

**II International Scientific Conference GCPMED 2019
"Global Challenges and Prospects of the Modern Economic Development"****SPORTS GAMES AS EFFECTIVE MEANS OF HUMAN
ADAPTATION TO MODERN LIVING CONDITIONS**

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Abstract

The most important task of human education is the formation of a highly professional, socially active, creative, physically developed person who is aware of his duty and place in the development process of a new society. The solution of this task is only possible for those people who have a high level of health that meets the modern society requirements. A large role is given to physical culture, namely sports games as an effective means of influence on the development of physical qualities, motor abilities, physiological systems, psychophysical properties, moral and volitional qualities. The success of mastering a sports game, and, consequently, the improvement of the above-mentioned qualities and properties largely depend on the ability to actively participate in sports games, meaningfully apply gaming techniques. Only under this condition, the sports game will be developing and educating. The use of sports games for health strengthening can be achieved by applying the rational placement of players on the playground during the game. Determination of the optimal locations of players on the playground was carried out by methods of mathematical modeling. The usage of obtained results will influence positively the intensity of the game and the effectiveness of sports impact on the health of involved people. That, in turn, will contribute to effective social and professional adaptation of people in modern conditions.

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1. Introduction

The modern changing world places high demands on human health, which is an important component of life that enables individuals to achieve significant results in their professional activity and have an active position in the social life, which ultimately has a positive impact on the quality of people's life of all ages.

Among the variety of components ensuring the human health in modern conditions, the healthy lifestyle becomes more and more important. Physical culture and physical education occupy here a paramount position as factors determining development of necessary physical qualities (strength, speed, endurance, etc.), motor abilities (speed, coordination, etc.), improving human's physiological systems (cardiovascular system, respiratory system, etc.), as well as education of moral and volitional qualities of involved in sport activities people (friendship, collectivism, mutual assistance, commitment, courage, persistence, determination, etc.) (Kondaurova & Shikhovtsov, 2018). Only a high development level of the above mentioned qualities and body systems allows a person to fully adapt to the environment.

Considering the whole complex of physical culture means, it should be recognized that sports games are a universal tool providing comprehensive and harmonious human development, formation of the vital psychophysical properties of the organism: resistance to adverse external conditions, ability to rapid adequate response and 'switching' in accordance with the changing situation, volume and stability of the attention, etc. (Nikolaeva, Shikhovtsov, & Ivanova, 2015). However, the real practice often shows the inability of players to effectively apply the sports game to reach the goal of physical development and improvement of the health quality. It leads to negative consequences (lack of initiative, unsystematic and sometimes senseless actions in the game, etc.) and reduces the effectiveness of sports games' impact on engaged people.

2. Problem Statement

In our opinion, the formation of negative qualities through sports games is possible because of players' misunderstanding the philosophy in the game process, where the location of athletes on the playground plays an important role. Success in a sports game, in most cases, is determined by the choice of the right position on the play ground for a particular tactical and technical action. At the wrong or untimely choice of a position, the achievement of high results is quite difficult, and in the sports games with shock movements (tennis, badminton, volleyball) it is almost impossible. This fact has a negative impact on the development pace of sports games, the ability of players to clearly interact with teammates in the game, reduces their motivation to engage in sports games and inevitably leads to the inability to use sports games as an effective means of health promoting – an important factor in improving the life quality. The above clearly indicates the relevance of this study.

3. Research Questions

This research has the following tasks:

- to study the state of the research problem in the scientific literature;

- to develop a technology for determining the rational positions of players on the court to improve the efficiency of sports games;
- to define the importance of sports games for improving the life quality of people.

4. Purpose of the Study

The purpose of the study is to identify and justify the research method that contributes to the qualitative development of sport games as an effective means of improving health and life quality. The authors have developed the own technology based on the symbiosis of mathematical and pedagogical sciences which contributes to the effectiveness of the impact of sports on the involved people.

5. Research Methods

As part of the study, a theoretical analysis and generalization of the scientific literature on the considered issues was carried out. Based on the method of mathematical modeling, the optimal placement of players on the playground during the game was studied and analyzed. The results of the study were processed using the methods of mathematical statistics (Guba & Presnyakov, 2015).

6. Findings

No one doubts the importance of rational positions of players on the play ground (court) to achieve success in the competition. The proper placement of players is necessary for proper dealing with the game object (ball, shuttlecock, etc.), it promotes the activation of actions and interactions of players in the game. Determining the optimal placement of players on the court is possible by using the method of mathematical modeling, namely in the process of solving the optimization problem:

$$P_{\text{team}} = \sum_{n=1}^k P_n \rightarrow \max, \quad (1)$$

where P_{team} is the team probability of receiving the ball; P_n – probability of receiving the ball by the n^{th} player ($n = 1, 2, \dots, k$); ‘ k ’ – number of players taking the ball.

The value of P_n in (2) is determined from the expression:

$$P_n = \iint_s W_1(x, y) dx dy, \quad (2)$$

where ‘ s ’ is the area of integration, numerically equal to the part of the play area within which the player is able to receive the ball; to simplify the calculation P_n in (1), the shape of the play ground can be taken as a square; $W(x, y)$ – a truncated two-dimensional probability density that reflects the place where the ball hits the court.

The function value $W(x, y)$ at point A of the play ground with coordinates x_0, y_0 characterizes the limit:

$$W(x_0, y_0) = \lim_{\substack{\Delta x \rightarrow 0 \\ \Delta y \rightarrow 0}} \frac{P(x_0, y_0)}{\Delta x \Delta y}, \quad (3)$$

where $P(x_0, y_0)$ is the probability of ball hitting in the area of the defending team with the square $\Delta s = \Delta x \Delta y$.

This probability is determined by the limit formula of J. Bernoulli:

$$P(x_0, y_0) = \lim_{n \rightarrow \infty} \frac{m}{n}, \quad (4)$$

where 'm' is a number of hits of the ball in the court with coordinates x_0, y_0 ; 'n' – the total number of hits of the ball in the play ground.

When experimentally determining the probability density function, it is advisable to replace them with histograms. The height of the histogram as a percentage in each square (x, y) is determined by the formula:

$$W_i(x, y) = \frac{m(x, y)}{n} \cdot 100\% \quad (5)$$

To solve the optimization task 1 (determining the optimal coordinates of the players' placement in the defending team) we have developed a heuristic algorithm of defensive actions by receiving the ball.

The initial data for solving task 1 for the heuristic algorithm are: 1) histogram $W_1(x, y)$, a specific game situation is known; 2) the height of the histogram $\tilde{W}_1(x, y)$ in each square of the court; 3) the shape and size of a play ground 's'. When developing a heuristic algorithm for protective actions by receiving the ball, the form of the court 's' is adopted as a square with an area of $1m^2$.

The algorithm for finding the optimal location of the players in the defending team is quite simple: it is necessary in each of the protection zones (1, 2, ..., 6) to determine the squares (x, y) of the playing area where the evaluation values $\tilde{W}_1(x, y)$ are the highest. If the values $\tilde{W}_1(x, y)$ are equal in some squares, the initial position of a player receiving the ball is determined on the border of these squares (Kareva, Shikhovtsov, Nikolaeva, & Nikolaev, 2016).

The centers of squares determined by the above-described method, which have the highest probability of ball hitting, correspond to the most rational placements of players taking the ball from the opponent, that is, they are a reflection of the optimal strategy of the defending team in a particular game situation (Nikolaeva, Nikolaev, Shikhovtsova, & Shikhovtsov, 2015).

Sports games are a universal means of physical education, promoting health and improving the physical condition of people of all ages. The developed technology allows players to be rationally located on the play ground, which gives them the opportunity to actively participate in the game, thereby increasing the effectiveness of the impact of sports games on the health. The high level of health indicators allows a person to fully adapt to professional and social life and improve its quality.

7. Conclusion

Taking into account the fact of direct dependence of life quality on their health state, authors developed and offered to use the technology promoting activation of activity engaged in the sport game – effective means of health strengthening. The organization of game activity, taking into account the results of the conducted research, increases the health level of sports game participants. A high level of human health has a positive impact on the life quality.

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