THE TRAINING LOADS INDIVIDUALIZATION ON THE BASIS OF FUNCTIONAL AND RESERVE ORGANISM RESOURCES DETERMINATION OF GRECO-ROMAN WRESTLERS

A.S. Kuznetsov – doctor of pedagogics  
I.S. Mutaeva – candidate of biological sciences  
A.V. Ryabchuk – applicant  
Naberezhnye Chelny Branch of the Federal State Budgetary Educational Establishment of Higher Professional Education “Povolzhskaya State Academy of Physical Culture and Sport”  
Naberezhnye Chelny  
Y.Y. Krikukha – candidate of pedagogics  
Federal State Budgetary Educational Establishment of Higher Professional Education “Siberian State University of Physical Culture and Sport”  
Omsk

email: kzm_diss@mail.ru

Keywords: functional and reserve resources of an organism, adaptation, the method of express – diagnostics “D&K-Test”, the effectiveness of Greco-Roman wrestlers’ training, examples of the training cycles organization, individualization of the training loads.

Annotation. In functional training of Greco-Roman wrestlers one of the main aims is the training of the mechanisms of muscular work energy supply which is connected with such inner functional indices as power, volume, recoverability, effectiveness, the level of mobilization, metabolic processes realization. It is known that muscular work energy supply happens in two modes. The first mode is anaerobic, when energy compensation happens in case of oxygen deficiency. The second mode is aerobic, when the necessity of the organism for oxygen is fully satisfied.

Research methods: scientific-methodical literature analysis, the method of multifactorial express – diagnostics “D&K-Test” created by professor S.A. Dushanin.

Materials. Functional state indices and reserve resources of the wrestlers’ organism are defined and analyzed with the help of comparative analysis.

Results. Comparative analysis of the wrestlers’ currant state allowed to determine that during the research period there is decrease of aerobic resources, the level of working capacity, the power of glycolytic, aerobic sources of energy supply because of great training loads. Also there is a high general level of the wrestlers’ organism functional state.

On the basis of analysis of the integral functional state of the wrestlers there are positive changes of the adaptive abilities of the wrestlers. In the indices of anaerobic metabolic volume, which characterize anaerobic resources of the wrestlers, we see a positive dynamics.

Conclusion. Planning the training and competitive loads of Greco-Roman wrestlers should be held taking into account the bioenergetic profile of muscular work energy supply.

Urgency. In the adopted conception of a long-term social-economic development of the Russian Federation during the period till 2020 the role of physical culture and sport is determined as
human potential development. A modern strategy of professional sport development tells about the competitiveness of our wrestlers in the world, especially on the Olympic Games, World championships and Students games. High sport results in the Olympic kinds of sport are the reflection of the social-economic potential of the country. In order to achieve high sport results in the world it is necessary to use potentialities of the sport science, which include the use of progressive research methods. Thus in order to achieve high sport results it is necessary to search for new and effective methodologies and programs of sport training and their realization, taking into account individual and typological peculiarities of sportsmen’s organism.

For many years there is a complex diagnostics and evaluation of the sportsmen’s functional state by the specialists in the sphere of physiology, biochemistry and medicine, such as F.A. Iordanskaya, R.E. Votylyanskaya, V.S. Farfel’ and others. Moreover, the scientists held different research works on functional state definition and reserve organism resources determination of the sportmen. The specialists were always interested in the problem of energy supply of muscular work during different kinds of motion activity. First of all this question is about the energy resources of an organism and the ways of their compensation during sport training and during the period of restoration.

The aim of this research work is to improve individual training of Greco-Roman style wrestlers on the basis of functional and reserve resources of the organism determination.

Research organization. The research was held in inter-department laboratory of the branch of Povolzhskaya State Academy of Physical Culture, Sport and Tourism in Naberezhnye Chelny. 16 wrestlers of Greco-Roman style were studied (age range 17-23 years old). All the sportmen have the qualification of master of sports or candidate master. The average length of the trainings was 9 years.

Research methods. One of the methods which allows to evaluate the functional state without using invasive research methods and get information about the main parameters of aerobic and energy metabolism is the method of multifactorial express – diagnostics created by professor S.A. Dushanin. For the express – diagnostics of the sportsmen’s functional state we used the hardware-based program complex “D&K-Test”. This complex works according to the principle of electrocardiogram registration in chest leads according to Wilson - V3R, V1, V2, V4, V5, V6, of the first derivative in chest leads according to Wilson - dV3R, dV2, dV6. With the help of this hardware-based program complex the following indices were defined: anaerobic metabolic volume (anaerobic resources) (ANAMV); the volume of anaerobic utilization (anaerobic genotype) (%ANAMV); aerobic metabolic volume (aerobic resources) (AMV); the volume of aerobic utilization (aerobic genotype) (%AMV); general metabolic volume (the level of working capacity) (GMV); the power of kreatinephosphate source of energy supply (power endurance, reactivity, temperament) (PKP); the power of glycolytic source of energy supply (speed endurance) (PGL); the power of aerobic source of energy supply (maximum oxygen consumption ) (MASES); anaerobic metabolism threshold (economy, science, learnability ) (W ANMT); heart rate on ANMT (criterion of efficiency of aerobic source use) (heart rate ANMT); general energy fund (GEF). Also bioenergetics groups of the sportmen were defined, individual and current level of the wrestlers.

Research results. In the functional training of Greco-Roman style wrestlers one of the main aims is the mechanisms of muscular work energy supply training, which is connected with such inner functional indices as power, volume, recoverability, effectiveness, the level of mobilization, metabolic processes realization. Many authors mention that the functional resources of the organism are individual which is connected with the genotype conditionality of aerobic and anaerobic resources [3,4,6,7]. Some sportmen have the mechanisms of muscular work energy supply potential which provides the development of endurance or speed or strength and this conditions the character of sportmen’s organisms genotype to different types of loads [1, 2,5].

It is known that muscular work energy supply happens in two modes. The first mode is anaerobic, when energy compensation happens in case of oxygen deficiency. The second mode is aerobic, when the necessity of the organism for oxygen is fully satisfied.
For the individual planning of the training loads we defined the bioenergetic profile of the wrestlers. Picture 1 presents the classification of the wrestlers according to bioenergetic groups.

Picture 1. The classification of the wrestlers according to bioenergetic groups

Picture 1 shows that the first group includes 7% of the wrestlers, the second group includes 58%, the third group includes 21% of the wrestlers and the fourth group includes 14% of the wrestlers. It is noted that among the wrestlers who have the qualification of master of sports or candidate master prevails the second bioenergetic group which is characterized by predominance of aerobic – glycolytic type of energy supply of muscular work, a high level of learning capability, effectiveness, science, reactivity.

According to studied indices of functional and reserve resources of the wrestlers’ organism in January and March 2014 we see the following changes (Table 1).

Table 1

<table>
<thead>
<tr>
<th>Indices</th>
<th>ANAMV</th>
<th>% ANAMV</th>
<th>AMV</th>
<th>% AMV</th>
<th>GMV</th>
<th>PKP</th>
<th>PGL</th>
<th>MASE</th>
<th>W ANMAT</th>
<th>Heart rate ANMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>January</td>
<td>74,76</td>
<td>±30,92</td>
<td>22,31</td>
<td>±6,57</td>
<td>77,69</td>
<td>±6,57</td>
<td>327,8</td>
<td>±48,85</td>
<td>39,41</td>
<td>±6,24</td>
</tr>
<tr>
<td>March</td>
<td>77,87</td>
<td>±29,51</td>
<td>23,80</td>
<td>±6,10</td>
<td>76,20</td>
<td>±6,10</td>
<td>320,4</td>
<td>±45,34</td>
<td>30,69</td>
<td>±4,95</td>
</tr>
</tbody>
</table>

Comparative analysis of the wrestlers’ current state allowed to determine that during the research period there is decrease of aerobic resources, the level of working capacity, the power of glycolytic, aerobic sources of energy supply.

We also analyzed the integral functional state of the wrestlers. There are positive changes of the studied indices. In the indices of anaerobic metabolic volume, which characterize anaerobic resources of the wrestlers, we see a positive dynamics. We see a positive dynamics of all wrestlers’ indices increase: anaerobic type has increase to 15,2% (P > 0,05); the mixed type to 17,3% (P > 0,05); aerobic type to 18,9% (P > 0,05). The deviation from the model values of the wrestlers’ ANAMV was 6,67%, from the first stage to the second stage of the research works the changes into decrease to -1,66% was stated. If we consider bioenergetics groups, the average level of a current functional state and reserve resources of an organism is seen only in case of one sportsman.

In the indices, characterizing aerobic metabolic volume (AMV), we see the increase of average results: anaerobic type to 14,7% (P > 0,05); the mixed type to 16,2% (P < 0,05); aerobic type to 18,6% (P > 0,05). In the indices of general metabolic volume (GMV), characterizing the level of wrestlers’ working capacity, we see the indices increase in case of all sportsmen: anaerobic
type to 17% (P > 0.05); the mixed type to 16.1% (P < 0.05); aerobic type to 19% (P > 0.05). In power indices of kreatinephosphate source of energy supply (PKP) all wrestlers have increase to the second stage of the research: anaerobic type to 24.8%; the mixed type to 20.5%; aerobic type to 17.9%. In the indices, characterizing the power of glycolytic source of energy supply (PGL), we see positive changes of the wrestlers’ average indices in case of P < 0.05: anaerobic type to 25.6%; the mixed type to 16.5%; aerobic type to 6.9%. In the indices, characterizing the power of aerobic source of energy supply (MASES), i.e. maximum oxygen consumption, we see the decrease. Moreover, a deflection to 2.37% from model indices of MASES was defined. It is connected with the orientation change of the training process. Due to the competitions wrestlers have the increase of the training loads intensity and the decrease of the loads volume of aerobic orientation which influences the aerobic source of energy supply and oxidative muscle fiber formation.

In the indices, characterizing the anaerobic metabolism threshold (W ANMT) and the criteria of efficiency of aerobic source use (heart rate ANMT), all wrestlers have a positive dynamics of changes (picture 2).

**Picture 2.** The indices changes of the functional and reserve resources of Greco-Roman style wrestlers’ organism taking into account the bioenergetics profile, %

According to the results of the functional and reserve resources of an organism determination, on the second stage of the research we see that the wrestlers from the group of an anaerobic profile have the highest and the most reliable increase in the indices of PGL, PKP. The wrestlers from the group of an aerobic profile have the highest and the most reliable increase in the indices of AMV, GMV, W ANMT, heart rate ANMT. The wrestlers from the group of a mixed profile have the highest and the most reliable increase in the indices of ANAMV, PKP, PGL and heart rate ANMT.

In March the operative state and reserve resources of the wrestlers’ organism had minimum and satisfactory levels in case of high level of a current and integral states of an organism. It is connected with the fact that the research period coincided with the fulfillment of great training loads and competitions. In order to fulfill thorough control of the wrestlers’ functional state it is necessary to have operative control.

It is known that symbolically there are three levels of muscle work energy supply. But the use of kreatinephosphate is enough for 10-15 seconds of work, the use of glycolysis for 2 – 4 minutes. The ability of a person to resynthesis of adenosine triphosphate (ATP) in such cases is individual. They are also individual in case of aerobic mechanism. On the one hand, the power and volume of each level are conditioned by nature, on the other hand, the range each of them can be widened due to the training.

The main is the question concerning the organization of the training lessons taking into account functional and reserve resources of the wrestlers’ organism. We think that a training
process should be built in a way that the fulfilled training loads are directed to development of a necessary source of energy supply, taking into account the individual resources of an organism.

For example, the wrestlers from the third bioenergetic group are genetically predisposed to an optimal balanced level of energy supply of muscular work. But this statement allows to revalue own individual resources in the conditions of maximum stress. During the training the sportsman can be confident but at the same time can fail competitions. That is why we consider it reasonable to use the exercises of aerobic orientation. A low level of power endurance demands keeping power resources during the whole period of training.

The given bioenergetic group can be trained according to the mixed scheme where the principle of undulating alternation of the volume and intensity of the training and competitive loads correspond according to the principle of “pendulum”. The training process organization according to this principle provides possibilities increase of great volume of physical loads fulfillment with intensity increase. We can widely use a contrast alternation of “stressed” and “regulating” micro cycles in case of undulating changes of the volume and intensity of physical loads correspondence. In yearly macro cycle, especially during the period of direct training for the competitions, sequentially alternate stressed and regulating micro cycles. At the stage of direct training for the competitions it is recommended to include a base micro cycle into a training mesocycle during two weeks, where you can fulfill maximum possible volumes of the training loads, especially in the second and third zones of intensity. Then it is necessary to hold a restoration micro cycle where it is recommended to decrease general volume of physical loads to 50-60 %. Then it is reasonable to include stressed micro cycle with maximum use of a special training load where it is necessary to increase the volume of work in the fourth and fifth zones of intensity to 20-30%. Moreover it is reasonable to participate in one-two control battles and preliminary control competitions. Weekly micro cycle before the competitions includes the training loads, decreased in volume in comparison with a previous micro cycle for a full recreation. Before the main start the sportsmen have to train taking into account their state of health under control of the specialists. Before the important competitions, especially two or three days before them, it is necessary to hold a control training with the volume of 70 % of a competitive exercise. The training before the competitions can be held no later than three days before the main competitions. A day before the start it is recommended to hold a sucking training fulfilling the main techniques of the competitive activity.

During the preparatory period it is necessary to hold one or two trainings directed at a special power endurance development. And during the competitions it is reasonable to include a training directed at a special endurance development.

During a yearly cycle of training can be planned two or three competitions, during which the wrestler should show the best sport results.

We give an example of the recommended intensity zones of the training load fulfillment for the wrestlers from the third bioenergetic group, taking into account the current functional state: 1) restorative – heart rate 149 – 161 bpm; 2) aerobic - heart rate 162 – 173 bpm; 3) aerobic-anaerobic - heart rate 174 – 185 bpm; 4) anaerobic-aerobic - heart rate 186 – 197 bpm; 5) anaerobic – heart rate more than 197 bpm. Such an approach allows to define the wrestler’s training level, taking into account the effectiveness criteria of anaerobic and aerobic energy supply source use according to heart rate indices.

The second bioenergetic group, where the bioenergetic profile - aerobic- glycolytic type of muscular work energy supply – is characterized by a high level of economy, science, flexibility, reactivity of a wrestler’s organism. The representatives of this profile have a low level of anaerobic resources and a special power endurance.

During the training process it is reasonable to use the system of long-term training organization which is based on the principle of undulating alternation of the volume and intensity of the physical loads at the stages of sport perfection and a yearly cycle.

At the stage of a direct training for the competitions (three-five weeks or another period) the base (two-three weeks) and precompetitive (two-three weeks) micro cycles are sequentially used.
During the base micro cycle it is necessary to fulfill the training load of aerobic orientation, mainly in the first-second zones of intensity. During the period of preparation for the main competitions it is necessary to decrease the general volume of the training load of different intensity in the micro cycles to 40-50%. The volume of the training load in the fourth and fifth zones of intensity it is necessary to increase to 20-25%, participating in control trials and lead-in competitions using 5 or 6 starts.

The last control training is held three-four days before the competitions. The final sucking in training with the elements of competitions is held 16-24 hours before the start. In the micro cycles of the preparatory period it is necessary to plan two trainings directed at a special power endurance development, at the stage of a direct training for the competitions one or two trainings. The training directed at a special endurance development should be held only three-four days before the important combats.

The highest results it is reasonable to plan 2-3 times a competitive stage. We also present the recommended intensity zones of work for the wrestler from the second bioenergetics group, taking into account the indices characterizing the state of energy supply in the context of the comparative characteristics of a current state with individual model indices: 1) restorative – heart rate 139 – 151 bpm; 2) aerobic - heart rate 152 – 163 bpm; 3) aerobic-anaerobic - heart rate 164 – 175 bpm; 4) anaerobic-aerobic - heart rate 176 – 187 bpm; 5) anaerobic – heart rate more than 187 bpm.

Thus at the stage of maximum realization of Greco-Roman wrestlers’ individual resources one of the reserves of a further sport perfection is sports training individualization based on thorough study of the functional and reserve resources of an organism, search and application of the most effective means and methods of training.

The research allows to conclude that planning the training and competitive loads of Greco-Roman wrestlers should be held taking into account the bioenergetic profile.

**Bibliography**

2. Bogatov, A.A. The connection of intensity index of the regulatory systems and other indices of heart rate with a special working capacity of skiers-sprinters / A.A. Bogatov // Theory and practice of physical culture. – 2003. – №1. – P. 54-55.