

## METHODS OF TECHNICAL AND TACTICAL TRAINING BASKETBALL PLAYERS WITH HEARING IMPAIRMENTS USING INNOVATIVE TECHNOLOGIES

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**Annotation.** *Purpose:* to develop information technology for technical and tactical training of skilled basketball players with hearing impairments. *Material:* the study involved 24 women's national team athletes Ukrainian Basketball hearing impaired (age - 25-30 years). Technical protocols were processed 12 games from the World Cup and Europe, XXII Summer Deaflympics. Fixed number of shots and hit free throws, steals, rebounds and on its offensive rebounds, fouls and errors. *Results:* the developed system of tactical training basketball players with hearing impairments. Accentuation was made of the prevalence of method visibility while developing tactical interactions. The main result was the development of the author's method of video tutorials with animated illustrations. Also, use the lamp LS Line-3-65-12-C to control the training process athletes. *Conclusions:* there was a significant improvement in competitive activity athletes. Athletes performed significantly more hits from the foul line and successful shots from long range compared to main rivals. Also increased the number of interceptions in games. Application of information technology had an impact on the competitive result: basketball team of Ukraine took the second place in the Deaflympics in Sofia in 2013.

**Keywords:** basketball, olympics, hearing, impaired, competition, efficiency, throw.

### Introduction

In modern basketball very player shall be able to accurately and timely make pass or catch ball in very sudden situation, to instantly change direction of dribbling or throw ball in basket without preliminary preparation [4-7]. Activation of defense actions, on the one hand, makes forward with ball to accelerate fulfillment of techniques and, on the other hand, it makes him to change their dynamic and kinematic structure, adapting to new conditions [7, 8, 9, 10, 13]. Activation of game and connected with it changes of conditions of game techniques' fulfillment result in certain changes in methodic of basketball players', having health problems, training [2, 3, 11, 12, 14].

In particular, methodic of visualization of information, which is perceived by ears by healthy female basketball players, has been especially urgent. Such information includes all coach's instructions both during trainings and during competitions, communication of female basketball players with hearing problem between each other in the course of trainings and in games. Traditional system of deal-mute communication in the course of trainings reduces motor density of trainings. In this connection working out of technologies, which would permit to maximally visualize and ensure prompt perception of information, usually transmitted in healthy sportswomen's teams with the help of speech, has become especially urgent.

The research has been conducted in compliance with "Combined plan of scientific –research work in sphere of physical culture and sports for 2-11-2015" by topic 2.4. "Theoretical-methodic principles of individualization in physical education and sports" (state registration number 0112U002001) and according to governmentally financed by Ministry of education and science of Ukraine scientific-research work for 2013-2014 "Theoretical-methodic principles of application of informational, pedagogic and medical biological technologies for formation of healthy life style (state registration No. 0113U002003).

### Purpose, tasks of the work, material and methods

*The purpose of the research* is to work out and experimentally prove methodic of technical tactic training's, improvement of qualified basketball players, who have hearing problems, with the help of innovative technologies.

In the research 24 sportswomen of women combined basketball team of Ukraine (1<sup>st</sup> and 2<sup>nd</sup> line ups), who had hearing abnormalities, participated. Before research the age of sportswomen was within 25-30 years old; from them IMS – 8 persons, MS – 8 persons and CMS – also 8. For foundation of effectiveness of the applied by us in process of training of female basketball players with hearing problems author's methodic, we compared indicators of competition functioning of combined team of Ukraine and relatively stable women's combined team of Lithuania at main competitions. We processed records of 12 games with IIII of world championship (Italy, September, 2011), European championship (Turkey, July, 2012) for deaf sportsmen and 22<sup>nd</sup> summer Deaflympic games (Bulgaria, August, 2013). We registered quantity of throws and baskets of penalty, 2 scores', 3 scores' throws, grasp changes, pick ups at own and adversary's backboard, quantity of mistakes and fouls.

## Results of the research

*Methodological basis* of our work was theory of movements' control by N.A. Bernstein [1].

In his works N.A. Bernstein refused I.P. Pavlova's idea about open reflex arch and replaced it by ideas of sensor corrections (feedback) and reflex ring; for these ideas he was obstructed in 1949. As per N.A. Bernstein, for fulfillment of any movement brain not only sends certain "signal" to muscles but also receives from periphery organs of sense perception signals about achieved results and on their base generates new, correcting signals.

In this way the process of movements' formation takes place, in which between brain and periphery nervous system there exists not only direct connection but feedback as well. Bernstein formulated hypothesis that for formation of movements of different complexity "signals" are generated at different by their hierarchy levels of nervous system. With gaining of automatic character this function is delegated to lower level.

Human being has five levels of movements' formation, which are denoted by letters A, B, C, D and E and have the following names [1]:

A – level of tonus and posture;

B – synergy level (level of coordinated muscular contractions);

C – level of space field;

D – level of meaningful actions (meaningful chains);

E – group of highest cortical levels of symbolic coordination (writing, speech and etc.).

N.A. Bernstein's conception of leveled movements' formation characterizes every level of its morphological localization by leading afference level, by specific properties of movements, main and background role in movements [1]. The most ancient in phylogeny and creating earlier in ontogeny are sub-cortical level, conventionally designated by N.A. Bernstein as levels A and B. These levels are highly developed in animals. In experimental psychology of movements the greatest attention was paid to cortical levels C and D, as levels, intrinsic to "human", intellectual levels. Level E is the highest level of inspired-meaningful movement.

In our opinion, the most important for technical and tactic training of sportswomen with hearing problems, are levels C (space field) and level E (level of meaningful movements). As far level C is characterized by integration of signals, coming from outside, i.e. visual and hearing, then it is logic to assume that absence of one of them in weakly hearing sportswomen (in our case hearing) shall be compensated by expansion of information, received from operating analyzer (in our case from visual). This statement is also characteristic also for level E: deficit of information for understanding, coming from different sources, in connection with absence of hearing analyzer, shall be compensated by increasing of quality and quantity of signals, coming from visual analyzer.

Basing on mentioned ideas introduction of additional visual information, which would help to quickly transmit the required data, in training process of weakly hearing female basketball players, will facilitate perfection of both technical and tactical sportsmanship, because of compensating of information coming to movements' controlling levels deficit (meaning level C- space field and level E – understanding of movements and actions).

These principles served as methodological base for working out of informational technologies for training of sportswomen with hearing problems.

As a result of synthesis of theoretical principles and our experimental data [11, 12, 13, 18, 19, 22, 23] we worked out a system of tactic training of weakly hearing female basketball players (see fig.1), which was applied during 9 months in the process of training of women combined team of Ukraine for Deaflympic games, which took place on August 6-13, 2013 in Sophia.

In the base of our system of weakly hearing female basketball players' training we put received by us experimental data about peculiarities of physical fitness, competition functioning and psycho-physiological potentials: higher speed of visual responses, "caution" manner of game, lower level of physical fitness in comparison with healthy sportswomen. In connection with found peculiarities, in our system of tactic training we combined classic and author's tactic schemas with accent on periphery eyesight. We accentuated on method of visual aids in the process of mastering of tactic inter-actions; main result of this there was working out of author's visual aid with animation illustrations and application of LED LS Line-3-65-12-C for control of training process of female basketball players, who have hearing problems.

*Methodic of application of LED LS Line-3-65-12-C for control of training process of female basketball players with hearing problems is as follows.*

Basketball required combined efforts of all members of team, who shall act as one organism. It is known that the best way to intensify team's game is to improve every separate player's game. At every training coaches pay great attention to improvement of all basketball techniques in attack and defense. It is not very difficult for every coach to control healthy sportsmen, give them instructions or correct their mistakes. But if coach deals with deaf sportsmen, it is necessary to seek new means of training process's control, of trainings' mobility, intensity and working intensity [2, 3, 14, 17]. We used linear LED lamp LS Line-3-65-12 with control unit DriverBox-4-03-240 in training process of combined basketball team of Ukraine of sportswomen with hearing problems.

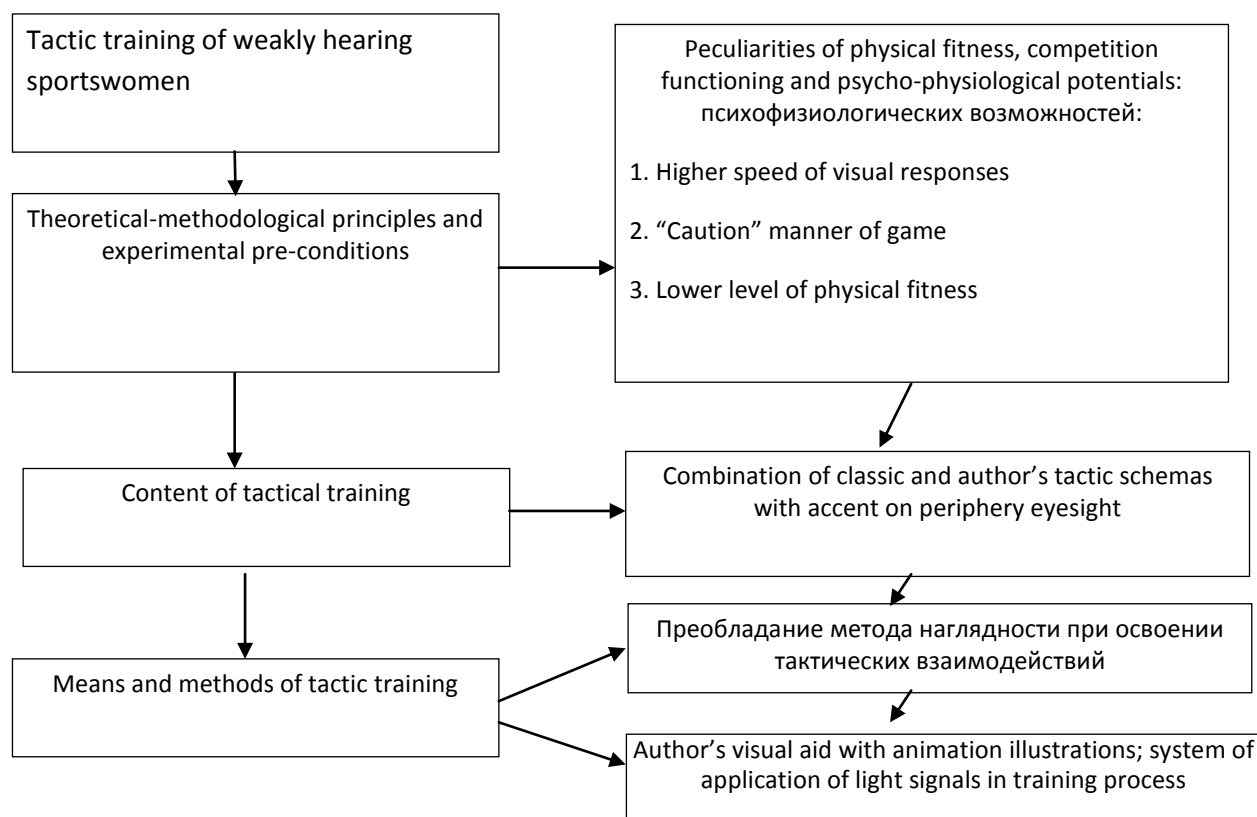


Fig.1. Author's system of tactic training of female basketball players with hearing problems

The quantity of LEDs is 12 (4RED+4GREEN+4BLUE). Total light flow was 1164Lm=4x94+4x155+4x42, color RGB, source of light 3W LED. Energy supply – current 700mA per one channel (3 channels in total). Life period – not less than 50 000 hours. Type of control signal - ШИМ current ma. Case was made of anodized aluminium. Cooling was of convection type. Control system - DriverBox-4-03-240. Protection - IP65. Dimensions (LxWxH) was 374mm x 64mm x 91mm. Mass – 1.5 kg. DriverBox-4-03-240 is control unit of LED four-color lamps; quantity of drivers – 3, power - 240W. DriverBox-4 functions as multi-channel controlled stabilized source of DC for semi-conductors – light sources.

DriverBox-4 consists of impulse power supply unit and of fro 1 to 12 independent three-channels DMX drivers. Impulse power supply unit (PSU) is designed for converting of AC 220 V into DC 24 V for energy supply of DMX drivers. Power of PSU depends on model of Driver Box. Driver is three channels current LED dimmer, controlled by protocol DMX512. Driver is a specialized independent device and consists of micro-controller and three controlled DC stabilizers.

This technical device was fixed at two basketball stands under backboards at eyes' level of sportswomen. We used 3 colors (red, blue and green); depending on color, sportswomen fulfilled certain action. For example, when passing from the spot, with red light, it was necessary to fulfill long pass with one hand; with blue light – middle pass with two arms; green – short pass in jump. Throws of ball were fulfilled in series, depending on light, from different points (red – 3 scores throws, blue – middle distance throws, green – throws from close distance). Also, light signal was used for improvement of group and team inter-actions; with the help of light color every player fulfilled appropriate combination or interaction.

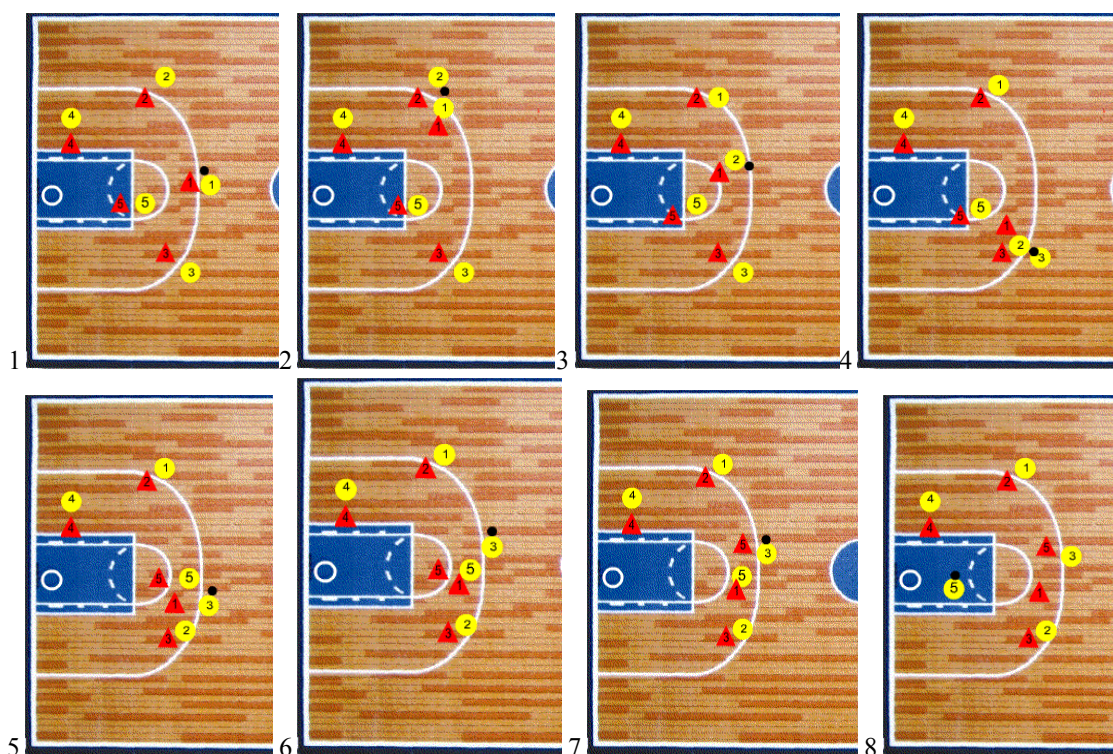
*Methodic of tactic training of weakly hearing female basketball players with the help of author's visual aid with animation illustrations.* As it is known, improvement of attacks and defense is resulted from constant training of correct interactions, first in little groups (two-three players), then – in all team with the help of exercises, including different aspects of attacks and defense [16, 13, 20, 21]. In our research we used interactive technologies, in particular – program «Macromedia Flash MX2004» [9, 13]. This program ensures tool devices for visual working out of multimedia documents, containing animation, audio, video, elements of user's interface, capable to maintain interactivity. We have received certificate of authorship for this work. Film is based on theoretical information about basketball tactic, on reviewing of existing tactic combinations. Central part of film consists of author's animation video-clips on certain tactic schemas of attacks and defense. Thus, we made vivid both: classic tactic interactions in basketball and author's one, developed especially for the given team in cooperation with coach. Advantage of our visual aids is that



tactic schema is perceived as something holistic, with simultaneous movement of all players, but not discreetly, like on magnet board.

In first days of training process of preparatory period every player was presented with all new and already mastered tactic animation illustrations. Coach explained all combinations and gave exact tasks for players depending on their role in game. During competition period female basketball players with hearing problems participated in Championship of Ukraine for women leans of supreme league; animation was widely used in main and auxiliary cycles of macro-cycle. Practically at every training coach demonstrated video-film, analyzed certain interaction and gave tactic instructions for coming training (see fig. 2).

For example, owing to the fact that in our team there was sufficiently experienced center forward, we tried to completely use her potentials in game and built schema of game interactions, considering this fact. Improving team interactions we used typical schema "Little eight". Which was built on numerous guiding and crossing of forwards and included our center forward in this interaction (see fig 2 (1-8)).



*Fig.2. Shots of author's video –aid with animation illustrations; illustration of tactic interaction "Little eight with center player"*

Player 1 with ball is in zone No.1, players 1,3,4 are in zones № 2 and № 3, № 5 accordingly (fig. 2 (1)). Player 1 dribbles ball to player 2 and in the moment of crossing gives him ball from hand to hand (fig. 2 (2)), then player 2 dribbles ball to player 3 and gives him ball in the same way; lines of attackers' movements resemble figure "8" (see fig. 2 (3) 2 (4)).

At this moment center player 5 starts movement to zone № 1 to provide screen against player with ball. After screen player 3 fulfills distant throw (see fig. 2 (5) 2 (6)).

If back 4 starts to counter act player's 3 throw, he throws ball to center play, who, after screen turns, leaving back 2 behind, and comes to free place under ring (see fig. 2 (7,8)).

Results of competition functioning of women combined team and its main adversary (women combined team of Lithuania) at main competitions, were as follows below. For foundation of effectiveness of applied by us author's methodic in training process of female basketball players, who have hearing problems we compared indicators of of competition functioning of combined team of Ukraine with relatively stable women combined team of Lithuania at main competitions. We processed technical records of 12 games from ИИИ of world championship (Italy, September 2011), Championship of Europe (Turkey, July 2012), of 22<sup>nd</sup> Deaflympic games for deaf sportsmen (Bulgaria, August 2013). We registered quantity of throws and baskets of penalty, 2-scores, 3-scores throws, grasp changes, pick ups at own and adversary's backboard, mistakes and fouls (see fig.. 3-5).

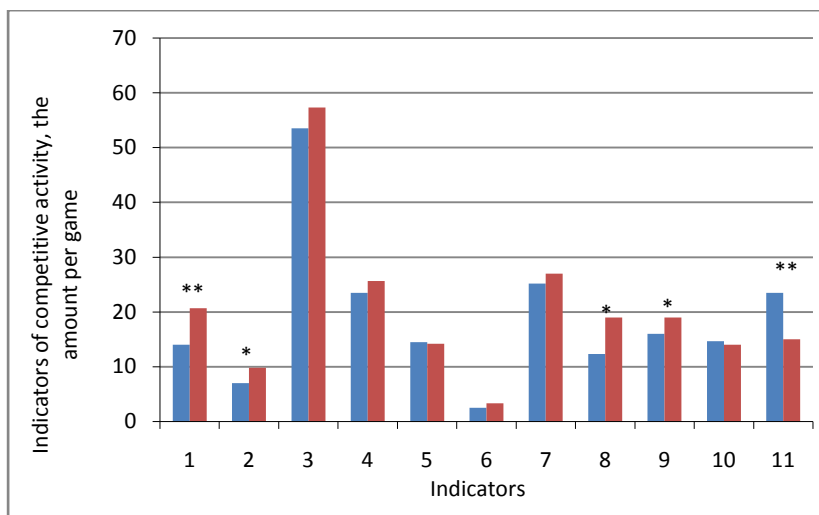


Fig.3. Indicators of competition functioning of Ukrainian women's combined team (n = 12) and Lithuanian women's combined team (n = 12) at basketball world championship for sportsmen with hearing problems:

\* - p<0.05; \*\* - p<0.01;

1 – penalty throws, quantity per game; 2 - penalty throws, quantity of baskets per game; 3 - 2-х очковые броски, количество за игру; 4 - 2-scores throws, quantity of baskets per game; 5 - 3- scores throws, quantity of baskets per game; 6 - 3- scores throws, quantity of baskets per game; 7 – pick ups at own backboard, quantity per game; 8 - pick ups at adversary's backboard, quantity per game; 9 –changes of grasp, quantity per game; 10 – fouls, quantity per game; 11 – mistakes, quantity per game.

■ - female basketball players with hearing problems; ■ healthy female basketball players

Analysis of data of 3<sup>rd</sup> world championship showed that sportswomen of Lithuanian combined team have confidently more penalty throws and baskets, pick ups at adversary's backboard that witnesses about correct location of basketball players on site under adversary's basket in attack, in moment of attack's finishing. It is necessary to pay attention to quantity of grasp changes, which were fulfilled in world Championship. Sportswomen of combined team of Lithuania turned out to be more dexterous and made confidently higher quantity of grasp changes than combined team of Ukraine.

Judging by fig.3 both teams nearly in the same was violated rules, but combine team of Ukraine made more violations that resulted in negative consequences. Also, Ukrainian combined team made nearly two times more mistakes than Lithuanian combined team (see fig.3).

Thus, performance of Lithuanian combined team at world Championship was better than Ukrainian combined team by all indicators that permitted for it to engage second place and win silver medals. Our combined team took third place.

In spite of sufficient fitness, especially for European Championship, which took place from June 29<sup>th</sup> to July 7<sup>th</sup>, 2012 in Konya (Turkey), Ukrainian basketball players with hearing problems were on fourth place. At the same time combined team of Lithuania again became silver prize-winner. Comparing teams' results we made the following conclusions. Quantity of throws and baskets from penalty line, fulfilled by teams were equal; 2-scores throws were fulfilled by 9,17 more during one game by Ukrainian team; Lithuanian sportswomen had by 4.67 basket less during one game (see fig. 4).

So, sportswomen of combined team of Lithuania, according to results of analysis, had better results at European Championship nearly by every indicator.

Application of interactive technologies in training process in the process of preparation to next competitions included the following. 22<sup>nd</sup> summer Deaflympic games took place from July 22<sup>nd</sup> to August 5<sup>th</sup> in Sophia, Bulgaria and positively influenced on level of sportswomen's technical and tactic fitness. After experiment we registered confidently better improvement of many indicators of competition functioning of female basketball players with hearing problems (see fig. 5).

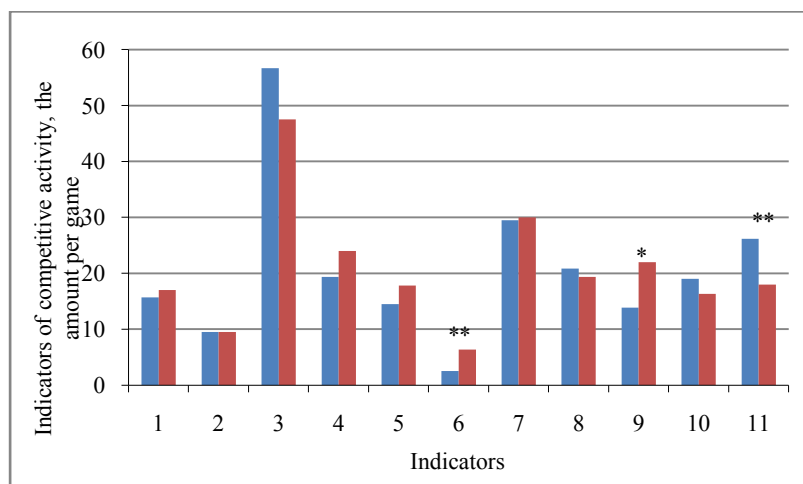


Fig.4. Indicators of competition functioning of Ukrainian women’s combined team (n = 12) and Lithuanian women’s combined team (n = 12) at basketball European championship for sportsmen with hearing problems:

\* - p<0.05; \*\* - p<0.01;

1 – penalty throws, quantity per game; 2 - penalty throws, quantity of baskets per game; 3 - 2-х очковые броски, количество за игру; 4 - 2-scores throws, quantity of baskets per game; 5 - 3- scores throws, quantity of baskets per game; 6 - 3- scores throws, quantity of baskets per game; 7 – pick ups at own backboard, quantity per game; 8 - pick ups at adversary’s backboard, quantity per game; 9 –changes of grasp, quantity per game; 10 – fouls, quantity per game; 11 – mistakes, quantity per game.

■ - female basketball players with hearing problems; ■ healthy female basketball players

After analysis of indicators of total functioning of Ukrainian and Lithuanian combined teams at 22<sup>nd</sup> summer Deaflympic games we could notice sharp changes in favor of our team (see fig. 5,6). It is necessary to note quantity of penalty throws: Ukrainian sportswomen fulfilled confidently more baskets from penalty line. After implementation of our methodic our female basketball players felt self-confidence that reflected on their 3 scores throws. Also Ukrainian players fulfilled more distant throws and baskets than Lithuanian players. Owing to improvement of defense system, Ukrainian sportswomen at this competitions increased significantly quantity of grasp changes in comparison with Lithuanian combined team. Only quantity of mistakes, made by both teams in game remained on the past level that is why it is necessary to work more actively on elimination of this problem. Increasing of competition efficiency reflected also on competition results: female basketball players of Ukrainian combined team took 2<sup>nd</sup> place on Deaflympic games 2013, in Sophia.

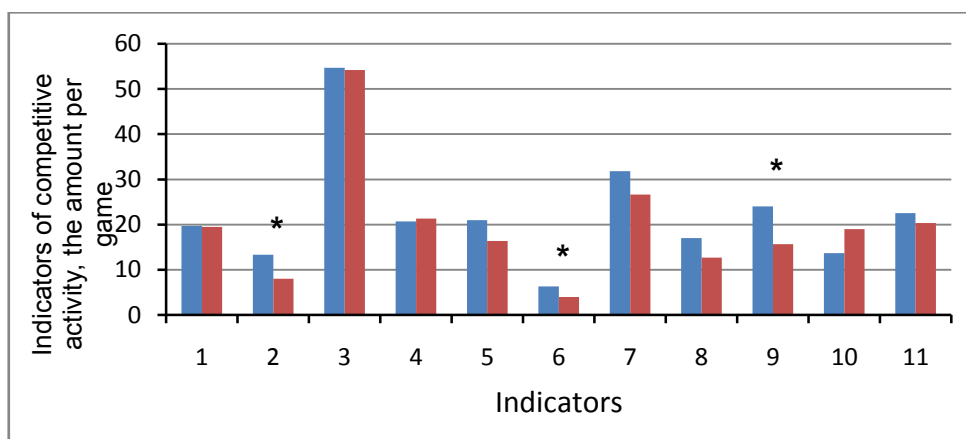


Fig.5. Indicators of competition functioning of Ukrainian women’s combined team (n = 12) and Lithuanian women’s combined team (n = 12) at summer Deaflympic games for sportsmen with hearing problems:

\* - p<0.05; \*\* - p<0.01;

1 – penalty throws, quantity per game; 2 - penalty throws, quantity of baskets per game; 3 - 2-х очковые броски, количество за игру; 4 - 2-scores throws, quantity of baskets per game; 5 - 3- scores throws, quantity of baskets per game; 6 - 3- scores throws, quantity of baskets per game; 7 – pick ups at own backboard, quantity per game; 8 - pick ups at adversary’s backboard, quantity per game; 9 –changes of grasp, quantity per game; 10 – fouls, quantity per game; 11 – mistakes, quantity per game.

■ - female basketball players with hearing problems; ■ healthy female basketball players

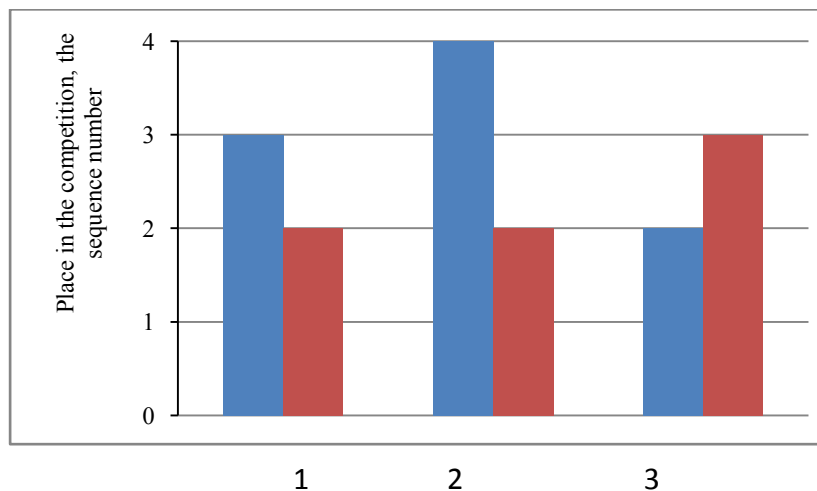




Fig.6. Indicators of performances of Ukrainian women's combined team Lithuanian women's combined team at world competitions for sportsmen with hearing problems:

-  - combined team of Ukraine; -  mbined team of Lithuania

1 – World Championship; 2 – Championship of Europe; 3 – Deaf-Olympic Games.

#### Conclusions:

Thus, at 22<sup>nd</sup> Deaflympic games sportswomen from Ukraine demonstrated better results. It was connected in first turn with intensification of trainings of Ukrainian combined team in comparison with training for previous championships that surely gave positive result. Intensification was achieved owing to new system of communication of coach with sportswomen, i.e. owing to application of new methodic of training process's improvement. The prospect of further researches imply improvement of information technologies' system for training of sportswomen with hearing problems.

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