



**Music influence on athlete`s sportsmanship (from the example of
synchronized figure skating athletes)**

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Abstract

Physical culture increase people`s potentialities. This article considers music like an effective tool to achieve a range of desirable physiological, psychological and performance effects among athletes. There are many different effects from music influence sportsmanship. The research in this article also shows how music influences on features of brain activity of synchronized figure skating athletes in conditions of perception competition music phonogram depending on level of sportsmanship from the bioelectrical brain activity point of view. It was testified that during the sportsmanship growing the psychophysiological factor (like music perception skills) have the main role in the improving of motor skills.

Keywords: Music influence, sportsmanship, music effects, synchronized figure skating, brain activity, electroencephalography;

1. Introduction

Every sport, where people are put under rough conditions, has specificity, which systematically influences on people`s organism adapting it to the particular type of actions. But physical culture considers people in not only physical aspect, but from personal point of view, because it increase people`s potentialities. It can be different nonphysical qualities and skills including music perception.

Music is considered like an effective tool to achieve a range of desirable physiological, psychological and performance effects among athletes. Somebody considers music like a «performance enhancing drug» [7]. There are many effects from music influence sportsmanship [2]:

1. Synchronization (the tempo of the music can have effect on movement. Rhythm is an important component in motor skill and performance);
2. Acquisition of motor skills (music can help to replicate aspects of human movement. It can be used in learning environment);
3. Attainment of flow (music during physical activity can make mind and body function on «auto-pilot» with minimal conscious effort).

High approximation of competition music phonogram perception is one criteria of synchronized figure skating team success. [1] Firstly, the correct rhythm perception of all team members provides the synchronism of transition and execution of the elements. This criterion also influences on judges` marks regarding the «Interpretation» component. [8] In this way, the

right music rhythm perception ability is the main athletes` skill in synchronized figure skating. It`s known, central nervous system has the main role in the mechanism of adaptation. [6] Encephalography method (detail evaluating of bioelectrical activity of the brain) helps to evaluate results of such type of process from the neurophysiology point of view.

The purpose of this work is to evaluate the bioelectrical synchronized figure skating sportsman brain activity in condition of competition music rhythm perception.

2. Research methods

We used electroencephalography device «Neiron-spektr 4» («Neirosoft», Russia) to record the bioelectric activity, and to evaluate quantitatively and qualitatively the functional state of the brain (alpha rhythm, low-frequency beta rhythm, high-frequency beta rhythm, theta rhythm and delta rhythm). Electrodes were located according to the international scheme «10-20».

The research object is a group of 28 athletes (group of high qualification (8 people), medium qualification (11 people) and low qualification (9 people) from figure skating school department, Seversk town.

During the experiment, the sportsmen had to count a rhythm inwardly and put the special computer program button in every count «8». Thereby we had an opportunity to evaluate the correct perception of the competition musical rhythm. Data, which has been received as a result of recording bioelectric brain activity during listening audio, was compared with the background recording of research participant`s bioelectric brain activity.

3. Results and conversation

Analysis of the data received has shown that all of the explored rhythms amplitudes have increased in the medium and low qualification groups during the cognitive test ($p < 0,05$, table 1). It was noticed that low-frequency beta rhythm and high-frequency beta rhythm amplitudes have increased in the temporal lobe of the brain in all groups (fig. 1).

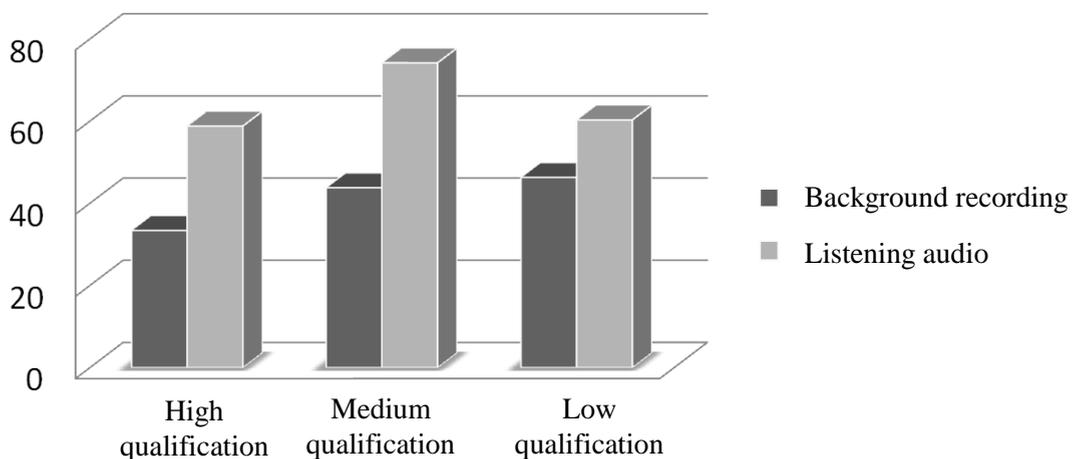


Fig.1 High-frequency beta rhythm amplitude in temporal right lobe of the brain

Wherein there are no trustworthy changes in low-frequency beta rhythm, high-frequency beta rhythm amplitudes in frontal lobe of the brain in a group of high qualification during listening audio. Furthermore, low-frequency beta rhythm amplitude goes down in the right frontal lobe of the brain in that group. For example, high-frequency beta rhythm amplitude index is $19,7 \pm 0,9 \mu V$

(background record) and $40,3 \pm 3,8 \mu\text{V}$ (record during listening the audio) in the right frontal lobe of the brain of people from low qualification group ($p < 0,05$, table 8). But the data received from the research group of high qualification looks as follows: $30,3 \pm 2,9^* \mu\text{V}$ (background record) and $24,6 \pm 2,8^* \mu\text{V}$ (record during listening the audio) (fig. 2).

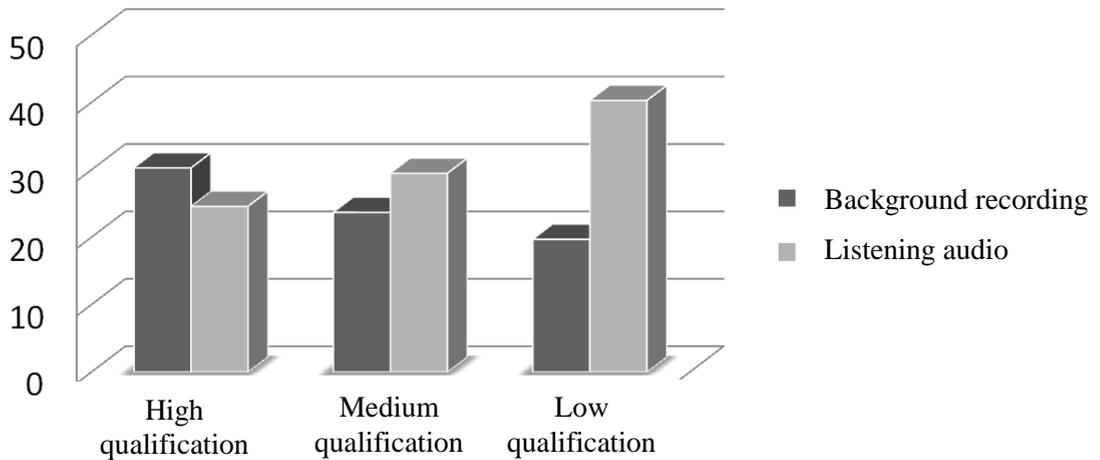


Fig.2 High-frequency beta rhythm amplitude in frontal right lobe of the brain

It's known that human's mental activity is accompanied by the revitalization of beta rhythm, and, besides, the revitalization of high-frequency beta rhythm is connected with a new activity, the effect of novelty. On the contrary, the stereotypical, habitual activity is one of the reasons of the inhibition of this rhythm. [5] Based on this, it is possible to make a conclusion that interpretation of the predetermined musical rhythm isn't a task with novelty effect for skilled athletes. Contrariwise, inhibition of high-frequency beta rhythm in right frontal lobe of the brain means that music rhythm perception of competition phonogram was successful, which cannot be said about the sportsmen of medium and low qualifications. Data has shown that the growth of high-frequency beta rhythm in right frontal lobe of the brain emphasizes how difficult for athletes is to percept and interpret a musical rhythm.

Revitalization of frontal and temporal lobe activity is explained by natural functions of this brain's lobes. So temporal lobe is responsible for the perception of audio information, frontal lobe is responsible for the solution of assigned task and acquisition of skills [3]. Also received data has confirmed researches' results from 2001 by Jh. Tramo team in cognitive neurobiology of music. Researchers studied the connection between the bioelectrical brain activity and the ability to percept the rhythm. Researchers found out that frontal, parietal lobe of the left hemisphere and also the right part of cerebellum get active during the perception of predetermined music rhythm [4].

Together with the increase of beta rhythm power, there was also the increase of the theta rhythm amplitude in frontal and temporal brain lobes. It means that there is a high attentiveness by doing this kind of tasks (fig. 3,4).

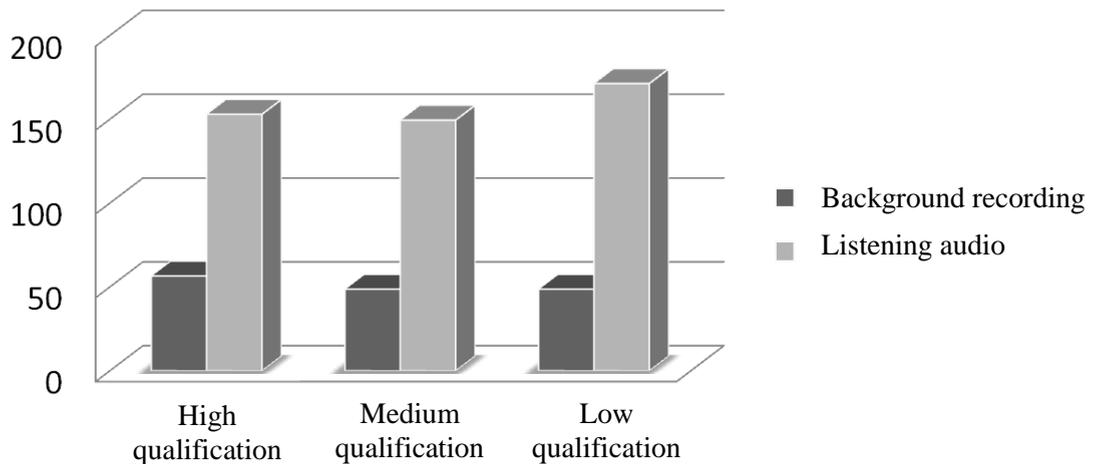


Fig.3 Theta rhythm amplitude in frontal right lobe of the brain

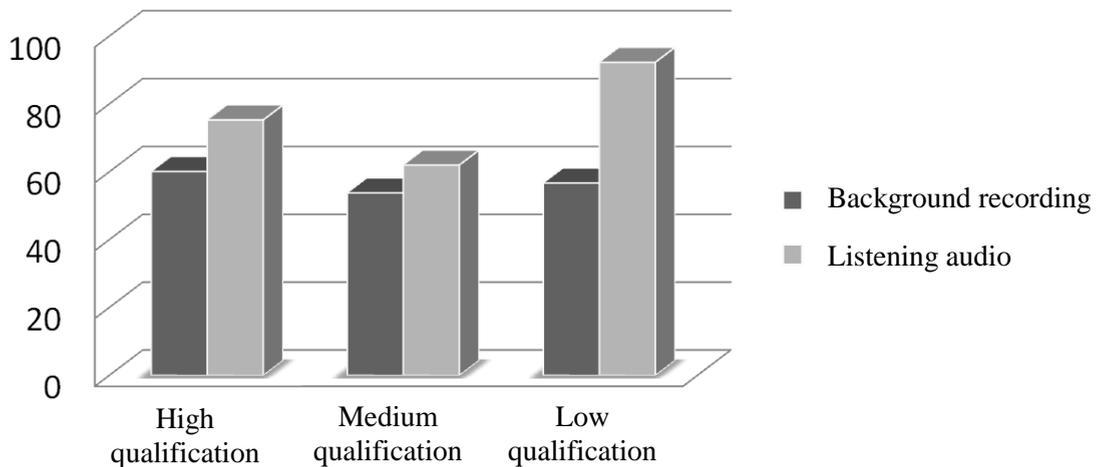


Fig.4 Theta rhythm amplitude in temporal right lobe of the brain

There are trustworthy differences in the analysis of received data between groups with low and high qualification or between medium and high qualification. But there are no any differences between groups with low and medium qualification (fig. 1,2). It should be noticed that this consistent pattern is seen in such kind of brain lobes which had the reaction to the experiment, particularly, in the frontal and temporal brain lobes. It testifies that during the sportsmanship the growing psychophysiological factors have the main role in the improving of motor skills.

4. Conclusion

Our research has allowed to discover features of bioelectrical brain activity of synchronized figure skating athletes in conditions of perception of competition music phonogram. There was discovered the predominance of beta and theta rhythms in frontal and temporal brain lobes and the differences in the activity of the brain hemispheres depending on the level of sportsmanship.

References:

1. Absalyamova, I.V., Belyaeva, A.U., Jgun, E.V. (1992). Synchronized figure skating (exact lines). Moscow: SCOLIPE.
2. Dennehy V. How can music influence performance [Available at: <http://believeperform.com/performance/how-can-music-influence-performance/>] [Accessed 07.12.2017]
3. Electroencephalography. [Available at: <http://www.ido.rudn.ru/psychology/psychophysiology/2.html>] [Accessed 10.12.2017]
4. Gaser, C., Schlaug, G. Brain structures differ between musicians and non-musician. [Available at: <https://www.ncbi.nlm.nih.gov/pubmed/14534258>] [Accessed 05.12.2017]
5. How the brain works. [Available at: <http://memini.ru/encyclopaedia/87/>] [Accessed 05.12.2017]
6. Kapilevich, L.V. (2011). Physiology of sports: tutorial. Tomsk: publishing house of Tomsk polytechnic university.
7. Ruani A. 4 Remarkable ways music can enhance athletic performance [Available at: <https://thehealthsciencesacademy.org/health-tips/music-can-enhance-athletic-performance/>] [Accessed 07.12.2017]
8. Special and technical rules of single, pair skating and ice dance. [Available at: <http://fsrussia.ru/dokumenty/12-obshchie-dokumenty.html>] [Accessed 10.12.2015]