THE EFFECT OF FAST, LIGHT AND FAVORITE MUSIC ON PHYSIOLOGICAL FUNCTION AND PHYSICAL PERFORMANCE OF THE MALE ATHLETE STUDENTS

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Abstract Listening to music can be useful for athletic performance because of the similarities between the rhythm of the music and the movements of the human body. Given the ambiguity in the lead for better music, the goal of this study was to investigate the effect of fast, light and favorite music on physiological function and physical performance of the male athlete students. 25 healthy male athlete students with the age of 20.8 ±1.20 years, height of 180.5 ±7.02 cm and weight of 70.8 ±10.9 kg participated in this study voluntarily. The present study was a repeated based test (4 times without music, fast, light and favorite music in 4 consecutive weeks with a one week rest apart them to control the effects of fatigue during the test). Results showed that fast music caused a significant changes in anaerobic power, sprint, agility, muscular endurance, aerobic power, rating of perceived exertion (RPE) ($p < 0.05$). Also, favorite music caused significant changes in explosive power and agility ($p < 0.05$). But, light music just made significant effect on minimum power ($p < 0.05$). According to this study, it seems that listening to fast music before aerobic and anaerobic activities can be effective on maximum and submaximal functions.

Key words music, rating of perceived exertion, physical function, athlete

Introduction

It has been shown that there are similarities between musical rhythm and movement patterns of the human body. So, matching the music with sport always increases the efficiency of the exercise participant. The relationship between music and mental physiological changes in the human body had been considered by scientists. History of research on the effects of music on motor behavior goes back to the beginning of the last century. In recent years, the use of music as a factor affecting on sports performance has attracted the attention of researchers in science (Nittono, Tsudakai, Nakajima, 2000). It has been shown that music impetuses for the strengthening or adapting

the rhythm and movement. Four principal ways that music may develop athletic performance are; reduce fatigue (Van Eck et al., 1996), increase the level of mental arousal, improve coordination (Simpson, Karageorghis, 2006) and increase the sedation (Copeland, Franks, 1991). Some of the results of the effect of music on physiological improvements show things such as: changes in heart rate, breathing, blood pressure, levels of endorphins, skin reactions, brain waves, nervous system and the automatic nervous system controls and reduce physical pain (Schmidt Peters, 1991). Music increases the motivation of athletes to continue (Karageorghis, Drew, Terry, 1996) and fatigue will be delay by decreasing the amount of perceived exertion on the body (Smolen, Topp, Singer, 2002; Boutcher, Trenske, 1990). Based on current assumptions, the music narrowing attention and divert the mind from fatigue caused by lead, it changes mental arousal, it is a means of stimulating or sedative before or during activity and finally body react to the implementation rhythm of the music on submaximal activities (Costasi, Terry, 1997). Studies have shown that listening to music while performing physical activity can reduce stress (Copeland, Franks, 1991; Ghaderi, Rahimi, Azarbayjany, 2009) and increase understanding of the emotional state (Boutcher, Trenke, 1990). This effects may indirectly divert attention from internal signals (physical) to external signs (music) (Simpson, Karageorghis, 2006). So, listening to music during exercise can improve performance especially aerobic (Atkinson, Wilson, Eubank, 2004; Ghaderi, Rahimi, Azarbayjany, 2009) and anaerobic activities (McMordie, 2009; Simpson, Karageorghis, 2006). Music effectiveness, related to function and characteristic features of music listener, music with slow rhythm leads to relaxation and reduce tension in the listener (Labbe, Schmidt, Babin, Pharr, 2007) while fast-paced music is provocative and can increase muscles tension (Makoto, Asami, Chie, 2005) Barwood and colleagues (2009) reported that in terms of stimulating listening to music, attendees who were running on a treadmill can travel farther, they were less lactate accumulation and in contrast, perceived exertion did not change significantly (Barwood at al,. 2009). Crust and Clough (2006) in a study of young subjects rod performance in different conditions; such as light and fast music as a isometric, they showed that motivational music in compare with light and beat music can increase more endurance in goal (Crust, Clough, 2006). Koc (2009) searches in a review study to evaluate the effect of music on athletic performance. He noted that the overall positive effects of music can be physiological (heart rate, blood pressure and body temperature), psychological (perceived exertion) and even physical performance factors (sprint, power, endurance and aerobic capacity) (Koc, Turchian, 2009).

Research on the effects of music on submaximal and maximal exercise intensity is small and imprecise. Some of the findings showed that listening to music improves anaerobic performance (McMordie, 2009), but the type of music can be an exercise on peak power is effective or not? It is not exactly clear (Yamamoto, et al. 2003). Nittono and colleagues (2000) concluded that fast music can only be improved speed performance athletes (Nittono, Tsudakai, Nakajima, 2000). In contrast, Ferguson and colleagues (1994) demonstrated that both types of music (fast and slow) can improve performance in karate training (Ferguson, Carbonneau, Chambliss, 1994). Eliakim and colleagues (2007) study the effects of listening to music at 140 beats per minute during the warm-up began and the results showed that music can yield a significant effect during the Wingate test (Eliakim et al., 2007). Karageorghis and colleagues (2009) test for anaerobic Wingate to measure the elite volleyball players use, these individuals when exposed to favorite music with the rhythm 140 bpm ten minutes before the test Wingate were, increased peak anaerobic power in 5 seconds First Was seen. Based on these results, it seems that the motivation or acute favorite music during exercise can be effective and useful. Previous research has shown that listening to music during exercise by shifting attention to external signs (music), due to fatigue and discomfort associated with exercise, will prevent (Karageorghis et al., 2009; Nakamura et al., 2010). Yamamoto research on

the effects of two types of music listening during the warm-up spicy looked on anaerobic performance Concluded between those who listened to music and those who have not heard, there is no significant difference (Yamamoto et al., 2003). Other findings showed that listening to music during anaerobic activities have no effect on performance (Pujol, Langenfeld, 1991; Karageorghis, Drew, Terry, 1996). According to a few studies with contradictory results in this field, this research aims to address the effects of listening to music with a fast pace, calm and understanding the desired pressure, aerobic and anaerobic power of male college athletes in check.

Material and methods

In this quasi-experimental study, 25 healthy male athlete students at the age of 20.8 ±1.20 years, 180.5 ±7.02 cm and 70.8 ±10.9 kg voluntarily participated in this study. After explaining the test conditions, including the potential risks and sign individual consent by the subjects was performed. Study with a repeated-test (four times under the condition without music (control), play fast music, slow and arbitrary in four consecutive weeks with a one week rest (to control the effects of fatigue when tests) was conducted. According to the plan, no music in the first week, second week with fast music, light music in the third week and finally, fourth week to test with their favorite music. This study was in accordance with the guidelines of the University Institutional Review Board.

In this study, the agility test (4 • 9 m), explosive power (jump), muscular endurance (push up), sprint (60 m), anaerobic power (RAST) and aerobic power test (1600 meters or one mile) were used. Test sessions were held between 8:30 to 11:30 am with an interval of one week between each step. 48 hours before the test participants were prevented from doing strenuous activity. Participants before the test sessions were identical meals. Also, all participants 12 hours before the tests deprive from eating any food and banned consumption of caffeine substance (26). The average temperature of the test in all four phases 25°C ±2 were recorded. In each trial participants used the same clothes. Before starting the meeting, a briefing to learn about test conditions and learning how to express RPE during exercise were allocated for subjects. Also, it was considered that none of the participants had trouble in hearing.

All the tests in 4 steps without music, fast music, slow and arbitrary were conducted in four consecutive weeks. Before starting the test, the subjects took 15 minutes to warm up.

Agility test (4 • 9 m): This test is used to assess the general agility. The best record of the subject was recorded using a chronometer (Q&Q, Japan).

Explosive power test (long jump): This test is intended to measure explosive power. The test was repeated three times for each subject and the best record was considered. Between each trial, 3–5 min interval was considered.

Muscular Endurance test (push up): This test is used to measure muscular endurance. The movements without pause were performed by subject for 30 seconds and full repetitions were recorded.

Sprint test (60 m): In a straight line with a distance of 60 meters was used to measure speed. The participants ran the distance and theirs time were recorded by a stopwatch (Q&Q, Japan).

Anaerobic power test (RAST): RAST test is similar to Wingate bike test to measure power and fatigue index is used. Times were taken for 6 × 35 meters with 10 seconds rest between them, using a stopwatch (Q&Q, Japan) for each subject separately and the four indices calculated using the following formula (Alex, Adelino, Claudio, 2008):

Speed = distance ÷ time

Acceleration = velocity ÷ time

Force = mass • acceleration

Power = power = (weight • distance) ÷ time

Maximum power = lowest elapsed time

Minimum power = maximum elapsed time

Mean power = total full time ÷ 6

Fatigue index = (maximum power - minimum power) ÷ total running time for the sixth time.

Cardio-respiratory endurance (one mile): This test was used for the assessment of aerobic power of subjects. Subjects ran as quickly as possible so that the designated route and time traverse this distance was recorded by a stopwatch and was placed on a corresponding formula:

$$VO_{2max}\ (ml/kg/min) =$$
$$132.853 – 0.0769\ (weight) – 0.3877\ (age) + 6.315\ (gender) – 3.2649\ (time) – 0.1565\ (heart\ rate)$$

Rating of Perceived exertion: At the end of each stage of anaerobic test, RPE (15-point Borg perceived exertion) of the subjects were asked in the work sheet. Borg scale of perceived exertion test is a subjective test to determine exercise intensity. Borg scale, subjective to the individual in his quest score of 6 (without trying) to 20 (maximum effort) gives. Light aerobic activity score 13 (partially hardened), activity at anaerobic threshold score of 15 (hard), and anaerobic activity score 17 (very hard and above) takes place.

Music: Two pieces of music after an investigation by 1.5 Music audition Adobe software to suit the number of beats per minute were available to participants. For fast and slow music to the music with a tempo of 145 beats per minute Sachs Invisible thieves and songs here's to the night with the rhythm of 120 beats per minute were used. Participants were free to choose the music. They can choose any kind of music with any kind of rhythm. Sony NWZ–W273 sports a music player with wireless technology manufactured by Sony, which was designed to remain stationary when performing the tests on the ear.

Results

The mean and standard deviation of variables is presented in Table 1. Within-group differences of values were statistically significant among the four tests (without music, fast, light and favorite) ($p < 0.05$). The significant changes in explosive power, speed, agility, muscular endurance and aerobic power was observed during fast music condition ($p < 0.05$). Also, favorite music created significant changes in explosive power and agility. Only fast music led to significant changes in the rating of perceived exertion ($p < 0.05$).

In addition, fast music caused a significant effect on maximum power, minimum power, mean power and fatigue index ($p < 0.05$). Also, change the minimum power in light music condition was statistically significant ($p < 0.05$).

Table 1. Comparisons of physical and physiological performance during four music conditions (no music, fast, light and favorite)

Variables	Fast	Light	Favorite	No Music
1	2	3	4	5
Explosive Power (cm)	143.24 ±15.7*	141.12 ±16.01	140.23 ±17.28*	136.24 ±18.22
Speed (s)	9.23 ±3.45*	9.49 ±2.56	9.33 ±3.01	10.23 ±2.13
Agility (s)	8.45 ±1.05*	9.01 ±1.16	8.70 ±1.89*	9.18 ±1.26
Muscular Endurance (rep)	33.46 ±8.34*	31.05 ±3.99	30.21 ±9.02	28.13 ±9.11
Aerobic Power (ml/kg/min)	49.36 ±8.5*	47.73 ±10.3	48.55 ±6.9	46.09 ±9.68

1	2	3	4	5
RPE (6-20)	12.61 ±4.27*	12.05 ±4.30	12.91 ±5.01	11.55 ±4.68
Maximum Power (w)	427.73 ±91.24*	402.61 ±69.3	409.75 ±105.27	403.33 ±89.69
Minimum Power (w)	311.50 ±74.12*	288.22 ±81.7*	305.46 ±70.55	301.74 ±91.27
Mean Power (w)	362.19 ±69.38*	345.11 ±75.47	354.17 ±68.10	343.66 ±81.59
Fatigue Index (w/s)	3.74 ±1.93*	2.84 ±1.57	3.39 ±1.87	2.39 ±2.04

* Significantly different with no music condition at $p < 0.05$. The values were expressed as mean ± standard deviation. RPE: Rating of perceived exertion.

Discussion

The results showed that fast music led to the significant changes in explosive power, speed, agility, muscular endurance and aerobic power. Also, favorite music did not change significantly in the explosive power and agility. Also, fast music caused a significant change in maximum power, minimum power, mean power and fatigue index. Light music also caused the significant effect on minimum power.

Reducing fatigue, coordination, increased levels of arousal, and ultimately relaxation and improve cognitive processes increase level of performance. These positive changes proposed as a musical work (Szabo, Small, Leigh, 1999).

First finding of this study showed that rating of perceived exertion declined in music mode. Overall, the results of previous studies has shown that listening to music during exercise, reduce perceived exertion, by reducing the pressure caused by exercise (Karageorghis, Drew, Terry, 1996; Karageorghis, Mouzourides, Priest, Sasso, Morrish, Walley, 2009; Birnbaum, Boone, Huschle, 2009). Research findings show that music does not have any significant effect on perceived exertion. But listening to fast music was along with a significant decrease in rating of perceived exertion. Various studies have reported contradictory findings. In some studies to reduce perceived exertion (Ghaderi, Rahimi, Azarbayjany, 2009; Mohammadzade, Tartibiyan, Ahmadi, 2008), which is consistent with the results of the present study and in some, no significant changes in perceived exertion (Barwood, Weston, Neil, Thelwell, Page, 2009) have been reported. According to some researches, uncomfortable effects of music during exercise test reduces in mind, while the removal of audio, such as music and visual elements may be paid according to internal working pressure and reduced ability to withstand fatigue. In fact, listening to music, individuals from the same attention prevent fatigue. It works by lowering levels of serotonin and dopamine in the brain when run incremental changes in conditions related to music (Boutcher, Trenke, 1990). One study showed the effects of music therapy on cardiovascular responses and reported listen to music during exercise caused a significant decrease in rating of perceived exertion and significant increase in heart rate, respiratory rate per minute, oxygen consumption and minute ventilation (Miller, Manire, Robertson, John, Barbara, 2010). Based on music attention from internal factors (pain and fatigue) and external factors alter to pursue the matter and can be seen changes in the level of perceived exertion (Dave, Sam, Duncan, 2005). In this study, only fast music reduced rating of perceived exertion.

Barwood and colleagues (2009) reported that listening to motivating music, the participants while running on a treadmill, distance walked more, had lower levels of blood lactate accumulation. In contrast, no significant change was observed in perceived exertion (Barwood, Weston, Neil, Thelwell, Page, 2009). The results of this study uncrossed Sousse. This difference can result due to individual differences (age, gender, favorite music, etc.). Koc (2009) in a review article investigated the effect of music on athletic performance. He noted that the overall positive effects of music can be physiological (heart rate, blood pressure and body temperature), psychological (perceived exertion) and even physical performance factors (sprint, strength, endurance and aerobic power) (Koc, Turchlan, 2009).

The second findings of this study showed that listening to fast and favorite music had a positive effect on anaerobic performance. This result is antithetic with previous findings showed listening to music in an activity that was performed with low intensity was more effective to activities that was performed with maximum intensity (Karageorghis, Drew, Terry, 1996). Pujol and Langenfeld (1999) studied the effect of music on Wingate anaerobic test. In the study participated 12 males and 3 females. The results showed that the time to exhaustion, fatigue index, the average power output, the maximum and minimum power output in comparison to listening to music, there was no significant differences (Pujol, Langenfeld, 1999). That is inconsistent with results, of course, favorite and light music didn't cause any significant changes in fatigue index, the average power output and maximum power and minimum power had significant change in light music condition. Leslie (1967) investigated the effect of music on the runners speed. He didn't find an impact on the speed of runners that is in line with our results, only speed significantly changed with fast music (Leslie, 1967). Nittono and colleagues (2000) also investigated the effect of music on speed performance and found that fast music with compared to light music accelerated performance that is consistent with the study (Schwartz, Fernhall, 1990). The findings of Ferguson and colleagues (1994) reported the effect of fast and quiet music on the implementation of karate training (Ferguson, Carbonneau, Chambless, 1994). Karageorghis, Drew and Terry (1996) investigated the effect of hearing the kinds of music before the hand grip. They conclude that the hand grip strength after the stimulus music compared with the light music and non-music condition is increased (Karageorghis, Drew, Terry, 1996). However, the value of this effect varies depending on the aspects of personality athletes (Crust, 2004), which correspond to the present investigation. Elsewhere, McMordie (2009), in a study evaluated the effect of listening to music on the mean anaerobic power (which was measured using the Wingate test) repetitions of bench press and leg press exercise to exhaustion. The mean listening to music with mild and spicy without music was significantly increased in comparison with the case. Also, Bench press and leg press repetitions were more with listening to music compared to no music condition. In general, the results of this study showed that listening to music can impact on performance, especially in the case of fast rhythm music, the impact is greater (McMordie, 2009) Which corresponded with the results. Geisler and Leith (2001) demonstrated the difference between a variety of musical rhythms on basketball penalty shooting. They didn't observe significant effects in non-athletes (Geisler, Leith, 2001). This result may be due to the different songs and subjects were employed.

Finally, the study showed that fast music condition was only effective on aerobic power and subjects with fast music had better aerobic performance. This finding is consistent with results of Copeland and Franks (1991), Baulddoff and colleagues (2002), Nittono and colleagues (2000), (Copeland, Franks, 1991; Baulddoff, Hoffman, Zullo, Sciurba, 2002; Nittono, Tsudakai, Nakajima, 2000), But with the findings of Pujol and colleagues (1999), Schwartz and colleagues (1990), Litwack and colleagues (1992) is antithetic (Pujol, Langenfeld, 1999; Schwartz, Fernhall, 1990; Litwack, Schmidt, 1992). The music may replace physical work-related information that reaches from the sensory organs to the central nervous system, and increase work efficiency and improve the excitement of activities (Hayakava, Miki, Akada, Tanaka, 2000). From the viewpoint of nerve - muscle can also be said that every external stimulus such as blasting music while performing physical activity increases the amount of motor neurons in the primary centers and as a result of more workload through stronger muscle contractions even in fatigue condition (Shephard, 2001). Ghaderi and colleagues (2009) studied the effect of motivating music and calming music on aerobic performance, rating of perceived exertion and cortisol in male non-athletes. All participants with 80 to 85 percent of their maximum heart rate ran to exhaustion on a treadmill. Motivating aerobic performance in music group was significantly higher than the other groups that are in keeping with the results. In addition, rating of perceived exertion and cortisol concentrations, 5 minutes after the end of the exercise in light music was

significantly lower than the other groups (Ghaderi, Rahimi, Azarbayjani, 2009). In this study, only fast music caused a significant change in the rating of perceived exertion.

Based on the results of this study, exercise stress may be modulated in the form of perceived exertion with fast music condition as distracting attention. But, favorite and light music can't decrease enough the exercise stress. Also, the fast music can improve aerobic and anaerobic performance. Listening to fast music improves aerobic and anaerobic performance and reduces rating of perceived exertion and hardness of physical work or test. Music is a simple, cheap, and available way to enhance the many physical functions and performance. Therefore, it is recommended to coaches and athletes to aid improving sports performance via listening to fast music during their exercises and tests.

Acknowledgements

The authors would like to thank the athlete students for their willing participation in this study.

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Cite this article as: Arazi, H., Ghanbari, E., Zarabi, L., Rafati, F. (2017). The Effect of Fast, Light and Favorite Music on Physiological Function and Physical Performance of the Male Athlete Students. *Central European Journal of Sport Sciences and Medicine*, *17* (1), 33–40. DOI: 10.18276/cej.2017.1-04.