical situations(5).

Music therapy is currently being studied widely as an upcoming therapeutic regimen. Music medicine has evolved as a separate discipline, aspiring to incorporate the legitimate therapeutic use of music within a medical framework to prove beneficial to society(6).It is reported to have been used even in operation theatres to help calm the surgeon and the patient (7).Listening to music, specifically for the purposes of relaxation can be considered a means of stress reduction in daily life. However, many doubts regarding the efficacy of music as a stress mitigator still exists, with many claiming that music has only a placebo effect in stress reduction. Moreover the psychobiological mechanisms for a probable stress-reducing effect still remain unclear (8).

With these questions in mind, we conducted a study in our university to test the actual benefits of music. We conducted various tests and measured physiological parameters to analyze whether or not music has a significant, positive and demonstrable effect on stress relief.

METHODS AND MATERIALS

For the purpose of this cross sectional study, subjects within the age range of 17-25 years were selected randomly, regardless of gender, in order to participate in a short experiment on the application of music as a source of stress relief. The participants were limited to health care students from RAK Medical and Health Sciences University. Ethical clearance was obtained from the University Ethical Committee.

As an initial screening the participants were asked to fill out a questionnaire that collected the demographic details and also information of their daily habits in regard to

dealing with stress, the role of music in their lives and whether or not they had considered listening to music as a method of stress relief. Subjects with previous/current ear ailments or impairments and those who have had significant medical or surgical treatment for their ears were excluded.

Informed consent was taken from each individual before the study after explaining the aims and procedure.

The participants then filled out a form for calculating their Perceived Stress Scale (PSS). The PSS (9) is a 14 item validated psychological instrument questionnaire developed in 1983 and used effectively to score the perceived stress levels of any individual. It is a measure of the degree to which situations in one's life are appraised as stressful. Items were designed to assess how fickle, uncontrollable, and burdened, respondents find their lives. The scale also includes direct queries about existing levels of experienced stress. The PSS was designed for use in respondents with at least a junior high school education. Individual scores on the PSS can range from 0 to 40.

In our study the participants were categorized into groups as low, moderate and high stress levels according to their PSS scores for analysis. Scores from 0-13 constituted the low stress group;14-26 moderate stress and scores ranging from 27-40 were considered as high perceived stress group.

Next the physiological parameters were recorded in the subject prior to and subsequently after listening to music for ten minutes. The subjects were requested to listen to any music of their choice using headphones.

Physiological parameters including heart rate; respiratory rate and blood pressure were measured before and after participants were subjected to music. A pulse oximeter was used to record the heart rate while blood pressure was recorded using a manual sphygmomanometer. For documenting the respiratory rate, the examiner checked for the visible rise and fall of the chest while the heart rate was being recorded.

The Simple Visual reaction time (VRT) of each participant was documented both before and during listening to music. Simple visual reaction time was recorded in milli-seconds by the Audio Visual reaction time apparatus designed by Anand Agencies, Pune. Green light was used as the stimulus and the time taken to press

this button, after visualizing it using their dominant hand, was recorded as the visual reaction time (10, 11)

The study was conducted in a quiet room in the Physiology laboratory at RAK Medical and Health Sciences University.

Data analysis was done by entering the collected information into a Microsoft excel sheet and utilizing the SPSS 25 software for analyzing the info. Student's 't' test was used for comparison.

RESULTS

The study was conducted on 88 randomly selected students of RAKMHSU aged between 17-25.39 males and 49 females participated in this study.

Table 1 show all the variables which were measured before and after listening to music except visual reaction time (VRT) which was measured while listening to music. A statistically significant reduction was noticed in the respiratory rate, diastolic blood pressure and the VRT ($p < 0.05$)

TABLE 1- Variables measured in the participants, pre and post music

Variables	Pre Mean \pm SD	Post Mean \pm SD	P value
Pulse Rate	88.21 \pm 12.31	87.77 \pm 12.32	.671
Respiratory Rate	19.45 \pm 4.49	18.32 \pm 4.49	.019*
Systolic Blood Pressure	119.47 \pm 9.15	118.04 \pm 9.49	.084
Diastolic Blood Pressure	70.61 \pm 8.92	68.28 \pm 9.24	.011*
Visual Reaction Time	0.59 \pm 0.13	0.57 \pm 0.13	.021*

* $p < 0.05$

Table 2 reflects the reduction in the systolic and diastolic blood pressures as well as the VRT, all which have decreased significantly in the female as compared to the male after exposure to music.

TABLE 2- Comparison of variables between the genders

Variables	Gender	Pre Mean \pm SD	Post Mean \pm SD	P value
Pulse Rate	Males	85.82 \pm 13.29	84.38 \pm 11.95	.373
	Females	90.12 \pm 11.25	90.46 \pm 12.06	.802
Respiratory Rate	Males	20.66 \pm 4.84	19.38 \pm 5.45	.111
	Female	18.48 \pm 3.99	17.48 \pm 3.37	.089
Systolic Blood Pressure	Males	123.12 \pm 7.79	122.35 \pm 7.33	.608
	Females	116.57 \pm 9.17	114.61 \pm 8.64	.031*
Diastolic Blood Pressure	Males	72.92 \pm 9.02	71.82 \pm 8.80	.436
	Females	68.77 \pm 9.54	65.46 \pm 8.66	.006*
Visual Reaction Time	Males	0.55 \pm 0.12	0.53 \pm 0.14	.177
	Females	0.62 \pm 0.12	0.60 \pm 0.12	.044*

* $p < 0.05$

The study had also measured the stress levels of the students prior to the trial using the Perceived Stress Scale (PSS) questionnaire, based on which they were divided into 3 groups.

In the low stress group with a PSS value of 0 to 13 and the high stress group with PSS value of 27-40, all the variables were compared and no statistically significant difference was observed.

Table 3 which reflects the findings in the moderate stress group with a PSS value of 14 to 26, showed significant statistical differences between the pre and post music results, mainly in the respiratory rate, diastolic blood pressure and VRT. Most of the participants fell under the moderate stress category.

TABLE 3- Parameters measured in students with moderate stress

Variable	Pre Mean \pm SD	Post Mean \pm SD	P value
Pulse rate	87.96 \pm 12.43	86.39 \pm 12.07	.177
Respiratory Rate	19.39 \pm 4.24	17.55 \pm 4.20	.002*
Systolic Blood pressure	119.71 \pm 9.83	117.57 \pm 9.40	.054
Diastolic blood pressure	70.85 \pm 9.15	67.94 \pm 8.51	.007*
Visual reaction time	0.59 \pm 0.12	0.56 \pm 0.10	.041*

. * $p < 0.05$

DISCUSSION

Music has long been recognized to help people cope with stress, anxiety and depression. It has been seen that varying genres, volume and artists may have varying impact on our emotions, focus, and physiological parameters. Many studies have been able to provide us with useful information regarding the impact of music on the human body.

Guo et al. in 2015 conducted a study on 36 undergraduate students in Shanghai to investigate whether listening to relaxing music would help reduce mental fatigue and improve performance in completing a cognitive-motor task. Both the control group and the music group performed fatigue-inducing and fatigue-evaluating tasks, the former in a quiet condition, and the latter while listening to relaxing music. It was found that the group of students who listened to music during a fatigue-inducing task had reduced mental fatigue and deterioration of motor performance than the control group. The analysis of event related potential (ERP) signals further suggested that the music group suffered less impairment of attentional control of response selection and inhibition than the control group (12).

Another study conducted by John Nida in 2014 proven that listening to music was the most effective form of relieving stress in college students. The study compared this form of relieving stress to other forms like breathing exercises and sitting in silence and drew the conclusion of it being the most effective intervention to combat and relieve stress(13).

Yet another study measured the subjective anxiety, heart rate, blood pressure, cortisol and salivary IgA of undergraduate students during rest and after an oral presentation, which acted as a stressor. During the rest period, they were asked to prepare for the presentation either in the presence of classical music or in silence.

With music, the stress-induced increases were prevented independent of gender. These findings provide experimental support for claims that music is an effective anxiolytic treatment, which emphasizes the effect of music on different variables. (14)

Medical students are always under considerable stress most of the time and if stress is perceived negatively or becomes excessive can have an adverse effect on academic performance and health. Studies on the effect of music on reducing the perceived stress in medical students have proved to be statistically significant (15, 16).

Our study exhibited similar results as the above studies in proving that listening to music, even for a short time, is beneficial to medical students and can reduce stress induced physiological parameters.

Music can also affect the psychobiological stress response of patients as evidenced by the study conducted in 40 hypertensive elderly individuals who required ophthalmic surgery. They were separated into control and experimental groups. The experimental group were subjected to music throughout the entire procedure including the preoperative and postoperative periods. It was established that the parameters in the experimental group returned quickly to screening baseline values, whereas the control group experienced persistent elevations similar to the preoperative levels. There was also a significant reduction in perceived stress and increased coping abilities in the experimental group. (7) Other studies also concur that classical music seemed to significantly decrease blood pressure in hypertensive patients. (17-18).

Studies have also established that listening to music significantly decreased the anxiety levels associated with any hospital-based procedure and it was concluded that including music in endoscopy units can prove to be

beneficial to the well-being of patients (19), and could also be used as a noninvasive method to reduce anxiety and depression in cancer patients (20).

A study in 2013 was conducted to evaluate the Visual Reaction Time (VRT) and Auditory Reaction Time (ART) of participants initially without disturbance and later with two kinds of background music. It was found that the mean VRT for different colors and the mean ART for different frequencies, decreased while listening to background music. Thus a conclusion was drawn that music improves ART and VRT by facilitating the processing of inputs in the somatosensory cortex (21). Other studies too concluded that different genres of music affect the VRT (22) and the VRT was shortened more when the triggering stimulus was presented in the dominant visual field (23).

The findings of our study too reflected similar finding as all the studies above with statistically significant reduction in respiratory interval and diastolic blood pressure after being subjected to music for 15 minutes. The results showed statistically significant changes in VRT during listening to music as compared to before being subjected to music. Our study displayed fluctuating patterns in the student's heart rates with no significant decrease in the heart rate. This is in line with past research in which the effect of music on heart rate variability was assessed and although there was a decrease in the mean heart rate, it was not statistically significant (24).

Studies carried out by Thoma et al highlighted the fact that listening to music prior to a standardized stressor predominantly affected the recovery and response of the autonomic nervous system. The endocrine and psychological stress response to music was varying and to a lesser grade (25).

CONCLUSION

Considering all findings, this study reiterates that music can be used as a reliable coping mechanism for stress both for normal people and for patients. This facilitates the possibility of using music intervention on procedural anxiety and during recovery to reduce anxiety and perhaps influence response to pain.

Listening to music, according to our research, may alleviate the physiological effects of increased stress and anxiety. It demonstrates cardiovascular and pulmonary improvement, paving the way for more research into

music as a non-pharmacological, cost effective intervention for stress prevention and treatment, as well as lowering the risk of diseases caused by stress.

Limitation

The findings of this study were however limited to a sample of 88 students in a single university. Elements such as the genre of music and the volume that the student was subjected to was not taken into consideration.

Exposure of participants to music was also limited to 15 minutes, which may be less than the ideal time needed to show statistically significant changes in the physiological and mental status.

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