

## Effect of lyrics in music on perceived exertion of physical activity

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### Abstract

The aim of this research is to examine the role of the music with lyrics, music without lyrics and physical activity under condition of no music on the perceived exertion of male and female students during physical activity (running on treadmill). For this purpose, 23 students (11 males, 12 females) with an age range of 24.13 yrs were selected randomly among the available students. The participants underwent physical activity under condition of music with lyrics in the first session, same music without lyrics in the second session and no music in the third session. The test duration was 5 minutes for all participants and their running intensity was in correspondence with 80% of their maximum heart rate. The recovery period between each session was 48 hrs. After each session, the participants specified their rated perceived exertion (RPE) by completing the Borg scale questionnaire. The results of the analysis of variance (ANOVA) with repeated measures revealed that music with lyrics had a significant effect on the participants' perceived exertion, but music without lyrics had no effect on their perceived exertion. With respect to the reduction of the perceived exertion rate during the use of music with lyrics, it can be concluded that the presence of lyrics in music reduces the participants' perceived exertion and causes the activity time to seem shorter. It can be deduced that the presence of lyrics in music has a significant effect on the improvement of psychological conditions of athletes and their perceived exertion.

**Keywords:** music with lyrics, music without lyrics, perceived exertion, physical activity

### Introduction

Music is one of the arts that humans have learned from nature and used it in everyday activities of their lives. (1) Music applications in physical activity has developed rapidly in the 1970s and 1980s. There was only a trickle of empirical research on the effect of music on physical

performance in the 1980s and 1990s, but this trickle has turned into a stream during the present decade.(2) Music is used to accompany all types of activities (e.g., driving, cooking, cleaning, writing, exercising) whether this is to distract, energize, or provide a rhythmic cue for the listener. (3)

In exercise and sport settings, the use of music has become extremely widespread. (4) At first, Music was used in group exercises but it extended from group to individual exercise when personal listening devices such as Nike's *Personal Sport Audio*<sup>TM</sup> and *iPod*<sup>TM</sup> reached the mass market.(2) Numerous studies in the exercise domain indicate that people routinely use music to regulate emotions and affect for activities that vary in their physical intensity demand.(5) In particular, music has been shown to enhance positive affect, which bears strong influence on an individual's intention to exercise and adhere to an exercise program.(6) During the same period, music was integrated into many professional sporting events and added considerably to the sporting spectacle.(2) Various studies have been undertaken to investigate the effect of music on athletic performance which mostly mention the positive effects of music on physical activities.(7)

There has been an explosion in music use by athletes during training and prior to competition, while countless millions of exercise participants have made music an essential part of their daily workout. The boom in the use of music by athletes and exercisers appeared to take researchers by surprise.(2) Listening to music is an activity that most athletes do before a competition which indicates the decreasing or increasing effects of music on motivation.(8) The combination of music and sport can increase psychological stimulations through increasing motivation. Music improves performance in strength and endurance activities.(9) The benefits of music use in the exercise domain have been attributed to a rhythm response or entrainment to music rhythm that has been associated with greater neuromuscular efficiency.(10)

The relationship between music and physiological and psychological changes is a topic of interest for many experts and scientists of sport sciences and psychology.(11) Intuitively, for a stimulus such as music to be used on a daily basis by so many people for such a variety of purposes it *must* have some benefits. However, of particular interest to behavioral scientists is the reliability and reproducibility of any purported effect, its magnitude, and the contingencies that surround it. For example, is music as effective during high intensity activity as it is during low intensity exercise? Can music provide as much benefit for elite athletes as it appears to have for recreational participants? This raises the additional question of whether the recent popularity of music use by athletes is a marketing-led phenomenon, rather than one that is grounded in genuine psychological and physical benefits.(2)

Music is a good source of motivation and energy for athletes and sometimes listening to good music has a magical effect. Listening to music can make people more relaxed and decrease their muscle tension rate.(12) Some studies have shown that participants who listened to music during physical activity, ran longer on the treadmill belt.(13) In his research, Flint investigated the effect of music on physical performance and observed that the participants who listened to music with fast beats, walked up the stairs faster.(14) The lyrical content of music is known to influence

people's behaviour (15). For example, Jacob, Guéguen, and Boulbry (2010) found that listening to prosocial song lyrics during the eating period in a restaurant (lunch and dinner) increased patrons' tipping behaviours, in terms of both the proportion of customers leaving a tip and the amount of money they gave per tip. (16) Greitemeyer (2009) showed that exposure to songs with prosocial lyrics fostered prosocial tendencies by increasing prosocial thoughts, affect, and behaviour in different situations (e.g., empathy towards others in need, donations to nonprofit organizations, etc.). (17) Although music with lyrics and without lyrics has a positive effect on participants' performance, the tracks with lyrics are more motivating for exercise than the same tracks without lyrics. (18) The studies have shown that music draws a person's attention from internal factors (like pain and fatigue) to external factors, i.e. music itself. (19) Listening to music with slow or fast rhythm during resting, exercise and recovery is effective on heart rate. (20) Music has a significant effect on heart rate and perceived exertion level during warm-up and activities with maximum intensity. (21)

In 1962, Borg basically stated the difference between the perceived power and fatigue (perceived exertion). He suggested that perceived power is related to short-term sports whereas perceived exertion is related to long-term sports. (22) Although perceived exertion is a mental tool, a person's rate of exertion may provide a just estimation of his actual heart rate during physical activity. (23) Some researchers tested the role of perceived psychological factors during sport and came to the conclusion that the participants have reported separate determinative factors in perceived reports. For example, in Hutchinson's research (2004) separate determinative factors of feeling exertion including physical, motivational and emotional feelings were investigated. These determinative factors are adopted from previous research of TaninBaom et al (1999) and Hutchinson and Tanbam's experimental research (2003) which confirm the various determinative factors in perceived exertion. (24)

Perceived exertion shows how a person feels the difficulty of a task he/she is doing. Everyone feels the exertion during tasks and activities. (23) Perceiving the exertion intensity guides our self-adjusting capacities and causes us to adjust and balance our output energy according to our feeling of exertion, this feeling is either perceived very intensely or is not challenging enough. Most of our perceptions of exertion are caused automatically so in the researchers' opinion, their presence and benefits are indisputable. (24) The Borg scale became much known very quickly and is presently used in almost all of rehabilitation centers of developed countries for determining the intensity of any type of exercise (25).

Finally, according to the research conducted on the effects of music on perceived exertion, considering the effect of the presence of lyrics in music in comparison with the absence of lyrics in music on the perceived exertion during physical activity, it seems that further research is required. The present study was done with this overall aim that the presence of lyrics in music, in comparison with the absence of lyrics, has more effect on the participants' perceived exertion. Furthermore, this research examines the difference between the effects of physical activity under the conditions of music with lyrics, same music without lyrics and no-music control on the participants' perceived exertion. The results of this research can be used to gain better results by athletes especially in long-term sport activities.

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## **Research method**

### **The first stage: Music Selection**

At first, 40 non-athletic students (20 males and 20 females) listened to 4 pieces of music with and without lyrics which had been selected based on their beats per minute and then completed the Brunel music rating inventory-2 questionnaire (a questionnaire for selecting music) for each piece of music. After gathering all the 160 questionnaires and analyzing the data, the piece of music which had interested the participants the most and had gained the highest score (emotionally and motivationally) was selected as the main piece of music for the field testing. The 4 pieces of music used in the stage of selecting the main music were 1. Baroon (by SiavashGhomeishi), 2. Jina (by ShadmehrAghili), 3. The Final Countdown (by Europe) and 4. Amazing (by Inna) which all (both with and without lyrics) had a tempo of 110 to 130 bpm.

In the stage of selecting the music and the participants listening to music, we divided the 4 pieces of music into two groups of music with lyrics and music without lyrics. We also divided the 40 students (20 males and 20 females) into two groups of 20 participants (10 males and 10 females), in a way that a group of 20 participants listened to a certain set of music (1.English music with lyrics, 2. English music without lyrics, 3.Persian music with lyrics and 4.Persian music without lyrics) and then the place of the music pieces, with and without lyrics in both English and Persian, were changed.

### **The second stage: Selecting the participants for field testing**

After selection of the main music by the participants, that piece of music was used both with and without lyrics. In this stage, 23 non –athletic students (11 males and 12 females) who had no role in selecting the music were selected randomly for the field testing. In the field testing, i.e. running on treadmill, the maximum heart rate of the participants was recorded with respect to their age and they were asked to run on treadmill at a power output corresponding to 80% of their maximum heart rate for 5 minutes (the duration of the main piece of music which was chosen earlier). All of the participants underwent field testing in 3 separate sessions under conditions of 1. Music with lyrics, 2. Same music without lyrics and 3. No music at all. It must be noted that the time of the test were the same for all the participants in the 3 sessions with a recovery period of 48 hrs in-between, in a way that the test was performed from 15:30 to 17:00 and 19:00 to 20:30 o'clock on even days of the week.

To prevent partiality or error in the tests, the participants of the males and females groups were divided into two groups, in a way that in the first session, six participants from the group of 12 female participants listened to music with lyrics and six participants listened to music without lyrics and in the second session, those performing the test under condition of music with lyrics in the first session started to run on treadmill while listening to music without lyrics and those performing the test with music without lyrics in the first session, underwent the test in the second session while listening to music with lyrics. All the participants performed the test under condition of no music in the third session. Likewise, the same method of mutual matching was executed in the group of the 11 male participants.

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## Test procedures and method

At first, the age of all the participants was recorded and considering their resting heart rate on the field testing day and with the use of the maximum heart rate formula  $\{Hr = 220 - \text{age} = ?\}$  and also the formula of  $\{Hr = \text{participants' maximum heart rate} - \text{resting heart rate} \times \text{the exercise intensity (80\%)}\}$ , the speed, intensity and slope rate of every participant's running on the treadmill was calculated.

It must be noted that the intensity of the running on the treadmill in all participants in all the 3 testing sessions was in correspondence to 80% of their power and that the slope of the treadmill was adjusted to 20 degrees in all the 3 sessions. After recording the speed and intensity of the test in each participant, all the participants started to perform the treadmill test.

At first, the participants started walking with the lowest speed on the treadmill for 30 seconds while putting both hands on the built-in handlebar sensors of the treadmill and after 30 seconds the slope of the treadmill and also the required speed for each participants was adjusted and after 1 minute the selected music was played. The participants listened to the music using headphones and continued running on treadmill until the end of the music. The heart rate displayed on the treadmill monitor showed whether the rotation speed and intensity of the treadmill running belt was suitable for that participant or not, in other words, whether the participant's heart rate during running has reached the expected rate or not. After the music was over, the participants used the Borg scale of perceived exertion to assess how they felt after the treadmill test on each session. This was repeated in all the 3 sessions. It also must be noted that all the participants did warm-up exercises for 20 to 30 minutes individually before the test.

## Results

Descriptive statistics was used to describe data and deductive statistics such Kolmogorov-Smirnov statistical test (to investigate the normality of the data), Leven's statistical test (to investigate the homogeneity of variances) and the analysis of variance (ANOVA) test with repeated measures were used to analyze statistical hypotheses. The results of the music selection stage led to the selection of the four (2 English, 2 Persian) following music pieces:

As it can be seen in the chart below, among all the 4 pieces, the "Final Countdown" by Europe has gained the highest score in the total scores of a piece of music with and without lyrics. Also both the highest maximum score and the highest minimum score among the 4 pieces of music belonged to Europe.

The results of the analysis of variance with repeated measure showed a significant difference in within-subject differences. However, no difference was observed between the two genders ( $p=0.7$ ). The Bonferroni (post hoc) test was used to determine the place of difference.

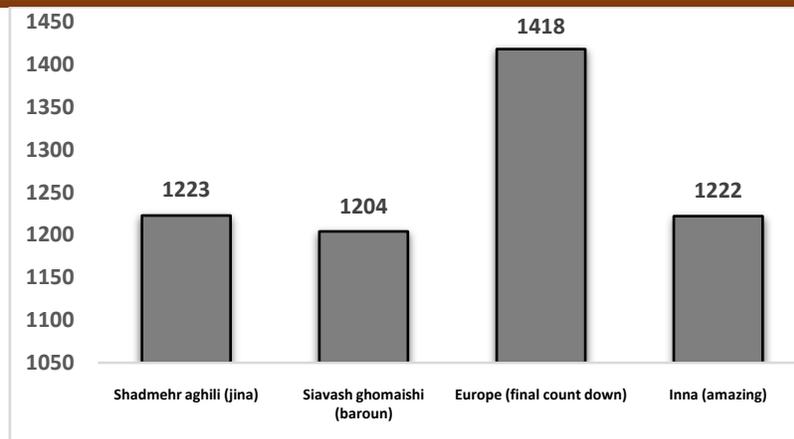


Fig2: Total scores of music with lyrics and music without lyrics

Table 1: pairwise comparison

Burg		Mean differences (i-j)	S.E	P
i	j			
No-lyrics	lyrics	0.69	0.36	0.2
	Without music	-0.87	0.39	0.11
lyrics	No-lyrics	-0.69	0.36	0.2
	Without music	-1.56	0.41	0.003*

\*Significance level was 0.05

The results of the post hoc test revealed that there is no difference in the rate of the perceived exertion between the groups of music with lyrics and music without lyrics ( $p=0.2$ ). However, there was a significant difference between the conditions of music with lyrics and no music ( $p=0.0003$ ). The findings showed that using music with lyrics in physical activities leads to better reduction of perceived exertion than the condition of no music presence.

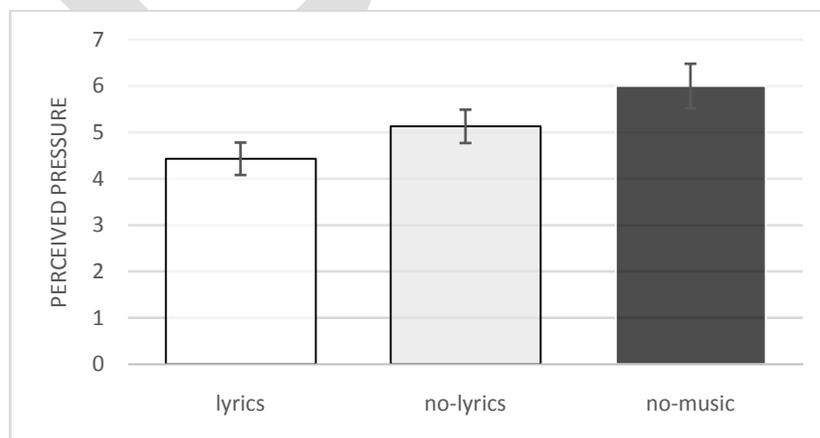


Fig 2: Perceived pressure in different exposure of music.

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## Discussion and conclusion

The results revealed that music with lyrics has a significant effect on the participants' perceived exertion in physical activity. Of course it must be stated that the rate of this influence had nothing to do with the participants' gender, in other words, the amount of the effect of music with lyrics was the same in both male and female participants. Therefore, when the participants ran on treadmill under condition of music with lyrics, their perceived exertion rate was reduced during running. All the participants claimed that the duration of running seemed shorter while listening to music with lyrics. These results were aligned with the results of the research by Asefi and Tabrizi (2011) who investigated the effect of music on the heart rate and perceived exertion rate of male physical education students, with the research of Barzgar, Suri et al (2012) on the effect of cardiorespiratory responses and effort perception index male athletes during increasing physical activity and with the research of Karageorghis and Priest (2008) which discussed the role of music in sports and exercise and the various ways in which music affects athletes.(21,12,5) However, the present study results were non-aligned with the research of Bont, et al (2012) who investigated the effect of listening to music on running performance and perceived exertion rate of university students.(26)

The results also revealed that music without lyrics has no significant effect on the participants' perceived exertion. This lack of effect was the same in both genders. The results showed that when the participants ran on treadmill under condition of music without lyrics, this type of music had no effect on the reduction or increase of their perceived exertion. These results are aligned with the findings of Bont, et al (2012) and with the findings of Jarraya, et al (2012).(26,27) Sanchez, et al (2014) also investigated the role of lyrics in relation to the effect of music on physical performance which has similar results with the results of of this research.(18)

The results also showed that there is a significance difference between the effect of music with lyrics on the participants' perceived exertion and physical activity under condition of no music. Music with lyrics had a greater effect on the participants' perceived exertion than physical activity under condition of no music at all. Of course it must be noted that this effect was not different in either genders. The results also revealed that there is no significance difference between the effect of music with lyrics and music without lyrics, i.e. the participants' perceived exertion while running under condition of music with lyrics was the same as their perceived exertion while listening to music without lyrics and the existence of lyrics or its non-existence has no positive effect on perceiving less exertion. This lack of effect was the same in both male and female genders. In the end, it must be stated that no significant difference was found between the effect of music without lyrics and physical activity under condition of no music, in a way that at time of running under condition of music without lyrics, the participants perceived that same amount of exertion as the time of running without any music at all. In other words, the existence of music without lyrics had no positive effect on reducing the perceived exertion of both male and female participants.

The results of this research are aligned with the findings of Savita D et al (2013) because they believed that there is a significance difference between the athletes' perceived exertion in a

physical activity with music (regardless of having lyrics or not) and their perceived exertion under condition of no music at all.(28) However, the results of this research are not aligned with the research of Sanchez, et al (2014) which revealed that physical activity under condition of music with lyrics, music without lyrics and no music at all has no difference on the athletes' perceived exertion.(18)

Generally, the results of this research revealed that music with lyrics has a positive and significant effect on the participants' perceived exertion because with the presence of lyrics, the perceived exertion of the participants was reduced and the participants assigned less score to the Borg questionnaire due to the use of music with lyrics, but the music without lyrics has no special effect on their perceived exertion and no increase or decrease was found on the participants' perceived exertion under condition of music without lyrics in comparison with the condition of no music. It must also be stated that the male and female participants' rate of perceived exertion at time of physical activity under condition of music with lyrics was less than the amount of their perceived exertion while performing the same activity under condition of no music at all. However, no significance difference was found between the participants' rate of perceived exertion in physical activity under condition of music without lyrics and their perceived exertion in physical activity under condition of no music at all. It must be stated that gender had no impact on the amount of these effects or lack of them.

Thus, it can be stated that the presence of lyrics in music has a significant effect on the participants' perceived exertion. This effect may be due to the distraction and focus elimination of the participants due to paying attention to the lyrics of the music, because the presence of the lyrics in music causes the participants to think about and focus on the words of the lyrics and lose their concentration on the task they are doing, i.e. running on treadmill, and thus feel less exertion during physical activity. Of course in the end, it must be stated that various different factors have affected these results. For example, the fact that all the participants' were Iranian and their mother tongue was Persian may cause the participants to have difficulty in relating to English songs than Persian songs. Of course this difficulty in relating to English songs may cause better or worse results in the participants. It must also be noted that the participants' previous positive or negative experiences of listening to certain songs has a significant effect on the participants' decision making.

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