ORIGINAL ARTICLE

Effect of Music on Pulmonary Function Performance of Athletes

Jaspreet Kaur[1], Prithpal Singh Matreja[2], Manu Mishra[3]

ABSTRACT

Background: Listening to music has the potential to modify the pacing strategy by positively affecting performance during physical exercise. ***Objective:*** To study the effect of music on the pulmonary function performance as well as pulse and blood pressure of the athletes. ***Methods:*** This prospective study was conducted in TMIMT College of Physical Education under Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India, between December 2024 and May 2025. A total of 75 participants were enrolled in the study, who were pursuing their third-year graduation in physical education and did exercise regularly at least 3 days a week and whose FEV1/FVC ratio was above 75%. The participants were evaluated for their vital parameters and spirometry at two different points of time. All the participants enrolled in the study had their baseline assessment of pulse, blood pressure and spirometry findings and then they were then subjected to exercise. After exercising their pulse, blood pressure and spirometry were again evaluated. The next session was done on subsequent day and after the initial assessment of all the parameters, the participants were subjected to exercise with synchronized motivational music. After the end of the exercise, their assessment was done. ***Results:*** Total exercise duration in whole group with music was slightly greater than exercise duration without music ($p<0.05$). Significant higher values of maximal heart rate were observed following exercise schedule both with music and without music ($p<0.05$). There was no significant difference on blood pressure as well as pulmonary function tests, e.g., forced vital capacity, forced expiratory volume in one second, and FEV1/FVC ratio with and without music. ***Conclusion:*** To conclude, music increases duration of exercise; it also tends to influence the cardiopulmonary function in athletes.

Keywords: Music, exercise, pulmonary function, athletes

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INTRODUCTION

The exercise capacity of athletes is dependent on adaptation of circulatory, respiratory, and musculoskeletal systems to increased loads[1]. Aerobic endurance/capacity delivers oxygen to muscle and helps in utilizing it to generate energy during exercises[2,3]. Maximal oxygen consumption (VO_2 max) characterizes the effective integration of the central nervous, with the cardiopulmonary, and metabolic systems[2,4]. The cardiovascular conditioning prevents lactic acid accumulation thereby increasing perfusion capacity[1,5].

Scientific evidence suggest that exercise has a positive effect, but half of the people quit sports due to lack of motivation[2,6]. The performance of athletes is dependent on duration and intensity of target exercise[7]. Music either stimulates or inspires physical activity and thus represent a significant motivation standpoint to combine with physical exercise[8]. The influence of music on performance of exercise is due to three types of mechanism, namely the psychological aspect which deals with affect, mood and subjective

1. Department of Physiology, Teerthanker Mahaveer Medical College and Research Centre, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India.
2. Department of Pharmacology, Teerthanker Mahaveer Medical College and Research Centre, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India.
3. TMIMT College of Physical Education, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India.

Correspondence to: Dr. Prithpal Singh Matreja, Department of Pharmacology, Teerthanker Mahaveer Medical College and Research Centre, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India. Email: drpsmatreja@yahoo.co.in

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fatigue. Other possible mechanism includes the physiological effect which include VO_2, cardiac output/ blood flow, hormonal response, lactate clearance and the psychophysiological aspects namely arousal, dissociation and autonomic control[2,9]. Music tends to reduce inhibitions and encourage rhythmic movement as per available evidence[10].

Music produces an ergogenic effect which is evident by an improved exercise performance which could either be by delaying fatigue or increasing work capacity[10].

Athletes are only able to listen to music before the training for relief of stressor and competition related anxiety they are rarely able to have this session during competition[11]. This pre-event process improves power and strength as well as distracts the intentional focus for perceived exertion[9,11-13].

There are subtle differences based on the occupation as well as strength, endurance and training programs of athletes and other professions such as athletes, singers and wind instrumentalist[1]. Athletes as well as vocal athletes have a significant change in respiratory function dependent on the frequency of training as there is need to control lung volume and adjust pressure levels to improve their performance[1,7,14,15].

Though previous studies have revealed controversial results regarding the effects of listening to music during the warm-up of a short-term high-intensity exercise bout or during the actual exercise bout or performance test. Hence, we conducted this study to find the effect of music on the pulmonary function performance of the athletes.

METHODS

This prospective study was conducted in TMIMT College of Physical Education under Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India, between December 2024 and May 2025. The participants enrolled in the study were pursuing their third-year graduation in Physical Education. All participants were enrolled in the study after they gave written informed consent to participate in the study. All participants who exercised regularly for at least 3 days a week with one training session of 90 to 120 minutes were enrolled in the study. The participants with a FEV_1/FVC ratio more than 75% were included in the study. Any participant who was not willing to given written informed consent and was not willing to comply with the study protocol were excluded from the study. Participants with a history of lung disease or upper respiratory tract disease were excluded from the study. Any participant who was on drug therapy that could affect the respiratory or cardiovascular performance were also excluded from the study.

The body weights and height were measured using a wall-mounted stadiometer to the nearest 0.1 cm between the top of the head and the standing position. It was ensured that all participants were in loose fit clothes and were barefoot. The participants were well informed about the measurements before the tests/procedures. Pre-tests were performed to familiarize them. All the participants enrolled in the study had their baseline assessment of pulse, blood pressure and spirometry findings such as forced expiratory volume in one second (FEV_1), forced vital capacity (FVC), and FEV_1/FVC ratio. All the subjects were informed regarding the study and tested for exercise duration in the morning hours. On the day of assessment all participants were initially made to sit down and relax for 5 minutes. This was followed by a run on treadmill as per the Bruce Protocol for Treadmill[16] and the time was noted. Once the participant had completed the exercise their pulse, blood pressure and spirometry were again evaluated. The next session was done on subsequent day and after the initial assessment of all the parameters. The participants were subjected to exercise with synchronized motivational music. After the end of the exercise their assessment was done.

Data was presented in tabulated form as mean±SD (standard deviation). The results were analysed using nonparametric tests (Chi-square test) and parametric tests (two tailed student t-test). Statistical analysis was by using IBM SPSS version 27.0 for windows. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 74 participants (47 males and 27 females) were enrolled in the study. The mean age of the participants was 22.15±1.15 years. Table 1 shows the baseline characteristics of the participants including height, weight, heart rate, systolic blood pressure (SBP), diastolic blood pressure (DBP),

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forced expiratory volume in one second (FEV_1), forced vital capacity (FVC), and FEV_1/FVC ratio. Then, all the participants were subjected to exercise on treadmill as per the Bruce Protocol for Treadmill. All the parameters were observed and values were recorded. There was a significant increase in heart rate after exercise ($p<0.05$). There was also a slight rise in the FEV_1 levels post exercise, rest all the parameters were comparable (Table 2). All the participants were subjected to exercise on treadmill as following the same protocol along with synchronized motivational music. All the parameters were observed and values were recorded. There was a significant increase in heart rate after exercise on treadmill ($p<0.05$). There was also a slight rise in the FEV_1 levels post exercise, rest all the parameters were comparable. There was no significant difference in all the parameters after playing the motivational music. Though there was slight increase in FEV_1, FEV_1/FVC ratio and heart rate following playing music; however, the difference was not statistically significant ($p>0.05$) (Table 3). There was an increase in the exercise capacity under the influence of music as depicted by an increase in duration of exercise, which was statistically significant ($p<0.05$) (Table 4).

Table 1. Baseline characteristics of the participants (n=74)

Characteristics	Mean±SD
Height (in cm)	163.13±8.65
Weight (in kg)	58.71±7.86
Heart rate (bpm)	68.76±5.00
SBP (in mmHg)	122.99±8.54
DBP (in mmHg)	82.12±7.11
FEV_1 (in litres)	3.57±0.37
FVC (in litres)	4.58±0.24
FEV1/FVC ratio	0.78±0.06

Table 2: Characteristics of the participants after exercise without music (n=74)

Characteristics	Before Exercise Mean±SD	After Exercise Mean±SD
Heart rate (bpm)	68.76±5.00	79.95±6.77*
SBP (in mmHg)	122.99±8.54	123.20±7.58
DBP (in mmHg)	82.12±7.11	82.05±5.78
FEV_1 (in litres)	3.57±0.37	3.60±0.37
FVC (in litres)	4.58±0.24	4.58±0.24
FEV1/FVC ratio	0.78±0.06	0.78±0.06
*p<0.05 as compared to baseline		

Table 3: Characteristics of the participants after exercise with music (n=74)

Characteristics	Before Exercise Mean±SD	After Exercise Mean±SD
Heart rate (bpm)	68.76±5.00	80.32±6.67*
SBP (in mmHg)	122.99±8.54	122.28±8.08
DBP (in mmHg)	82.12±7.11	82.08±6.92
FEV_1 (in litres)	3.57±0.37	3.62±0.38
FVC (in litres)	4.58±0.24	4.58±0.24
FEV1/FVC ratio	0.78±0.06	0.79±0.07
*p<0.05 as compared to baseline		

Table 4: Effect of music on duration of exercise (n=74)

Characteristics	Without Music (Mean±SD)	With Music (Mean±SD)
Duration of exercise (in minutes)	17.92±1.84	25.25±2.05*
*p<0.05 as compared between the groups		

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DISCUSSION

The results of our study showed that the total exercise duration in whole group with music was slightly greater than exercise duration without music. Though there was no significant correlation between duration of exercise, music and change in heart rate. The maximal heart rate was significantly higher with music and without music as compared to baseline. But there was no significant effect of music on heart rate. There was no significant effect on the Blood Pressure with or without music. Differences were observed in pulmonary function tests, e.g., forced vital capacity, forced expiratory volume in one second, and FEV1/FVC ratio with and without music.

Literature searches suggest that exercise capacity can be influenced by many factors which include knowledge, music, performance level and in competitions[17]. Listening to music tends to produce an ergogenic effect by modifying the pacing strategy[17]. This leads to heightened arousal, altering the mood by inducing higher state of functioning which results in increased attention span and increased work output with delayed fatigue[18].

One study observed that exposure of music during warm-up had a positive influence on the performance of soccer players. This beneficial effect was consistent throughout the day. The results of this study are quite like our study as there was an increased duration of capacity to exercise in athletes on exposure to music, though we had only emphasized on the aspect of exercise in the morning[19].

Another study investigated role of music on cardiovascular endurance showed a positive influence with greater aerobic endurance. This effect was consistent effect to endure the task, and the males had a slightly higher endurance[18]. The results of our study are quite similar to this study as in our study also we found that listening to music increased the duration of exercise on treadmill across both sexes. Our study is different from this study as in our study we did not look for gender variation and we used the Bruce Protocol for Treadmill[16].

Another study reported that there was no effect on repeated Wintage performance in active males on listening to the preferred music. The results of this study contrast with our study where we demonstrated that music tends to influence the performance of athletes[20].

Another study done where participants were divided into four groups to study the influence of outside distractions with exercise being performed using hand-grip squeezing demonstrated that those participants who were listening to music were able to perform hand-grip for a longer duration of time. The results of this study are similar to our study as in our study also we found that listening to music increased the duration of exercise in athletes[21].

There are few limitations to our study, firstly is the small sample size of participants; a larger sample size could have given different results. This was mainly because of limited duration to conduct the study. Secondly, an intervention arm taking only those participants who were exposed to synchronized music could have given different results, but this again was mainly to the time constraint. Thirdly, gender variation on exposure to music was not observed in our study, which could possibly show a different picture.

CONCLUSION

To conclude, our study showed that the duration of exercise with music was higher than the duration of exercise without music. We can conclude that music increases duration of exercise in; it also tends to influence the cardiopulmonary function in athletes.

Conflict of Interest: None declared.

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Ethical Approval: The study was approved by the Institutional Review Board (IRB) of Teerthanker Mahaveer Medical College and Research Centre, Uttar Pradesh, India.

Authors' Contribution: All authors were equally involved in concept and design, data collection, compilation and analysis as well as manuscript writing, editing, revision and final submission.

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