Influence of music type listening on anaerobic performance and salivary cortisol in males athletes

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Annotation:

Music has been widely recommended as a technique to enhance the psychophysical state of participants in sport and exercise. However, there is scant scientific evidence to clarify its proposed benefits. Therefore, the aim of this study was to determine the effect of fast and slow rhythm of music on anaerobic performance and salivary cortisol concentration in trained men. Thirty male physical education college students (ages: 25.66±3.89 yr, height: 176.65 ± 7.66 cm, body mass: 78.45±16.20 kg) voluntary participated in this study and divided to three groups: fast music, slow music, and no music(control). All subjects performed the coninghum test following a 20% grate and 14.3km/h speed on the treadmill. For measuring of cortisol, not stimulated samples of saliva collected, 15 minutes befor and immediately 5 and 30 minute after the exercise. No significant differences were found in anaerobic performance among the three groups in pretest indicating homogeneity of the groups. However, salivary cortisol no significant in anaerobic performance 5 and 30 minute after exercise as well. Summarily, Music doed not have a positive effect on performance, this study provided some support for the hypothesis that listening fast and slow music not significantly impacted during supramaximal exercise.

Мохаммад Гхадері, Мохаммад Алі Азербаїйані, Намид Агха Алінейад, Сирван Аташак, Махдех Моланоурі Шамси, Давод Гхадері. Вплив музичного типового слухання на анаеробний виконавський і слинний кортизол у атлетів чоловіків. Музика була широко рекомендована як техніка, здатна поліпшити психофізичний стан учасників в спортивних вправах. Проте, є недостатньо наукових фактів, які б свідчили про ефективність такого підходу. Тому, метою цього дослідження є спроба визначити ефект швидкого і повільного ритму музики на анаеробній виконавській і слинній концентрації кортизол у тренованих чоловіків. У дослідженні брали участь 30 чоловіків студентів (вік: 25.66±3.89 років, зростання: 176.65 ± 7.66 см, маса тіла: 78.45±16.20 кг) з колективу фізкультури. Вони були розподілені на три групи: швидка музика, повільна музика і контрольна. Всі випробування виконувалися під тиху музику, потім – 20% від дратівливої звукової дії при виконанні вправ на біговій доріжці зі швидкістю 14.3 км/год. Для виміру кортизолу використовувалися зразки слини за 15 хвилин до і негайно через 5 і 30 хвилин після виконання вправи. Ніяких істотних відзнак не було знайдено в анаеробній роботі серед трьох груп в попередньому тесті, що вказує на однорідність груп. Також не спостерігалося істотних змін в зразках слинного кортизолу в анаеробній роботі 5 і 30 хвилин після виконання вправи. Таким чином, музичні супроводи не мають позитивного ефекту при роботі. Це дослідження забезпечило деяку підтримку гіпотези про те, що прослухування швидкої і повільної музики трохи ущільнило процес виконання вправи.

Мохаммад Гхадери, Мохаммад Али Азербайджани, Намид Агха Алинейад, Сирван Аташак, Махдех Моланоури Шамси, Давод Гхадери. Влияние музыкального типового слушания на анаэробный исполнительский и слюнный кортизол у атлетов мужчин. Музыка была широко рекомендована как техника, способная улучшить психофизическое состояние участников в спортивных упражнениях. Однако, имеется недостаточно научных фактов, которые бы свидетельствовали об эффективности такого подхода. Поэтому, целью этого исследования является попытка определить эффект быстрого и медленного ритма музыки на анаэробной исполнительской и слюнной концентрации кортизола у тренированных мужчин. В исследовании участвовали 30 мужчин студентов (возраст: 25.66±3.89 лет, рост: 176.65 ± 7.66 см, масса тела: 78.45±16.20 кг) из коллектива физкультуры. Они были распределены на три группы: быстрая музыка, медленная музыка и контрольная. Все испытания выполнялись под тихую музыку, затем – 20% от раздражающего звукового воздействия при выполнении упражнений на бегущей дорожке со скоростью 14.3 км/час. Для измерения кортизола использовались образцы слюны за 15 минут до и немедленно через 5 и 30 минут после выполнения упражнения. Никаких существенных отличий не было найдено в анаэробной работе среди трех групп в предварительном тесте, указывающем на однородность групп. Также не наблюдалось существенных изменений в образцах слюнного кортизола в анаэробной работе 5 и 30 минуты после выполнения упражнения. Таким образом, музыкальные сопровождения не имеют положительного эффекта при работе. Это исследование обеспечило некоторую поддержку гипотезы о том, что, прослушивание быстрой и медленной музыки незначительно уплотнило процесс выполнения упражнения.

Key words:

slow and fast music, anaerobic performance, salivary cortisol.

повільний, швидкий, музика, анаеробна робота, слинний кортизол.

медленный, быстрый, музыка, анаэробная работа, слюнный кортизол.

Introduction

Using of music as an effective factor in improving the athletic performance has drawn attention of the sport researchers (6,17,27). Athletes by listening to music during exercise would face less pressure and release feeling of pressure (20). The sport researchers have proved the role of music in increasing energy of athletes (20). Studies showed that, listening music during physical activities reduces rating exertion perception (6,16) and increase emotional state (4). This influence may indirectly divert attention from the external signs (somatic) to the external signs (music) (42). Also based on the available hypotheses, music helps in limiting the attention and divert the mind from activity caused fatigue (19). In a way that, eliminates the fatigue from the hard labor (29). Changes psychic provocation, is a motivational or relaxation tool before or during exercise (7), It decreases fatigue pressure, as increases the level easiness of such exercises (47). Therefore listening to music during physical exercises, leads to improving aerobic (1,16), and anaerobic performances (24,32,42). Researchers focus on the hidden role of music as an ergogenic aids specially during physical activity (1,23). Music might in two ways delays fatigue and increases of work capacity ergogenic effect and improves sport performance (22). Finally, it leads to higher level increase of endurance, power and strength (1,11,23,30,47). The scholastic literature suggests

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four ways in which music might improve exercise performance: reduces perception of fatigue (Yamashita et al., 2006); increases levels of arousal (Karageorghis & Terry, 1997); encourages motor coordination or synchronization (Simpson & Karageorghis, 2006); and increases relaxation (Copeland & Franks, 1991). In the current study, we have examined the first three ways in which music could enhance sprint performance in rowing. Reduced perception of physical fatigue during exercise to music was attributed to selective attention resulting from limited information processing capacity (Hernandez- Peon, 1961). Researchers believe that music can prevent the unpleased feeling outbreak in sport. Music can reduce the exertion perception, the metabolic by products (acidosis) and hemodynamical phenomenon (heart rate and blood pressure) (35). In addition, music effectiveness is depended to the music type being used and the listener's characteristics. Slow rhythm music causes relaxation and reduction of stress listener (28,37). While fast rhythm music is motivational and increases muscle tension (31). Several data have shown that fast rhythm music (motivational) enhances performance, while slow rhythm music (sedative) is obnoxious (2,12,21). Another Studies showed that in comparison, both type of slow and fast music are better than non music status and improve performance (3). Numerous studies investigated the effect of music on the cardiovascular endurance performance and exertion perception during exercise but studies related to the effect of music on supra-maximal exercises is little. Some finding showed the effect of music on improvement of anaerobic performance (32), but the type of music is not effective on the peak of power during exercise (48). In contrast, Ferguson et al. (1994) proved that the fast and slow music improve karate performance (12). Nittono et al. (2000) concluded that only the fast music can improve the speed performance in the athletes (36). It was found that listening to music during anaerobic performance has no effect on increase of performance (21,39). On the other hand, music is effective on hormonal responses. Findings indicate that music can effect on cortisol secretion as listening to music reduces cortisol concentration (14,34,36,45), however It seems that the decrease in cortisol levels during listening to music maybe is different by music type (25,33,40). Some studies reported the cortisol reduction after listening to classic music (26). Whereas another researchers reveal cortisol level increase after listening to the fast music (motivational) (15). Brownley et al. (1995) reported the higher plasma cortisol levels after intensive exercise and listening to the fast music in comparison with the slow music and non music (5). Since the effect of music listening a one session supra-maximal exercise to the exhaustion has not been investigated and majority of the studies focused on the effect music on the submaximal exercise, and that more of the studies on the effect of music on cortisol level are done the medical fields (14,34,35), and that study on hormonal responses related to the music listening and sport is little (5,16). Therefore the main aim of the present study is on the effect of fast and slow music listening on anaerobic performance and salivary cortisol level in Athlete Males.

Methods

Subjects

Thirty physical education college male students (Mean ± SD, age=25.66±3.89yr, height: 176.65±7.66 cm, body mass=78.45±16.20 kg) volunteered as subjects and randomly divided in three groups: fast music, slow music and no music group, none of the subjects did not have hormone and hearing disorder background and at the time of study didn't place under pharmaceutical treatment.

Procedures

The subjects in 4 separate sessions and time interval of 48 hours at the same time of the day went to the National Olympic Academy sport physiology laboratory. The performance in each session was as follow: In the first session all participants were informed of the purpose, procedures and possible risks of the investigation before they gave written informed consent to participate in the study and personal data were recorded from them. In the 2nd to 4th sessions each of them according to the group they were allocated, the coninghum anaerobic Test was used which was running with speed of 14.3 km/hour and 20% slope. They ran on the treadmill (Technogem, HC1200, ITALY) at the time exhaustion. The Astrand 6 minute Cycle Test was devised by P.O. Astrand in 1956 for the evaluation and calculation of VO2max. the Under Over Astrand Test, that is 6 min running on the ergometer bicycle (ergometer C839 Monark) with one constant load and speed of 50 round/min pedaling was done (41).

Music selection

Considering the nature of the study, the music was selected from two different types, from the view point of musical indexes. The features of the fast music were high speed (120 beats per minute [bpm]) with strong tune, to such an extent that this type of music increased the energy of athletes and reduced tension (34). The relaxing music included slow rhythm (76 beats per minute [bpm]), in contract to the fast music reduced provocation (34). For listening to music the portable Sunio MP3-Player Instrument (model no. MCD-Z7F) was used (44). Before, the subjects stand up on treadmill, they put the headphone in car for listening the music. At the start of the test one person was ready to switch on the tape. The sound volume was the same for all of the study subjects (maximum volume 75%) (44). This volume was selected in order not to hear the treadmill noise and only listen to the music.

Saliva collection

Saliva samples were collected 15 min before exercise (PRE), 5- and 30- min post-exercise (5P), and (30P). Subjects were instructed to avoid food, drinking hot fluids, and brushing their teeth two hours before assessment and were seated in the laboratory for 20 minutes prior to the resting sample being provided. In each case, 4 ml of saliva was deposited into sterile containers (Labserve, Auckland, New Zealand) and stored at -20° C until assay. At the completion of exercise, subjects remained seated in the laboratory until all samples were collected. During recovery, participants were allowed to drink water ad libitum.

Cortisol assay

Saliva was analyzed in duplicate for cortisol concentrations, using Enzym Immunosorbant Assay kits

(RADIM SpA, Via del Mare, 125-00040 Pomezia (Roma) Italia). Inter- and intra-assay coefficients of variances were 6.9% and 6.2% for serum cortisol. Saliva samples for each subject were analyzed in the same assay to eliminate interassay variance. Giving that cortisol release following form boarding rhythm, whole saliva sample collected between 08:30 and 11:30 a.m.

Statistical Analyses

All of the data were reported based on the mean and standard deviation. In the present study, for description of the statistical indices, the descriptive method, and for analysis of the obtained data, the one way analysis of variance (ANOVA) for the independent group was used. All of the statistical calculations were done by SPSS 16 software. The level of $P<0.05$ was considered significant level.

Results

In order to determination amount of homogeny of testable one way analysis of variance (ANOVA) use between amount of vo2max of groups and not found significant differences between groups that indicate homogeny of that amount of measured variable given in table 1.

Running time as a measure of aerobic performance in fast music group as compared to slow music and no music (control) was lower, but this reduction wasn't significant. In away, that no significant difference was observed between fast music- slow music- and non music condition ($p > 0.05$), (figure 1). On the other hand, the salivary cortisol concentration 5 min after exercise was lower during listening to slow music compared with the fast- and non music condition, and the decline process continued till 30 min after activity, but insignificant reduction (Figure 2).

Discussion

The first research hypothesis was supported given that listening to music has no effect on the anaerobic performance. It agrees with the reports indicated that mechanism of listening to music is more effective at the low intensity training rather the over intensity training (20). It was noticed that music has no effect on the anaerobic performance in the active men. The findings is contrast to finding of Simpson and Karageorghis (2006) who reported synchronous music result in better anaerobic performance than a no-music control, but there were no significant difference between synchronous music and oudeterous condition (42). Pujol and Langenfeld (1999) studied the influence of music on Wingate anaerobic test performance in 12 men and 3 women, and found insignificant difference between reaching exhaustion, fatigue index, power output mean, the maximal and minimal power output at the time of listening to music as compared with non music (39), which agrees with our obtained data. A study was done on the effect of music during warming up on anaerobic performance in the adolescent elite national volleyball players. The subjects performed the anaerobic Wingate Test after 10 min warming up with and without listening music. It was found that during warming up with the listening to music, the mean heart beat significantly was higher. In contrast, music had no significant effect on the mean anaerobic output or fatigue index (9), which this finding is in accordance to our finding. Significance of these findings is that, the effect of music at the time of warming up may not have long term beneficial effect on the anaerobic performance. Yamamoto et al. (2003) studied the effect of slow and fast rhythm music listening before supra-maximal intensity bicycle driving on performance, heart beat, lactate concentration, blood ammonium, and catecholamine's concentration on the plasma. The subjects were 6 men who performed a supra-maximal activity on the ergometer bicycle for 45 seconds after listening to the fast and slow music for 20 minutes. It was found that the music listening could not significantly affect on the mean of power peak. But listening to the slow rhythm music reduced the plasma nor epinephrine level and fast rhythm music increased plasma epinephrine level. The type of music had no effect on the power peak during exercise (48). We found that low and fast rhythm music had insignificant effect on increasing anaerobic performances. In this relation, it seems that training intensity causes adjustment of the relation between attention process during activity and the activity related psychologic effects. As a results, the high intensity training directs the attention from fatigue feeling to the music (39). Karageorghis et al. (1996) studied the effects of pretest simulative and sedative music on grip strength, and found that grip strength after listening to simulative music as compared to sedative music and no music is higher (21). While the degree of effect is different depending on the personality aspects of the athletes (8). It is contrast to the present study, McMordie (2009) in a study on the effect of music loudness on anaerobic power mean (measured with Wingate test), chest press repeats and leg press till exhaustion, found significant increase of power mean by listening to the fast and slow music compared to the non music . Also the chest press and leg press to the exhaustion level was higher in music group as compared to no music and this increase was noticed more with fast music compared to the slow music. In all, this result found that, listen to the music during all types of exercises is effective on performance, particularly higher with fast music rhythm (32). A study investigated the effect of the music on the Wingate performance, and found that the peak of power significantly was higher during music listening than the non music condition, it indicates that physiologically music can improve the anaerobic performance (37).

Nittono et al. (2000) studied the effect Tempo of back ground sound and performance speed. fast music enhanced the performance, while relaxing music had no influence on the speed of the performance (36). Ferguson et al (1994) found increase of performance by both positive and negative music on performance of a karate drill (12), which is in contrast to our finding. It seems that the influence of music is related to some variables such as, the type of music, individual features (age, smartness, personality, and culture Mores) (12), which causes the different findings in above mentioned studies. Intensity, methodology, exercise duration (36) and time the listening to music (before or during exercise) are factors which can

Table 1.

The levels of measured variables in the fast music, slow music and control groups

Variable	Running time (second)	Salivary cortisol concentration	Salivary cortisol concentration	Salivary cortisol concentration
		15 minutes before training	5 minutes after activity	30 minutes after activity
Fast music	41.65±12.84	13.4±5.37	15.7±4.34	17.4±5.31
Slow music	46.81±13.48	11.9±5.71	10.80±5.71	12.3±4.48
Control	45.28±12.32	15.55±4.91	14.35±4.01	16.90±5.98

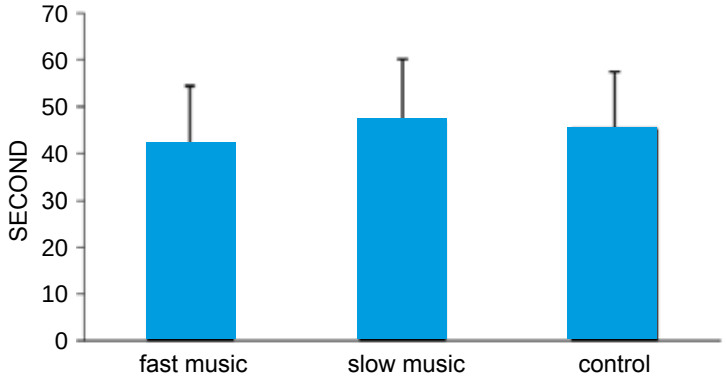

Fig 1. Anaerobic performance (mean ± SD) with the fast, slow and no music (control).

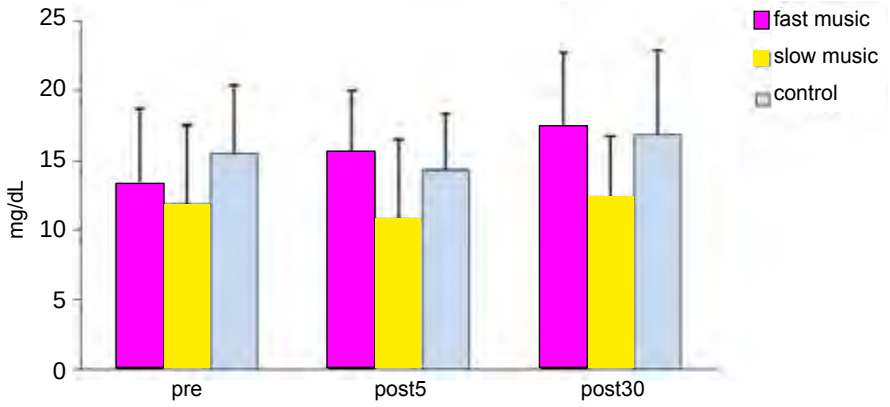

Fig 2. Salivary cortisol concentration (mean ± SD) during pre-exercise, immediately 5-min post and 30-min post exercise with the fast, slow and no music (control).

clarify contradictory between our results and previous findings. Also, in the present study, music was listened during exercise and the subjects were athlete males. But in the other studies that is contrast to finding of the present study (9,23), music was listened before starting the exercises. Meanwhile, we used Coninghum Test while not used in the other relevant studies. It has been reported that music listening reduces cortisol level. In addition, effectively music stops the pressure response. Ghaderi et al. (2009) found that, salivary cortisol level 5 min after exercise at the time of listening to relaxation music in compared to motivational and non music was lower significantly. However, 30 min after activity insignificant difference was observed on cortisol concentration on three types of music. Also insignificant difference of salivary cortisol concentration was observed at the time of listening to the motivational and relaxation music (16), It is possible that music listening reduces the mental tension in the subjects at the time of during running. Since mental stress is one of the cortisol secreting stimuli and only the three different groups were listening the music, lack of significant increase of cortisol concentration could be attributed to the listening of music. Brownley et al. (1995) investigated the effect of music on physiological and affective responses with three different intensities (slow, medium, intensive) in trained and untrained runner to graded treadmill exercise (5). Data indicate that after intensive training and fast music listening plasma cortisol levels was higher than the level obtained at the relaxation music and non music (5). Collectively, these results indicate that fast music with high beat during exercise maybe is effective in the untrained runners and in contrast, is ineffective in the trained group (5). The other finding demonstrated that, one session training insignificantly

reduces salivary cortisol concentration in the subjects 5 and 30 min after maximum running on the treadmill in the relaxation and motivational music group than the control (non music) group. Since the cortisol concentration at the time of listening to the slow music was lower than the fast music and control group, but is not significant. Certainly, cortisol response to training is depended to the activity intensity (13), and duration (18). Therefore one of the main stimulus secretion of cortisol is intensive physical activities (10). As Brownley et al. (1995) noticed that when the trained runner during supra-maximal exercise listen to the fast music had higher rates of respiration and cortisol levels (5), which agrees with present findings. Because in our study, the cortisol concentration at of listening to fast rhythm music 5 and 30 min after anaerobic activity was higher the time in comparison with the slow music and non music, but not significant. As it was pointed out on the anaerobic performance discussion, it seems that training intensity causes modulation of the relationship between the attention process and the activity caused psychological impacts during activity. As a result high intensity training directs external stimulus (music) to the fatigue feeling (39), and that music is not much effective.

Comclusions.

In conclusion and based on the findings of the present study it is concluded that, the supra-maximal anaerobic performance is not under influence of music and there is no difference between the effect of the music type. Also, the salivary cortisol response during anaerobic performance is independent on the type of music. Nevertheless, further studies are required to investigate the effect of listening to the type of music on anaerobic performance and cortisol secretion.

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