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**THE EFFECT OF KINDS OF MUSIC ON IMPROVING SOME PHYSICAL AND  
PHYSIOLOGICAL INDICES IN ADULT FEMALE DURING PERFORMING REPEATED  
HIGH-INTENSITY ENDURANCE TRAINING (RHIET)**

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**ABSTRACT**

**Introduction:** Today, it has paid attention to using different kinds of music in sport and rehabilitation domain. But the results of studies about the effectiveness of kinds of music are different.

**Purpose:** This study aimed at investigating the effect of listening to four kinds of music (sedative, brain-wave stimulator, motivation, and mixed) during performing intense endurance physical activity on blood lactate concentration, blood glucose level, physical activity to exhaustion occurrence, heart rate, ventilation frequency, and the distance covered.

**Materials and Methods:** To do this, 10 adult female participated in this research voluntarily. Every subject, based on her own ability, performed the repeated high-intensity endurance training (RHIET) until the blood glucose level dropped to the reported index in the literature of study (3.78 mmol/l). The subjects performed this protocol in a crossed design manner for five days that is one day was for performing and the next 48 hours for recovery. Blood lactate concentration, physical activity to exhaustion occurrence, heart rate, ventilation frequency, and the distance covered were measured immediately after exercise but blood glucose level was measured after 60 minutes from beginning of exercise.

**Results:** To analyze the data, descriptive and inference statistical methods were used. In order to determine the mean, standard deviation, variance, drawing graphs and tables and also examine research

hypotheses, Statistical method of analysis of variance with repeated measure (ANOVA R.M.) were used. The criteria of decision for all variables were  $\alpha=0.05$ . The results of this research showed that listening to kinds of music during performing intense endurance physical activity has not a significant effect on decreasing or removing blood lactate concentration while it showed a significant effect on decreasing heart rate and ventilation frequency, blood glucose level maintenance, increasing physical activity to exhaustion occurrence, and the distance covered ( $p<0.05$ ).

Discussion and Conclusion: In general, it can be concluded that music can function as physical and physiological enhancement. In particular, mixed music has the strongest effect on improving some physical and physiological indices during performing intense endurance physical activity.

**Key words: kinds of music, repeated high-intensity endurance training, physiological index, adult female**

## INTRODUCTION

Over the past few decades, many scientists use a variety of sports and rehabilitation seeks to improve physical performance (fitness). A new concept among coaches and athletes, the idea of using music to enhance the performance of the memory (1). Running or athletic performance is very complex and psycho-physiological and psychological factors -some of the nutritional status, central nervous system function, strength and skill, energy, and environmental conditions- that affect them (2). So, it is pointed to the applicable music in categorization of the music types, and some researchers have accomplished some researches about this type of music and the use of that in sport, treatment and rehabilitation that we can mention the research of Priest (2003) about the features and effects of the motivated music on sport, he has reported that if the rhyme features of music

follows the sportive skills pattern, it would be effective in the sportive operations and movement skills. Chou (2009) has reported in a research that the effects of music therapy on mood states, the understanding and participation of people with disabilities in doing the upper body exercises for rehabilitation listening to the music that follows the rhythm characteristics of the pattern causes the improvement in mood states, reduction of the conception of the working pressure, understanding the time, and increasing the participation in the sport programs. (3). Brain waves in the neurosciences meaning of certain words and rhythmic changes in the electrical activity of a group of neurons called. Each neuron has a certain voltage difference is that the content of ions inside and outside the floating cells, changes. When the number of neurons firing at the same time, the changes to

see if the wave, in which a group of neurons were excited all at the same time, will be excited again. At any moment, a number of brain waves are currently passing through the brain. Every time varies with different wavelength, which categories the alpha, delta, theta, beta and gamma are called, are classified. Electrical activity of the cerebral cortex wave alpha, beta, delta, theta, and gamma of the upper layers of the cortex, particularly subclasses of dendritic cells and possibly pyramidal neuron communication in this area is flooded and each has a specific frequency. Under the terms of the physical, physiological and psychological certain deep sleep, awake, alert, listening to the music and physical activity on the dominant wave form of brain electrical activity. There are two methods to convert brain waves into music. In the first method, the device uses electroencephalography (EEG), researchers recorded electrical activity from the scalp with the help of special software, electrical signals are converted into musical notes. The height of the waves, the waves to determine the length of the pitch and duration of the notes, but the music produced by this method is not very pleasant and pleasing to the ear. The second method uses fMRI via blood oxygen level in the brain momentarily measured. The ability to identify the parts of the brain without oxygen

provided to the researchers. The researchers combined data from fMRI and EEG brain to make new music from music experts is better than music made by Eagan producing plays. Like music, applications, music stimulates the brain waves by combining waves of music produced in the brain, brain waves are stimulated and the effect on the neuroendocrine system (LHPA/HPA and SAMaxis) makes the adjustment levels of cortisol, growth hormone, hormones, epinephrine and norepinephrine and DH sympathetic nervous system (SNS) and the number of physical, physiological and psychological, such as the accumulation and clearance of lactate production and consumption of energy and the willingness of individual tolerance and physical activity affect performance. Factors such as stress (exercise), dietary supplements diet, rest, listen to music and carbohydrate depletion of cortisol secretion and activity of the sympathetic nervous system and parasympathetic influence. Energy consumption is one of catabolic sympathetic and parasympathetic systems when energy is anabolic and maintenance. So neuroendocrine system (LHPA/HPA and SAMaxis) is touched, bartered energy can affect performance. It features music rhythm stimulate the brain wave patterns of physical skills, instead of following the model of brain activity or brain waves follows. So far in this sport,

treatment and rehabilitation of brain wave have not been studied as music, applications (4, 5, 6). Therefore it is essential that research in this field in order to compare the influence of music on the brain wave stimulation application evaluated with music. A minute, blood pressure, respiratory exchange ratio, etc. examined. Important factors affecting the characteristics provocative musical that follows: First, as an individual to react to rhythmic stimuli, hidden desire or rhythmic response to music, in fact, most of the individual lies (7) Second harmonic and melodic aspects of rhythm and tempo can run music change listener And emotional states influence means that the sound can cause changes in brain waves that are created physical activity (8). Research on factors such as the effect of music on physiological responses (heart rate, oxygen consumption measurement, and blood lactate and respiratory muscles), Psychological reactions (emotion and mood) are evaluated, often physical activity or exercise protocol on your bike ergometer and treadmill, a weightlifting activities, explosives and short-term, long-term running walking done. In most cases of practical music (the music in order to increase motivation and excitement of sports fields or sedatives are used in medical centers) have been used.

In this study the effects of four different types of music on physiological indices have examined and the implementation of physical activity or exercise protocol as severe repetitive endurance (RHIET) and because we Dah field of physical activity patterns are used in many sports.

And to answer the question of whether these four different types of music to listen to during intense endurance training is repeated, the amount of blood lactate, blood glucose, respiratory frequency, heart rate, time to exhaustion, physical activity and distance has a different effect? To allow for the use of music in sport, and treatment of certain types of it as the most recommended.

### **Research Methodology**

The present research is applied research. The study used a semi-experimental procedure was carried out as cross design. The method was cross-sectional study participants in per training session participated in a double category in a training group and at a subsequent meeting two categories were changed, therefore, there were seen no need for matching the groups and also the learning effect will be minimized. Researcher has compared the changes resulted from imposing the independent variables in the frame of research dependent variables in the post-stage of

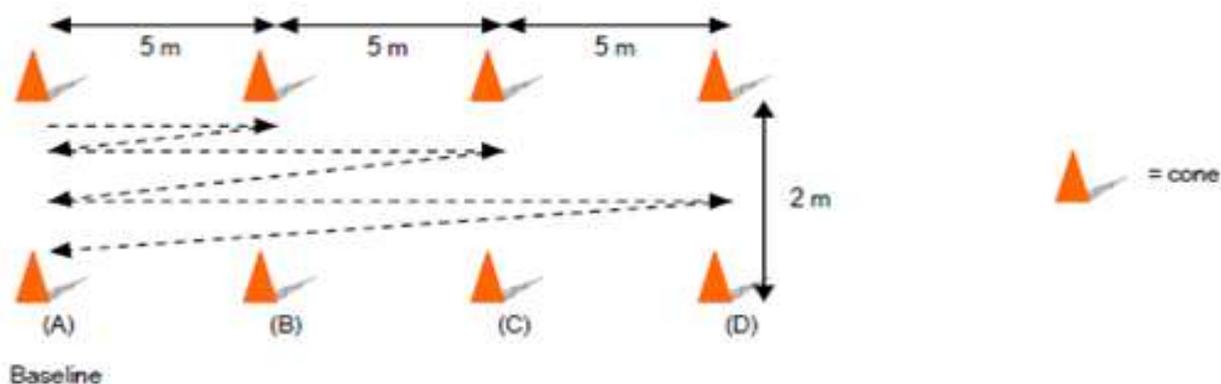
the research into five categories: control, Sedative music. Stimulative/motivational music. Brainwaves simulator music/ based on brainwaves frequency, Revised physical activity readiness questionnaire (rPar-Q), Mixed music. After preliminary studies, sampling, determination of control group to determine and provide research tools for data collection, a sample of 10 female adult with an average age of  $22 \pm 3$  years, who participated in the process was distributed. The reason of the use of high-school students was that in many professional sports training age occurs in this age range. Researchers pay attention to the practical aspect of research results. Volunteers before performing the study field and laboratory research, which include the purpose of this consent form, includes the target of research, either related to physical or non-physical sport, the benefits and disadvantages of test performance, the authors' duties, the way to respond to the volunteers' questions and the function of the research results all have been studied and signed.

During the field investigation in a pre-test, the participants have filled the forms and have hearing test, to test the rPar-Q readiness in order to physical, health and mental activities of firm in determination of project. In the stage of lab operation, firstly, the participants are

asked to perform the exercises. The participants are trained in how to perform exercise tests with explanations. It should be noted that subjects before exercise start the exercise test were released by about 15 minutes listening to some sedative music, brain waves that cause remodeling and regulation of brain waves, the daily pressures and stresses. At the end of practice, blood lactate measured by taking a drop of blood shed on the thumb and forefinger through the Lactometer Streep lactate. To know about the blood glucose levels for the implementation of the exercise protocol to each person's ability and glycogen depletion and muscle fatigue were recorded at the end of the workout by taking a drop of blood shed on the glucometer glucose strip. The RHIET test was used as a training protocol that is the Model of the eight cones were placed in two rows quaternary (9, 10). There is 2 meter distance between a two fourfold row and quaternary rows of five meters apart from each cone. Each sample test begins with a start command, the first five meters was taken within 30 seconds from the point A to B to sweep ran 60 meters total distance (two to five meters to 10 meters plus two plus two 15 m). Each sample begins with start command, the first 5 meters is run without a break, and to continue again a 10 meter distance from A cone to B cone without a relax should be run. The total

test time was 30seconds, according to whole performed distance of 60 meters (two 5 meter distance plus two 10 meters distance plus two 15 meters distance). Each sample should 6 times complete the test without breaking that the total test time was 180 seconds (3 minutes). If any participants ran faster in a back and forth manner during the performing test, he must wait until the end of time of 30 seconds, and then began the next course. The total test time was repeated several times according to one's ability (low blood sugar index). To ensure the

accuracy of exhaustive or intense exercise, blood glucose index (measuring blood glucose at the end of the training session) was used in one study,  $89/3$  and in another study of  $3/67 \pm 0/11$  mmol/l glucose was noted after intense exercise or exhaustive. Of course, if necessary (not sure of blood glucose) to complete a training protocol sprinting 100 meters(About10) at the end of practice time at 15 seconds and 45 seconds of rest time between activities were included (11, 12, 13, 14).



**Figure 1: High-intensity endurance training (RHIET) diagram**

To analyze the data, descriptive and inferential statistical methods were used. Descriptive statistics for the mean, standard deviation, distribution, draw graphs and tables, and to test the hypothesis of analysis of variance with repeated measurements was. Since each of the five groups according to the type of music and a crossover study of four consecutive days

without the music did not need to synchronize groups but normality of data distribution was assessed by Kolmogorov-Smirnov. If the data are normally distributed parametric tests are used. Criteria for making decisions on all variables in the five hundredth alpha and test the hypotheses is thus Observed that if F is less than F table of post hoc LSD tests were used to

detect a mean difference of each. All operations were performed using the computer. Excel<sub>2010</sub> for graph drawing software to

calculate the mean and standard deviation and variance for repeated measures was used to SPSS<sub>16</sub>.

## Results

**Table 1: Descriptive statistics data variables in the study groups**

Physical activity and Mixed music	Physical activity and motivational music	Physical activity and brain wave music	Physical activity and Sedative music	Physical activity without music	Variable
5/82± 0/45	5/08±0/56	5/32± 0/37	5/06±0/54	5/21± 0/62	Blood lactate (mmol.l) (LA)
5/40±0/28	5/11±0/20	5/01±0/27	4/03±0/36	3/97± 0/19	Glucose (mmol.l) (Glu)
±320/71 8919/00	8652/00± 224/15	8600/80 ±388/61	7692/20 ±323/00	±229/12 7236/60	Distance (m) (D)
94/48±7/21	73/89± 4/12	90/40± 4/29	67/82 ±2/87	74/92± 4/83	Time physical activity (min) (T)
141/90±2/13	140/30±2/01	139/90 ±2/02	128/00±2/03	133/50±1/57	Heart rate (HR)
62/30±2/59	90/59±2/19	62/40± 1/84	49/00±2/76	50/20±2/57	Respiratory frequency (bpm) (fr)

**Table 2: Analysis of variance of the variables of the study**

P value	Fvalue	Mean square	df	sum of squares	inferential statistics Source of variance	variable
0/476	0/896	1/217	4	4/867	Between repetitions(experimental factors) error	Blood lactate
		1/357	36	48/862		
0/000	7/127	4/362	4	488/17	Between repetition(experimental factors) error	Blood glucose
		033/22	36	0/612		
0/002	5/179	5164704/920	4	20658819/680	Between repetitions(experimental factors) error	Distances covered
		997303/098	36	35902911/520		
0/017	466/3	773/725	4	3094/900	Between repetitions(experimental factors) error	Time to exhaustion
		202/223	36	8035/279		
0/000	13/117	340/420	4	1361/680	Between repetitions (experimental factors) error	Heart rate
		953/25	36	934/320		
0/000	11/919	439/030	4	1756/120	Between repetitions(experimental factors) Error	Respiratory frequency
		836/36	36	1326/080		

**Table 3: LSD post hoc test for paired comparison of the differences between the variables in the study**

Vt	Pvalue					Inferential statistics	
	HR	T	D	Glu	LA	Comparison between the groups	
0/000*	0/053*	0/012*	0/020*	0/001*	0/865	Physical activity and brain wave music	Physical activity without music
0/699	0/008*	0/066	0/276	0/881	0/766	Physical activity and sedative music	
0/009*	0/022*	0/053*	0/001*	0/000*	0/258	Physical activity and motivational music	
0/004*	0/015*	0/047*	0/007*	0/003*	0/414	Physical activity and Mixed music	
0/002*	0/001*	0/012*	0/004*	0/031*	0/456	Physical activity and sedative music	Physical activity and brain wave music
0/359	0/855	0/908	0/920	0/741	0/407	Physical activity and motivational music	
0/969	0/117	0/594	0/614	0/314	0/149	Physical activity and Mixed music	
0/000*	0/001*	0/033*	0/046*	0/050*	0/123	Physical activity and motivational music	Physical activity and sedative music
0/002*	0/000*	0/054*	0/054*	0/012*	0/144	Physical activity and Mixed music	
0/392	0/279	0/606	0/501	0/346	0/968	Physical activity and Mixed music	Physical activity and motivational music

\*Significant differences

### Significant

According to research presented at the music had a significant effect on blood lactate but given the mean resting lactate and lactate at rest and physical activity were significant differences between all groups were observed after strenuous exercise. Listening to music is a significant effect on blood sugar levels within 60min after sporting activities without music and the music was so calming lower glucose levels in the blood showed This may reflect the fact that the motivation music, a combination of

brain waves tend to be able to do more work to raise subjects and calling for blood glucose to provide energy to the group without music and calming music reduces the excitement and desire subjects, more. The mean heart rate and respiratory frequency-time physical activity was significantly higher than the rest. Heart rate and respiratory frequency bands in combination, musical, motivation, musical brain waves higher than without music, and the music was sedative.

## Conclusion

**Table 4: The effect of music on some physiological and functional parameters**

Physical activity and mixed music	Physical activity and motivational music	Physical activity and brain wave music	Activity with sedative music	Activity without music	Variable
-	-	-	-	-	Blood lactate (LA)
****	*****	***	**	*	Blood glucose(Glu)
*****	****	***	**	*	Distances covered(D)
*****	***	****	**	*	Time to exhaustion(T)
*****	****	***	*	**	Heart rate (HR)
****	***	*****	*	**	Respiratory frequency (f <sub>R</sub> )

-No significant impact

\* Priority

Concluded that the combination of music and exercise may be the result of physical work to replace the information that comes from the sense organs to the central nervous system, Increase efficiency and improve the excitement of activity. Researchers have found that muscle tension varies with different types of music. Therefore, a musical stimulus, increased muscle tension and calm music during exercise may reduce muscle activity. From the perspective of the physiological effects of music is perhaps the most stimulating and increased cortical excitability in motor areas of the brain such as the pre-primary motor cortex in the motor or

four Bradmn that, as (6). In this study, the implementation of the exercise protocol, subjects blood lactate levels at rest 2/83mmol/l higher amounts of five mmol/l rose. The energy-intensive activities toADPphosphorylation of glucose and glycogen stored primarily during the process of anaerobic glycolysis and lactic acid production can be achieved. (15). the fate of lactate oxidation during submaximal activity and the recovery period is approximately 75% of lactate clearance process are included. This process involves the conversion of lactate to glucose and glycogen, respectively submaximal

exercise mode and return to the original state occurs. Some results indicate that the flow rate with a flow rate of glucose oxidation and lactate oxidation in some cases equal or higher (16). In this study, lactate levels increased fivefold rest but no significant difference between any of the groups was observed in blood lactate. Little research has been done on the effect of music on the implementation of activities in the field of aerobic. This research has been limited, Atan T. (2013), in his study of the effects of music on lactate in assessing significant difference was reported (1).

However, significant differences between resting lactate and lactate after all each class there are activities, The music can have a considerable effect on lactate production, but given the history of the study of music can Reset to expedite the clearing exercise on lactate tolerance is effective in practice. Music within the framework of the neuroendocrine system (LHPA/HPA and SAM axis) makes adjusting the levels of cortisol, growth hormone, hormones, epinephrine and norepinephrine and sympathetic nervous system (SNS) activity modification have and in some cases, physical, physiological and psychological, such as the accumulation and clearance of lactate production and consumption of energy and the willingness of individual tolerance and physical activity affect

performance. Factors such as stress (exercise), diet and supplementation, rest, listen to music and carbohydrate depletion of cortisol secretion and activity of the sympathetic nervous system and parasympathetic influence. Energy consumption is a system of sympathetic catabolic and anabolic whiles the parasympathetic system and energy. Therefore, anything that neuroendocrine system (LHPA/HPA and SAMaxis) to influence it can have effects on energy balance and performance (4, 5, 6). And therefore calls for blood glucose to provide energy to the group without music and calming music that excitement and desire subjects lowers further. Proportional to the intensity of exercise, glucose production in the liver also increases linearly.

During light to moderate exercise, glucose output side, two to three times more intense sports activity between seven to ten times the resting value increases. Increased hepatic glucose output by the liver glycogen content depends on the degree of fasting, food intake before exercise, and exercise levels in different subjects (17). The hormones involved in energy metabolism, and by the hypothalamic-pituitary-controlled cortisol, catecholamine's, insulin and glucagon are. Energy metabolism of catecholamine done by the pancreas to control blood glucose is the main regulator (18). In

humans, increased plasma epinephrine and norepinephrine-induced hepatic glucose production by increasing the activity he is (17). The exercise can be an explanation given by the hypothalamic-pituitary axis to affect glucose metabolism and utilization of this research are absolutely "certain of blood glucose and muscle glycogen stores and liver are shown.

The results showed that the activity of the heartbeat immediately heard the heartbeat of the music. Average heart rate of all groups in the ensemble was more exciting than to the band, music, brain waves, without music, and the band had a calming lowest heart rate. The group combines music, motivation and significant brain waves have been found. The significant difference between resting heart rate and activity was seen. At the heart of your research paper that has been done in recent years, Showed that no significant differences between the three conditions of quiet music, fast and without music in assessing anaerobic power there in a heartbeat. Wallis Brainsreport a moderate increase in heart rate in response to different types of music to listen. However, the analysis suggests that some participant's increased heart rate and heart rate at the same time, some of the participants reduced (19). ZimnyGH and colleagues in the field of music and sport expressed soothing and stimulating effects of music on heart rate is unstable. In

some cases driving music has no effect on heart rate while other findings support this conclusion. Music stimulus increases the heart rate is reported that the music world has motivationally increased when the heart rate is compared with unfamiliar music. Thus, personal understanding of a piece of music may be a physiological response to moderate (20). Pomeranz Band colleagues examined changes in heart rate with repeated exposure to sedative music. It seems repetitive music sessions calming parasympathetic nervous system activation and deactivation of the sympathetic nervous system is (21). Borg during exercise diary, working conditions and real actions, the feelings and motivations can be understood on the individual and his performance with many of the physiological signs including heart rate, oxygen consumption, of the muscles and lactate hyper transfusion of the respiratory and so on, effect (22). Eliakim M Michel et stimulant effects of music on the average heart rate during Reset clocks, as a result, no difference in mean heart rate during rollback and with no music (23). The mean respiratory frequency band of the whole group had more brain waves and then the mixed musical, motivation musical, and the and without music, respiratory frequency was lowest. The group combines music, motivation and significant brain waves have been found. Therefore, the frequency of

breathing during rest and exercise, significant differences were observed. The comparison of all pairs of averages suggests that a significant amount of distance traveled in groups: motivation music, mixed musical, motivation and musical groups with no more brain wave music and the music was sedative. The group combines music, exciting and brain waves have been found. The results obtained for the period of strenuous exercise showed that the four types of brain wave music, sedative music, motivation music, and mixed musical and music without significant difference, Person with more time on their activity (3). The comparison of all pairs of averages suggests that a significant period of exercise in musical composition, mixed musical, motivational and musical groups with no more brain wave music and the music was sedative. The mean duration of strenuous exercise combined with music most of all groups was. And then to the brain wave music, mixed musical, motivation music, musical and finally calming music group had a minimum duration of exercise should be noted significant differences between the group: mixed music, motivation and brain waves have been found. Pomeranz B colleagues to investigate the modifications presented with repeated exposure to calming music. The results showed that with music calming tension, reduce the perception of time, reducing the

working pressure and an increased understanding of peace was more impressive. It seems repetitive music sessions calming parasympathetic nervous system activation and deactivation of the sympathetic nervous system is (21). Finally, it is noteworthy that previous research on the effects of applied music on factors such as physiological responses (heart rate, measurement of oxygen consumption, lactate, muscle, blood and breath), psychological (emotional and affective states) And while we have been working on the effects of music on the brain waves and a combination of blood lactate, glucose, Respiratory frequency, heart rate, time to exhaustion and distance to evaluate and this research can help athletes in doing more with less fatigue.

Mechanisms involved, possibly modulating the activity of HPA, adjusting the levels of cortisol, growth hormone, modulating the activity of the sympathetic nervous system and other psychological factors such as increased motivation and decrease perceived work stress and perceived time. The results of this study can be prolonged for more sports and for competition or training activity and the activity pattern similar exercise protocol used in this research is to use. Therefore, in some sports, but music cannot be used during competitions Athletes can exercise or even at rest before the

match between the two halves of the game from the comfort of their music and thereby their performance without the cost and improve the use of doping. It is suggested that coaches and players during training for competition or training exercise protocol similar pattern of activity and the activity of this research is aimed at increasing the duration of the activity, The sense of empowerment and possibly reduce the amount of lactate, the perception of fatigue, fatigue and perceived stress The findings could be due to any music that can be superior to any of the physiological and functional use. The researchers suggested that similar studies in other physical activity patterns in other sports runs or similar research on the effects of listening to music on their return to the initial state researchers can also study similar to hear other types of music, including athletes, or do a combination of other music.

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