Structure and content of the model of training for marathon runners, taking into account the features of the mechanism of energy supply of muscle activity

UDC 796.015

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Received by the editorial office on 13.06.2023

Abstract

Objective of the study was to develop the structure and content of a training model for marathon runners, taking into account the peculiarities of the mechanism of energy supply of muscle activity and to evaluate its effectiveness.

Methods and structure of the study. Twenty-three marathon runners from Russia aged 23 to 37 were examined. Runners specialized in marathon running. Preparation for the competition took place in two groups of athletes: "aerobic type" and "mixed type" energy supply of muscle activity. Means and methods of training were selected taking into account the peculiarities of the mechanism of energy supply of their muscular activity.

Results and conclusions. In the course of the study, it was found that the content of the marathon runners training model, taking into account the peculiarities of their mechanism of energy supply of muscular activity, should be formed from the standpoint of a systemic and program-targeted approach to the selection of training means and methods.

Training sessions, taking into account the peculiarities of the mechanism of energy supply of muscle activity, solve problems not only associated with the development of physical qualities in marathon runners, but also with a number of positive morphological changes in the structure of their muscles, ligaments and joints, as well as in improving the mechanism of energy supply of muscle activity. For the training of marathon runners, it is typical to solve special problems for the development of tempo and speed endurance.

As a result of the application of the experimental methodology of training in athletes, a significant increase in the indicators of the functional and reserve capabilities of the body was revealed.

Keywords: *marathon runners; training model taking into account the peculiarities of the mechanism of energy supply of muscle activity; the content of preparation for the competition.*

Introduction. The competitive activity of marathon runners makes high demands on the level of their physical readiness [2, 4]. The training of marathon runners is based on the development of tempo and speed endurance [6, 7]. Tempo endurance is necessary for athletes to maintain high speed in the process of running a distance, and speed endurance is necessary for them to increase running speed at the finish segment of the marathon distance. The development of these qualities is possible only with a targeted impact during training on their physiological systems and, in particular, on the mechanisms of energy supply of muscle activity [3, 5].

An analysis of the literature has shown that in most works the issues of applying methods for developing different types of endurance in marathon runners have not been sufficiently developed, where different types of energy supply of muscle activity would serve as a differentiation criterion.

Objective of the study was to develop the structure and content of a training model for marathon runners, taking into account the peculiarities of the mechanism of energy supply of muscle activity and to evaluate its effectiveness.

Methods and structure of the study. Twenty-three marathon runners from Russia aged 23 to 37 were examined. Runners specialized in marathon running. Preparation for the competition took place in two groups of athletes: "aerobic type" and "mixed type" energy supply of muscle activity. There were 11 ath-

letes in the "aerobic type" group, and 12 athletes in the "mixed type" group. The experiment was carried out for a year. Means and methods of training were selected taking into account the peculiarities of the mechanism of energy supply of their muscular activity. To substantiate the content of the marathon runners training model, the following were identified:

- types of athletes according to the mechanism of energy supply of their muscular activity;

- a comparative analysis of the indicators of the functional and reserve capabilities of the body of athletes of different bioenergy groups was carried out.

To solve this problem, the method of express diagnostics of the functional state and reserve capabilities of the body of athletes was used using the D&KTest program. The method of express diagnostics of the functional state and reserve capabilities of the body was used to determine whether athletes belong to one of the bioenergetic types. The program analyzed the height of the R and S waves of the electrocardiogram taken in standard and chest leads. As a result, indicators were calculated that characterize the power, capacity, efficiency of anaerobic and aerobic energy supply systems for muscle activity [7, 8].

The study assessed:

1. ANAME – the capacity of an anaerobic source of energy supply. Characterizes the ability to perform the load in the third, fourth and fifth zones of intensity.
2. ANAME (%) – anaerobic utilization capacity. Characterizes the predisposition of runners to anaerobic work in percent.
3. AME – the capacity of the aerobic source of energy supply. Characterizes the ability to perform the load in the first and second zones of intensity.
4. AME (%) – aerobic utilization capacity. Characterizes the predisposition of runners to aerobic work in percent.
5. OME – total metabolic capacity. It characterizes the overall performance of the body.
6. MAIEO – the power of an aerobic source of energy supply, characterizes the ability to manifest general endurance, as well as to recover after anaerobic work.

Improving the quality of the training process was achieved by using different methods of training marathon runners. The features of the energy supply of their muscular activity were taken into account:

- for athletes of the "aerobic type" to ensure muscle activity, tempo endurance developed mainly due to the method of standard-continuous exercise, and speed endurance due to the repeated method;

- for athletes of the "mixed type" of providing muscular activity, tempo endurance was developed by the method of variable-continuous exercise, and speed endurance by a combination of the repeated method and the method of standard efforts with a normalized number of repetitions of the segments being run.

Results of the study and their discussion. It has been established that training sessions, taking into account the peculiarities of the mechanism of energy supply of muscle activity, have a higher efficiency. They solve problems not only associated with the development of physical qualities in marathon runners, but also with a number of positive morphological changes in the structure of their muscles, ligaments and joints, as well as in improving the mechanism of energy supply of muscle activity [1]. These changes allow achieving better results in the training process of marathon runners.

Evaluation of the functional and reserve capabilities of the body of athletes before and after the experiment showed that the increase in the indicator "ANAME" in athletes of the "aerobic type" was 4.55 c.u. (8.3%), athletes of the “mixed type” group showed an increase of 7.70 c.u. or by 12.7% ($p<0.05$). The increase in the "AME" index among the athletes of the "aerobic type" group amounted to 17.2 c.u. or by 8.1% ($p<0.05$), athletes of the “mixed type” group showed an increase of 17.91 c.u. or by 8.7% ($p<0.05$). Evaluation of the dynamics of the "OME" indicator in the group of "aerobic type" athletes showed an increase of 22.07 c.u. or 9.0% ($p<0.01$), athletes of the “mixed type” group showed an increase of 25.91 c.u. or 9.4% ($p<0.01$). The increase in the indicator "MAIEO" in the athletes of the "aerobic type" group amounted to 6.71 c.u or by 9.2% ($p<0.05$), athletes of the “mixed type” group showed an increase of 4.02 c.u. or by 7.7% ($p<0.05$).

Studies show that success in preparing athletes for competitions largely depends on taking into account the individual characteristics of the mechanism of energy supply for the muscular activity of marathon runners. It is necessary to select such means and methods of training that would best correspond to the peculiarities of the mechanism of energy supply for the muscular activity of athletes.

It is known that the specificity of an athlete is most clearly reflected in the results of his performances at competitions. The level of readiness of marathon runners for competitions characterizes the level of de-

velopment of tempo and speed endurance and the peculiarities of their motivation to achieve high results in competitions. The distribution of heart rate by intensity zones in marathon runners of aerobic and mixed types is shown in Figures 1, 2.

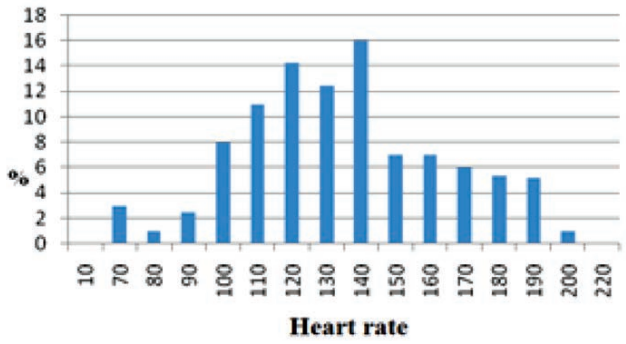

Figure 1. *Heart rate distribution by intensity zones in aerobic marathon runners*

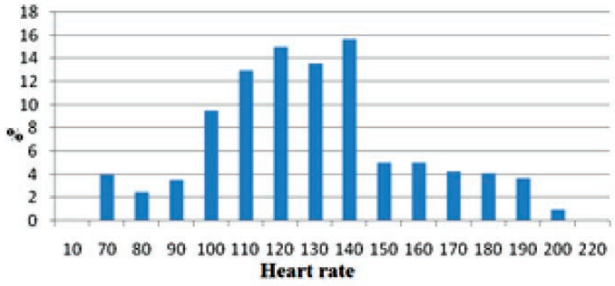

Figure 2. *Distribution of heart rate by intensity zones in marathon runners of mixed type*

In order to solve the problem aimed at improving the quality of organization and conduct of the training process with marathon runners, a model of training athletes was developed, taking into account the peculiarities of the mechanism of energy supply of muscle activity.

The main approach to building a training model for marathon runners was the distribution of means and methods for preparing athletes for competitions, taking into account the peculiarities of the mechanism for energy supply of muscle activity. In the course of the study, it was found that the content of the marathon runners training model, taking into account the peculiarities of their mechanism of energy supply of muscular activity, should be formed from the standpoint of a systemic and program-targeted approach to the selection of training means and methods.

A systematic approach to the selection of means and methods for training marathon runners made it possible to consider the training process as a set of structural components of the training process and their functional relationships in the course of preparation for competitions. These components of the training process and their functional relationship together determined a certain integrity and internal organization of the model for preparing marathon runners for competitions, taking into account the peculiarities of the mechanism for energy supply of muscle activity based on the breakdown of the load by heart rate zones for aerobic and mixed marathon runners (Figure 3, 4).

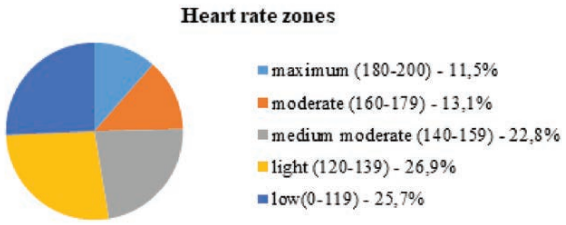

Figure 3. *Heart rate zone breakdown for aerobic marathon runners*

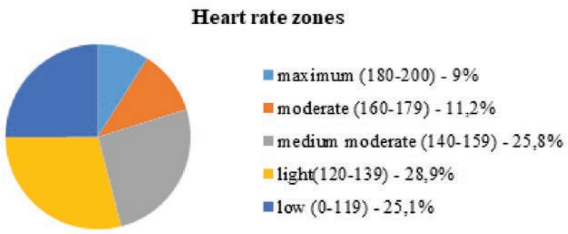

Figure 4. *Heart rate zone breakdown for mixed marathon runners*

When substantiating the model of preparing marathon runners for competitions, taking into account the peculiarities of the mechanism of energy supply of muscular activity, a program-targeted approach to the selection of means and methods of training was used. The basis for the application of the program-targeted approach to the selection of means and methods for training marathon runners, taking into account the peculiarities of the mechanism of energy supply of muscle activity, were the provisions that the basis of the model for preparing marathon runners for competitions should be: the goal of the training, the conditions for achieving it, the control of the training process, the results and their correction. The training process

in this case should be considered as the unity of the activities of the athletes and the coach in the course of preparation for the competition.

Thus, the use of systematic and program-targeted approaches to the selection of means and methods for training marathon runners was of no small importance for clearly setting the tasks of their preparation for competitions and determining solutions, taking into account the peculiarities of the mechanism of energy supply of muscle activity. An objective indicator of the high efficiency of the developed model of training marathon runners, taking into account the peculiarities of the mechanism of energy supply of muscular activity, was the results of the performances of the subjects of the experimental group at competitions. The results of their performances in marathon competitions were on average better than those of the control group by two and a half to three minutes.

Conclusions. As a result of the application of the experimental training methodology, athletes revealed a significant increase in the indicators of the functional and reserve capabilities of the body, namely: "AME", "OME". The data obtained allow us to draw a conclusion about the effectiveness of the experimental methodology for training long-distance runners, taking into account the peculiarities of the energy supply of their muscular activity.

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