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Effect of Fast Tempo Vocal and Instrumental Music on Cardiovascular Parameters, Perceived Exertion and Stress Rate During High Intensity Interval Training in Asymptomatic Subjects: A Randomized Clinical Trial

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Abstract

Background and Purpose: ACSM defines physical activity as bodily movement that is produced by contraction of skeletal muscle. Music is said to be a sensory modality that can have effect on exercise. purpose of study was to study outcome of music with faster tempo and instrumental type, on cardiovascular, RPE, mood, stress and enjoyment thus improving observance to HIIT in asymptomatic subjects.

Methods: By random sampling method 40 subjects, male and female (20-30 years) with minimum to moderate amount of physical activity were selected and a two week trial with treadmill was done. Participants were be divided into 2 groups for HIIT: group A with fast vocal music and group B with instrumental music. Mood and stress was assessed pre and post using Abbreviated Profile Of Mood State (POMS) and Perceived Stress Scale (PSS) respectively, RPE was taken over time using Borg scale respectively, enjoyment was assessed post HIIT using Physical Activity Enjoyment Scale (PACES).

Results: Statistical significance was found in heart rate in vocal group, mood and enjoyment in both groups with a p value of < 0.005

Conclusion: present study of 2 weeks concluded that vocal and instrumental music had significant effect on heart rate, stress, enjoyment, mood during high intensity interval training

Key Word: *Enjoyment, High intensity interval training, Mood, Music, Rate of perceived exertion, Stress*

Introduction

American College of Sports Medicine (ACSM) defines physical activity as bodily movement that is produced by contraction of skeletal muscle and substantially increasing energy expenditure.[1]According to new ACSM guidelines adults aged between 18 to 65 years should continue to inculcate at least a minimum of 30 minutes of moderate intensity physical activity 5 days per week or engage in vigorous physical activity thrice a week.[2]

One among five in world is physically inactive.[3] According to WHO guidelines, Global Health Observatory states that globally in 2010, 23% of 18+ adults were insufficiently active men (20%) and women (27%) that is y did less than 60 minutes of moderate to vigorous intensity of physical activity on daily basis. Countless studies have been done to find cause of lack of performing physical activity, and most commonly cited reason was found to be "lack of time".[4,5]

High intensity interval training (HIIT) helps insufficiently active individuals overcome a major barrier of maintaining a physically active lifestyle, with that of a perceived lack of time. An added bonus is that from a time: benefit perspective, HIIT may prove to be a good example where less can be more. [6] intense work periods may range from 5 seconds to 8 minutes long, and are performed at 80% to 95% of a person's

estimated maximal heart rate, that is maximum number of times heart beats in a minute without overexerting. recovery periods last equal as long as work periods and are performed at 40% to 50% of a person's estimated maximal heart rate. Many research also conclude that exercise relatively increases positive affect and decreases feelings of fatigue and can aid in successful translation of exercise intentions into behaviour and improve adherence to exercise [7] and exercise induced feelings of fatigue and negative affect can act as a deterrent to continued participation. External stimuli may serve as mediating agent in diverting attention away from internal and painful stimuli. [8]

Music is one sensory modality that can have an effect on exercise. According to evidence, music captures attention, triggers a range of emotions, has positive effect on mood, evokes memories, increases work output, heightens arousal, reduces inhibitions and encourages rhythmic movement [9,10] which have considerable application in exercise domain. Music has an ergogenic effect and is evident when music improves exercise performance by eir delaying fatigue or increasing work output.

Psychological effects of music on exercise include way in which music influences mood, emotion, cognition and behaviour. re is a subcategory of psychological effects, referred to as psychophysical effects, which concerns with subjective perception of physical effort and fatigue. In music and exercise literature, sole psychophysical measure employed is Borg's Ratings of Perceived Exertion (RPE) scale; so psychophysical effects are synonymous with perceived exertion. [11]

A varied number of psychorapeutic interventions such as meditation and relaxation for alleviating such conditions. Many health professionals believed that exercise prevented onset of emotional problems and served as an effective treatment modality.[12] To our knowledge effects of music and ir influences on subsequent values of cardiovascular parameters, and perceived state of exertion, stress or mood have not been evaluated using a high intensity exercise protocol.[13,14] present study concentrated on effect of music with faster tempo on cardiovascular, RPE, mood, stress and enjoyment thus improving adherence to HIIT in sedentary subjects.

Materials & Methodology

MATERIALS:

- Consent (informed) form
- Data collection sheet
- Questionnaires

EQUIPMENTS:

- Treadmill (AeroFit AF-208)
- Pulse Oxymeter (Dr Trust- USA)
- Headphones

Methodology

Ethical clearance was obtained from Institutional Ethical Committee of KAHER Institute of Physiorapy, 45 sedentary subjects were scrutinized based on inclusion and exclusion criteria prior to ir enrolment into study. demographic data was noted and written informed consent was obtained from all participants prior to commencement of study. Participants were from various constituent units of KAHER. Sedentary subjects within age group 20-30 years of both genders and willing to participate in study were included. Whereas, subjects with any existing cardiovascular, respiratory, neurological or musculoskeletal conditions (fractures, sprain/strain) along with any hearing impairment were excluded from study.

Outcome Measures:

- Heart rate
- Blood pressure
- Modified Borg Dyspnea scale (RPE)
- Perceived Stress scale (PSS)
- Physical Activity Enjoyment Scale (PACES)
- Profile Of Mood States (POMS)

Procedure: Participants were required to perform in 6 HIIT exercise trials: i.e; 3 session per week for two weeks

To control for order effects, trial order was counterbalanced, meaning re were 2 groups, group A performed with music and group B with instrumental music, Firstly, HRmax was calculated for each participant using age-estimated equation (220-age). From obtained HRmax value, target heart rates were determined: 85% HRmax and 20%HRmax. participants

were made to wear Pulse oxymeter.

Before start of exercise participants were required to fill profile of moods scale and enjoyment scale. n according to ACSM guidelines for high intensity interval training, participants started with 5 minutes warm up followed by 1 minute of high intensity (80% HRmax) 4 times with 3 minutes interval period between each exercise at low intensity (20% HRmax). During each trial measures of stress and RPE was taken. participants had to answer how hard physical activity was and how y felt about physical activity before, after and at half time of each phase of HIIT i.e. during warmup, high intensity bout 1, 2, 3, during rest period between bouts 1, 2, 3 and cool down, where participants simply pointed out to which number most closely reflected ir current state. Completion of 20 min trial was followed by a 3 min cool-down, performed at a self-selected intensity. To assess post-task enjoyment, PACES scale and post task mood using profile of moods scale was assessed. Participants were asked to rest for an additional 60 min after exercise. next HIIT took place 1 day after first session (alternate).

Statistical Analysis

Statistical analysis was done using version 23 of SPSS software. Paired sample t-test was used for analysis of mean values of heart rate, blood pressure, perceived stress rate, enjoyment and mood. Independent sample t test was used for analyzing values of bouts of perceived exertion rate using Borg 6-20 scale.

Results

45 sedentary subjects were included in study. According to Table.1 it was observed that changes from pretest to post test in heart rate were better based on lower mean value in vocal group in comparison to instrumental which is shown in Table.2, and no significant changes were observed in values of Blood pressure in both groups

Table.1: Comparison of pre test and post test means of HR, BP in Vocal group

VOCAL	PRE TEST	POST TEST	PAIRED DIFFERENCE	t-test	p-value
HEART RATE	84.85 ± 12.96	78.00 ± 6.18	6.85 ± 13.11	2.336	0.031*
SBP	116.7 ± 10.78	120.5 ± 4.34	-3.80 ± 12.01	-1.414	0.173
DBP	74.7 ± 10.9	77.9 ± 4.56	-3.20 ± 10.18	-1.405	0.176
*Significant at 5% level					

Table.2: Comparison of pre test and post test means of HR,BP in Instrumental group

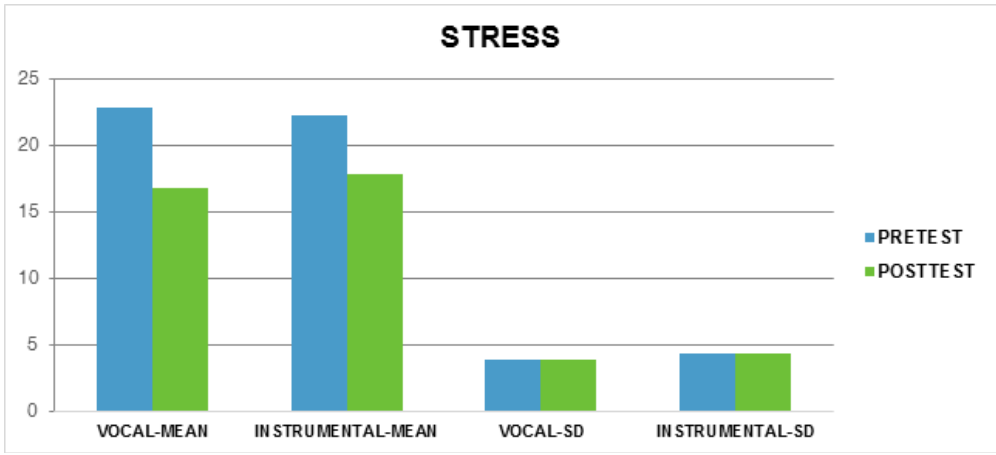
INSTRUMENTAL	PRE TEST	POST TEST	PAIRED DIFFERENCE	t-test	p-value
HEART RATE	81.36 ± 11.88	77.63 ± 7.22	3.73 ± 9.75	1.669	0.112
SBP	119.57 ± 9.53	118.42 ± 4.03	1.15 ± 7.81	0.646	0.526
DBP	76.52 ± 9.08	77.68 ± 6.50	-1.15 ± 6.64	-0.760	0.457

No significant differences were found in each bout of RPE in eir of groups which is shown in table.3

Table. 3: Comparison of means values of bout1, bout 2, bout3, and cool down between vocal and instrumental group

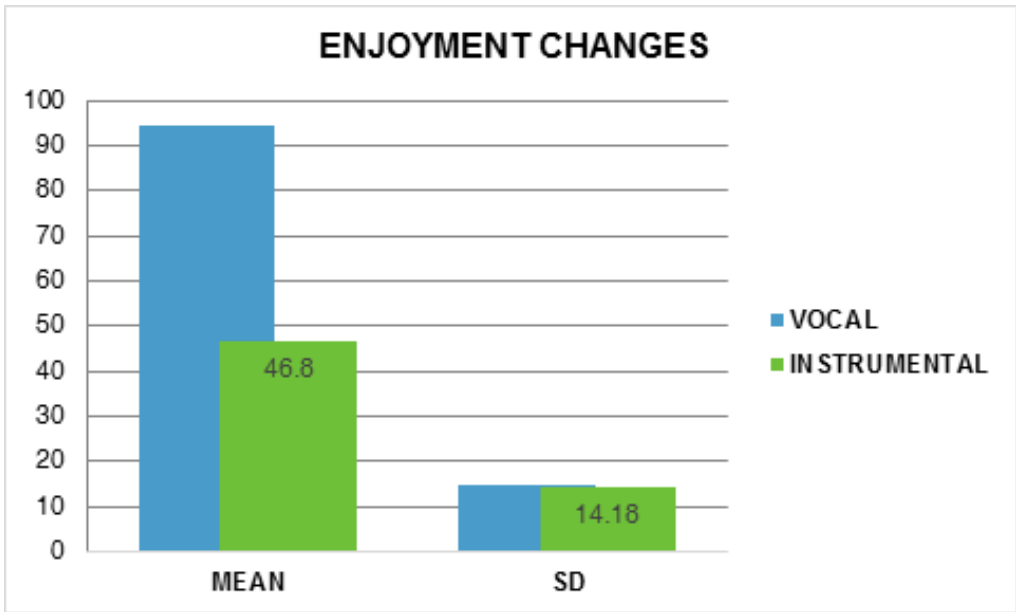
Particular	VOCAL MEAN ± SD	INSTRUMENTAL MEAN ± SD	t-test	p-value
BOUT1	11.0 ± 2.80	10.5 ± 2.64	0.581	0.565
BOUT2	10.55 ± 2.48	10.85 ± 2.51	0.380	0.706
BOUT3	11.35 ± 2.08	10.95 ± 2.03	0.615	0.542
COOLDOWN	11.05 ± 2.74	11.6 ± 1.93	0.734	0.468

Graph.1 indicates significant differences in between pre test and post test stress values in both goal as well as instrumental group



Graph.1: Comparison of pre and post stress values in vocal and instrumental groups

Graph.2 indicates significant changes in enjoyment levels were seen in both groups



Graph.2: Comparison of pre and post enjoyment levels in vocal and instrumental groups

Mood changes were significant in both goal and instrumental group as in Table 4 & 5

Table.4: Comparison of pre and post changes in mood for vocal group

VOCAL	PRE TEST	POST TEST	PAIRED DIFFERENCE	t-test	p-value
TENSION	6.4 ± 2.72	2.7 ± 1.94	3.7 ± 1.94	8.488	0.001*
DEPRESSION	2.85 ± 2.05	1.0 ± 0.97	1.85 ± 2.05	4.018	0.001*
ANGER	5.2 ± 3.33	1.2 ± 1.28	4.0 ± 2.8	6.367	0.001*
FATIGUE	5.85 ± 2.79	1.10 ± 0.85	4.75 ± 2.63	8.067	0.001*
CONFUSION	4.1 ± 2.91	0.9 ± 1.07	3.20 ± 2.87	4.975	0.001*
VIGOUR	12.85 ± 6.01	18.55 ± 2.39	-5.70 ± 1.0	-5.669	0.001*

Table.5: Comparison of pre and post changes in mood for instrumental group

Instrumental	Pre Test	Post Test	Paired Difference	t-test	p-value
TENSION	8.5 ± 3.44	3.7 ± 3.34	4.8 ± 2.6	8.232	0.001*
DEPRESSION	7.35 ± 4.80	4.10 ± 2.55	3.25 ± 2.93	4.951	0.001*
ANGER	8.0 ± 4.64	4.95 ± 3.59	3.05 ± 3.20	4.258	0.001*
FATIGUE	7.8 ± 3.25	4.15 ± 3.13	3.65 ± 2.77	5.877	0.001*
CONFUSION	5.95 ± 3.79	3.1 ± 2.33	2.85 ± 3.43	3.707	0.001*
VIGOUR	11.75 ± 3.72	14.9 ± 3.95	-3.15 ± 2.45	-5.737	0.001*

Discussion

Primary objective of study was to analyse effect of fast tempo vocal and instrumental track on cardiopulmonary parameters, perceived exertion and perceived stress rate during high intensity interval training. While secondary objective was study effect on mood and enjoyment change during high intensity interval training in sedentary subjects, which is proven right through alternate hyposis of study.

Trial `conducted by L.Bernardi to evaluate potential changes in cardiopulmonary systems induced by music, specifically tempo, rhythm, pause, individual preference, habituation, and previous musical training. Music induced an arousal effect, predominantly related to tempo. Slow or meditative music could induce a relaxing effect; relaxation is evident during a pause. Music, in trained subjects, first indulge attention during faster rhythms, and induce relaxation while on slower rhythms. [13]

Study done by Martin J. Barwood, on Motivational Music and Video Intervention Improvement using High-Intensity Exercise Performance, in this study each participant completed three 30-minute exercise bouts on a motorised treadmill under three counterbalanced conditions on separate days: control, motivational music plus video intervention, non-motivational intervention. study proved that music conditioned High intensity exercise showed lower RPE as compared to control and non-motivational intervention high intensity exercise. [15]

re are contradictory results, that music might or might not decrease RPE during high intensity exercise. present study support finding that music reduces rate of perceived exertion during high intensity exercise. present study on effect of music on HIIT protocol that included alternate high intensity bouts, interspersed with moderate intensity, study shows reduction in RPE during high intensity bouts, thus proving participants having have low fatigue less, thus making exercise effort more pleasurable and thus improving exercise adherence

Music listening is said to benefit health via stress-reducing effects. A study conducted by Roberto La Marca, indicated that music listening impacted psychobiological stress system. Listening to music prior to standardized stressor significantly affected autonomic nervous system (in terms of a faster recovery), and lesser degree of endocrine and psychological stress response. [16]

Results of this study showed re was extremely significant difference in perceived enjoyment of with and without music conditioned HIIT. STORK et al studied a similar study to see effect preferred music on perceived enjoyment of sprint interval exercise and found similar result. It has been suggested that increase in enjoyment of exercise can increase in adherence to that exercise.[17] so it can be suggested that participants would adhere more to HIIT with music as y perceive it as been more enjoyable and would more adhere to exercise when music is added to it.

Listening to classical and self-selected relaxing music after exposure to a stressor result in significant reduction in anxiety, anger, and sympatic nervous system arousal, and increased relaxation compared to those who sit in silence or listen to heavy metal music. After exposure to a stressor, listening to self-select or classical music significantly reduces negative emotional states and physiological arousal.

A study done by Sterling K. MacNay, M.M.E., RMT-BC on Influence of Preferred Music on Perceived Exertion, Mood, and Time Estimation Scores of Patients Participating in a Cardiac Rehabilitation Exercise Program showed increase in positive mood with preferred music. In present study a single session, subjects demonstrated a statistically significant decrease in mean values of factors tension, depression, confusion and anger; an increase in vigour, and no differences in fatigue in both condition i.e. HIIT with music and HIIT without music. [18]

Present study shows that re was a significant difference in mood in both vocal as well as instrumental condition HIIT.

Conclusion

Present study of 2 weeks concluded that vocal and instrumental music have significant effect on heart rate, enjoyment, mood, stress and no significant effect on perceived exertion rate during high intensity interval training

Future Scope: Borg CR-10 scale could be used for future studies

Source of Funding: Nil

Conflict of Interest: Nil

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