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Effect of different musical tempo on post-exercise recovery in young adults

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Abstract
The role of music in increasing the exercise performance is well recognized. There is very little information about effect of music on time taken for post exercise recovery. We examined the effect of music and different musical tempo on post exercise recovery time, following Queen's College Step test. 60 volunteers (40 male, 20 female) subjected to isotonic exercise on three consecutive days. They were allowed to rest in silence on the first day, rest by hearing slow music on second day and rest with fast music on third day. Parameters such as Pulse rate, blood pressure, rating of perceived exertion (RPE) were measured at predetermined intervals. Repeated measures ANOVA test showed that with slow music, recovery time of systolic blood pressure (SBP) (4.21 ± 1.10), diastolic blood pressure (DBP) (2.08 ± 0.62) pulse rate recovery (PR) (8.41 ± 1.53) and recovery from exertion (RPE) (4.46 ± 1.50) were significantly faster when compared to both no music and fast music. The study concluded that music hastens post exercise recovery and slow music has greater relaxation effect than fast or no music.

Keywords: exercise, musical tempo, recovery time, perceived exertion

1. Introduction

Physical exercise, an essential part of maintaining a happy and healthy lifestyle, is associated with changes in cardio-respiratory parameters and increases psychological stress and exertion. Following exercise, these parameters return to the resting values once the O2 debt is recovered [1] but it is not without risk of injury. To minimize these risks and perform optimally the next time you exercise, you must allow your body to recover. Exercise recovery involves a number of post-exercise steps that are essential for any exercise regime. It does not take long or require much effort, but it is often neglected.

There are a lot of things around that can improve recovery, and that relates to our physical well-being with the mental side of things. These are like post-exercise rest, sleep, massage, nutrition, hydration, cryotherapy, etc. In addition, music may be the one of the way to improve the same.

Music has long been known to affect the human body, with certain sounds influencing health, character, mood and consciousness of the listener. Effects of music prior to exercise and sport have been studied extensively. Pre-task music has been shown to act as an effective stimulant that can optimize arousal level and physiological states [2] Effects of music during physical activity have also been investigated thoroughly.

Although the role of such music is typically motivational, it may also serve to promote relaxation and efficiency in long-duration, repetitive activities such as distance running. The effects of post-exercise music to aid recovery, competition or injury- are now beginning to receive attention. So the recent study emphasizes the value of music in lowering stress [3] and its role in enhancing the exercise performance [4] by incorporating music in exercise regimen.

2. Material and Methods

Preclinical medical students (M=40, F=20) of M.L.N. Medical College, Allahabad were selected as the subjects. The selected subjects were interested in music and were not physically challenged.

An informed consent was obtained. A questionnaire was filled in by the subjects before testing to confirm that each subject was a non-smoker, with no personal history of allergy or any cardio- respiratory disease, etc. The subjects were assessed during the same time of year and at the same time of day to avoid possible seasonal and diurnal variation. It was ensured that all subjects were normal at the time of testing and at least 6 weeks prior to it. They were also asked not to exercise strenuously for 6 hours before the test. Age was obtained from the date of birth. Body height in cms was taken in erect standing position without shoes with Seca-Vogel and Helke Hamburg balance Machine. Body weight was recorded in kgs on a weighing machine with subject in his normal clothing without shoes.

After 30 minutes of rest in laboratory basal readings were recorded. The subject was allowed to do isotonic exercise for 3 minutes i.e. Queen's College Step test for 3 consecutive days. Then subjects were allowed to rest in silence on the first day, rest by hearing slow music on second day and rest by hearing fast music on third day. After each exercise session the following parameters were recorded every 1 minutes until these returned to resting values. The mobile with headphones was used for hearing music (Indian traditional classical music and western style) of their own choice. The following parameters were taken in to consideration-

- Pulse rate (beats/min): Radial pulse with three fingers
- Systolic blood pressure (mmHg)
- Diastolic blood pressure (mmHg)
- Rate of Percieved Exertion (RPE)

BP was measured with sphygmomanometer and stethoscope in standing position to eliminate the effect of posture both before and after exercise.

3. Rating of Perceived Exertion [5] (RPE scale)

This feeling should reflect their total amount of exertion and fatigue, combining all sensations and feelings of physical stress, effort, and fatigue and not only with any one factor such as leg pain, shortness of breath, or exercise intensity. We had advised them to concentrate on their total, inner feeling of exertion and try not to underestimate or overestimate their feeling of exertion; be as accurate as they could.

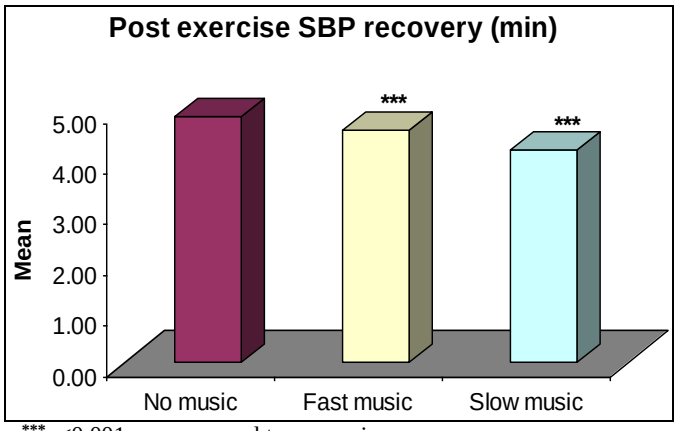
The RPE scale is a valuable and reliable indicator in monitoring an individual's exercise tolerance.

Original scale	Revised scale
6	0 nothing at all
7 very, very light	0.5 very, very weak
8	1 very weak
9 very light	2 weak
10	3 moderate
11 fairly light	4 somewhat strong
12	5 strong
13 somewhat hard	6
14	7 very strong
15 hard	8
16	9
17 very hard	10 very, very strong
18 maximal	
19 very, very hard	
20	

The data was analysed statistically using ANOVA test.

4. Observation and Results

A total of 60 sufficient students were recruited. The age of students ranged from 18-26 yrs with mean (± SD) 20.77 ± 2.19 yrs and median 20 yrs. Among students, 40 (66.7%) were males and 20 (33.3%) were females. Further, the weight, height and BMI of students ranged from 42-87 kg, 144-185 cm and 16.41-29.41 kg/m^2 respectively with mean (± SD) 59.32 ± 8.42 kg, 164.74 ± 8.83 cm and 21.90 ± 2.98 kg/m^2 respectively(Table-1). In all post exercise recovery parameters SBP,DBP,PR,&RPE the mean post exercise recovery were significantly faster (p<0.001) in slow music condition and slowest in no music condition (Table-2).

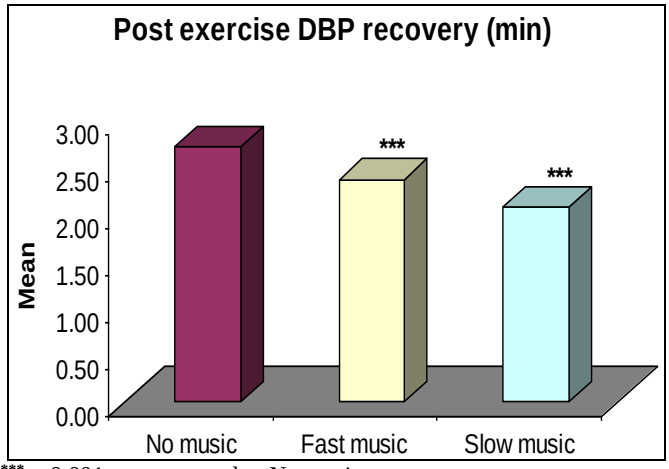


***p<0.001- as compared to no music

Fig 1

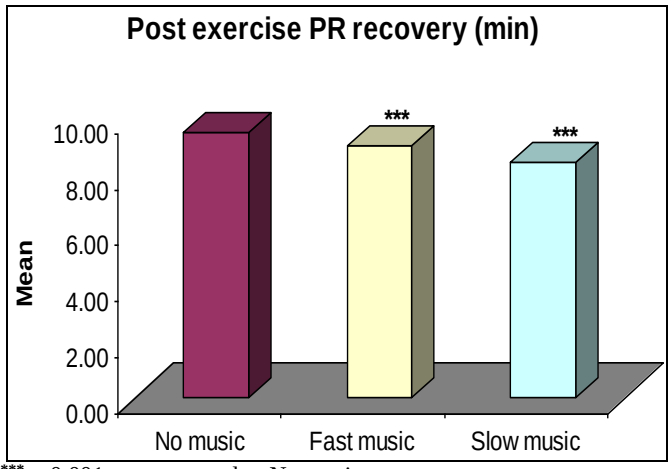
Table 1: Demographic characteristics of medical students

Demographic characteristics	Mean± SD (n=60)
Age	20.77 ± 2.19
Sex	M=40,F=20
Height	164.74 ± 8.83
Weight	59.32 ± 8.42
BMI	21.90 ± 2.98



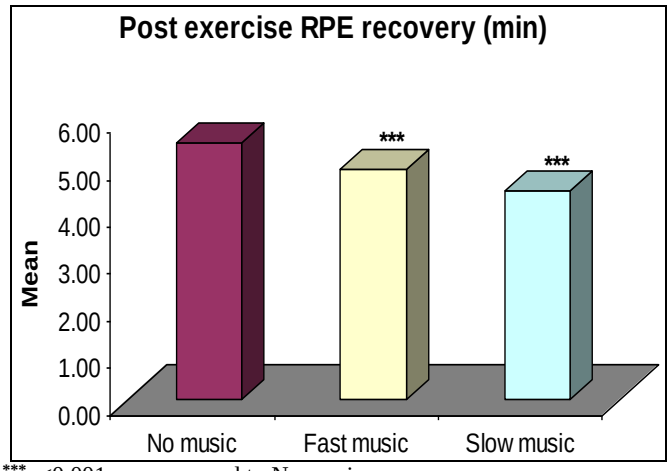
***p<0.001- as compared to No music

Fig 2



***p<0.001- as compared to No music

Fig 3



***p<0.001- as compared to No music

Fig 4

Table 2: Post exercise recovery (min) (Mean ± SD, n=60) cardiovascular parameters of different groups

Parameters	No music	Fast music	Slow music	F value	p value
SBP	4.87 ± 1.09	4.58 ± 1.15	4.21 ± 1.10	45.48	<0.001
DBP	2.71 ± 0.60	2.37 ± 0.53	2.08 ± 0.62	100.96	<0.001
PR	9.50 ± 1.55	9.05 ± 1.64	8.41 ± 1.53	74.86	<0.001
RPE	5.46 ± 1.71	4.89 ± 1.46	4.46 ± 1.50	74.00	<0.001

5. Discussion

The present study was planned to investigate whether the tempo of music influences post-exercise recovery time of blood pressure and pulse rate and Rate of perceived exertion. The main finding of our study was that blood pressure, pulse rate and RPE recovered to baseline faster when post-exercise relaxation was accompanied by music. Also, slow musical tempo caused earlier recovery of post-exercise blood pressure, pulse rate and RPE as compared to fast musical tempo. Present study is consistent with the studies, which proposed that music has the potential to reduce pulse rate and blood pressure [6, 7]. However, a latest research found that music was similar to silence in affecting heart rate recovery, salivary cortisol and pulse rate [8].

Music may influence one's responses to exercise in different ways. Music reduces sympathetic nervous control and therefore heart and respiration rates, metabolism, oxygen consumption, and muscle tension [9]. It diminishes mental and muscular tension thereby lowering sympathetic stimulation.[10] Music causes distraction that lessens physiological awareness and decreases perceived exertion [11]. Additionally, plasma catecholamine is also lowered when relaxation is accompanied by music [12, 13]. Probably these factors together caused faster recovery of blood pressure, pulse rate and RPE to baseline, when relaxation was accompanied by music in our study.

Slow music reduces the arousal and induces a state of relaxation, especially during a pause or slower rhythm [14] Listening to slow rhythm music decreases, while listening to fast rhythm music increases the plasma norepinephrine level. These effects of slow relaxing music may be attributed to the diminished muscular tension [15] reduction in cardiac pressure [16] decline in plasma norepinephrine, reduction in factors associated with pain and discomfort and/or the nervous effects of slower musical tempo which are not yet precisely understood. Whereas, the effects of fast musical tempo might be related to the increase in plasma cortisol levels [17] increase in plasma norepinephrine [18] and the nervous effects of faster musical tempo. Besides, co-ordinated minute movements of different limbs with musical tempo and rhythm might have affected these results.

6. Conclusion

The present study supports the view that physiological parameters recover faster after a bout of physical exercise when a person is allowed to relax with music. Further, slow relaxing musical tempo causes earlier recovery of cardiovascular parameters and RPE following exercise than fast musical tempo. These findings can have important implications in exercise and sports physiology and cardiopulmonary physiotherapy.

7. Limitations

Present study is limited to a small bout of exercise and is conducted on healthy volunteers. Further studies have to be conducted with larger sample size; on patients during the hospital stay; prior, during and following surgical procedures.

8. Acknowledgment

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