

Original Article

Considering the current balance between lactate and alactate mechanisms of energy supply in preparation of free style wrestlers

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Abstract: The effectiveness of the method of permanent correction of individual training of skilled freestyle wrestlers considering the current balance between the individual components of anaerobic mechanism of energy supply have been experimentally justified. The base of the author's program is composed of the ratio between the indexes of biochemical monitoring (excretion of creatinine and lactate) during the pedagogical experiment in response to cycle ergometry "Vita maxima" and specialized check-up tests. The correction factor was to identify the individual balance between the lactic and alactic components of anaerobic energy supply, and to organize influence with appropriate exercises on the weaker link by involving the cluster analysis.

Keywords: Individualization, freestyle wrestlers, anaerobic mechanism of energy supply, permanent correction.

Introductions.

The experts highlight importance for the principle of individualization of special physical conditioning of skilled freestyle wrestlers (Medved, A.V., 2009; Karminčić H. 2009; Tovstonoh O., 2015). In doing so, they consider the following types of individualization: by the style of conduct (game oriented, speed oriented wrestler, power oriented wrestler, etc.) (Boyko V.F., 2014; Sazonov V. 2014, M. Sybil, 2018); by morphofunctional features, etc. We have found some research papers on the application of knowledge with the account of mechanisms of energy supply before our experiment (Sorvanov V.A., 2005; Sazonov, V., 2014). However, we have not discovered scientific materials taking into account individual characteristics of energy supply and options to correct individual training of skilled freestyle wrestlers according to these features. There were no experimental data about the features of individual dominance of anaerobic - lactic or alactic ways of energy supply during implementation of power-speed actions and application of this factor in the practical training of athletes. In our previous publications (Sybil M.G., 2015), we have thoroughly analyzed the results of pedagogical experiment, which confirmed our hypothesis about the importance of consideration of individual characteristics of energy supply in building the training process of skilled athletes on the example of freestyle wrestlers. Specifically, the participants of the main experimental group improved their physical fitness by 5-7%, which was much higher than the participants of the checkup group (by 1-2%). This contributed to the overall improvement of sports skills of the individuals from the main experimental group that influenced the results of their competitive activity (Sybil M.G., 2015). We observed prolonged reactions to the effectiveness of the experimental factor after the experiment, but after a while these effects decreased and sometimes ceased to act individually.

Purpose of the research of the next section of the research was to develop a program of permanent correction of individual training of skilled freestyle wrestlers considering the balance between the individual components of anaerobic mechanism of energy supply.

Materials and methods.

In the present paper the theoretical analysis and synthesis of scientific methodological literature and empirical research data; study and generalization of knowledge of the leading sports practice; pedagogical supervision; pedagogical experiment; functional methods (cycle ergometry "Vita maxima", specialized check-up tests); biochemical methods (rapid test methods for determining excretion of creatinine, lactic acid, "Lachema" company); methods of mathematical statistics have been used (Student t-test, cluster analysis SPSS Statistika 17). The research has been conducted at the Department of Biochemistry and Hygiene and the Department of Athletic Sports of the Lviv State University of Physical Culture. Forty skilled athletes in freestyle wrestling were involved in the research, including eleven Masters of Sports, fourteen Candidate Masters of Sports, fifteen first-class athletes. Athletes were divided into the main group (MG) and the comparative group (CG) based on the rule of random selection and they were homogeneous.

Pedagogical and biochemical monitoring for the growth of special skills and condition of the energy supply system has been conducted during the experiment. Cycle ergometry "Vita maxima" has also been used in the studies, which simulates specific loads of the wrestlers under laboratory conditions by the duration, intensity and energy volume. Creatinine (alactic criterion), lactic acid (lactic criterion) were used as biochemical markers of the anaerobic metabolism. The following tests were used to control physical condition: shuttle run 4×9 m; rope climbing 5m without feet; running around the head 10 times; handsprings with the head resting on the carpet to the "wrestler's bridge" and backwards 10 times; running with chasse steps around arms 10 times; exercise "Obstacle Course"; exercise "Passing under the legs". In addition, we have used a test to determine special endurance, which simulated competitive combat and a test for recovery after monotonic, specific work, the implementation of which lasted for 2 minutes. The heart rate was measured after the test and during the first minute of recovery. The recovery coefficient was calculated as follows: $Cr = S2/S1$, where S1 - heart rate after the test, S2 - heart rate one min after the test.

According to the increment of data of biochemical variables in response to the graduated loading, the experiment participants have been divided into separate clustered sets, the so-called alactics, lactics and mixed (Figure 1).



Figure 1. Distribution of athletes of the main and comparative group by belonging to a cluster set.

Then, according to these groups the athletes received the task to train during the experiment according to the author's program shown in Fig. 2. Given the individual percentage ratio between the alactic and lactic components in the implementation of specific muscular efforts of the wrestlers, the scope of "glycolytic" loading was expanded for the alactics, while "creatinephosphatic" for the lactics. Those who got into a clustered set of the mixed type underwent training according to the alactic or lactic type alternately within the duration of the experiment (Fig. 2).

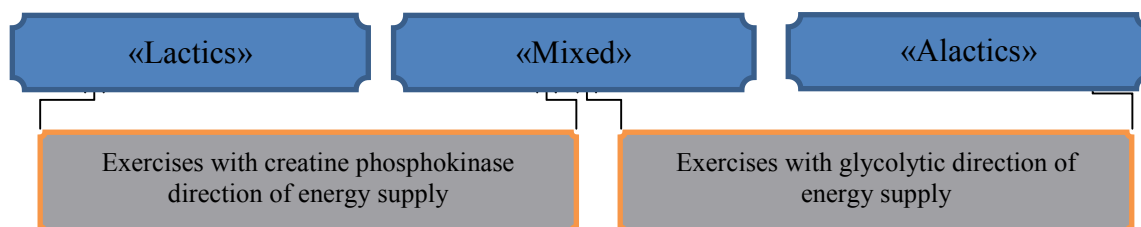


Fig. 2. Individualization of training process of wrestlers of the main group by belonging to cluster sets.

Results.

As can be seen from Fig. 3, the participants of the experiment were diagnosed in terms of individual characteristics with regard to the mechanism of energy supply during implementation of special muscular efforts by performing tests of special physical fitness, as well as by performing cycle ergometry "Vita maxima". The biochemical monitoring was carried out in parallel. The next step was to make ranking of all participants by the depth of biochemical shifts in response to the test data using the cluster analysis (HIERARCHICAL CLUSTER ANALYSIS, SPSS), which made it possible to establish personal "lactics" and "alactics" in percentage.

In accordance with this individual specific of anaerobic energy supply every representative of the main experimental group received a training program under micro and mesocycles, which underwent permanent correction according to the current biochemical screening. Individual training of the athletes was corrected in the "ex tempore" mode according to the results of the cluster analysis dendrogram. This dendrogram contained information about the current relationship between the indicators of deviations in the excretion of creatinine and lactic acid in response to the test graduated loading. This very relationship ("alactics-lactics") served the basis for calculating the percentage ratio between the exercises of alactic and lactic nature by the scope and intensity of their use in preparation of freestyle wrestlers.

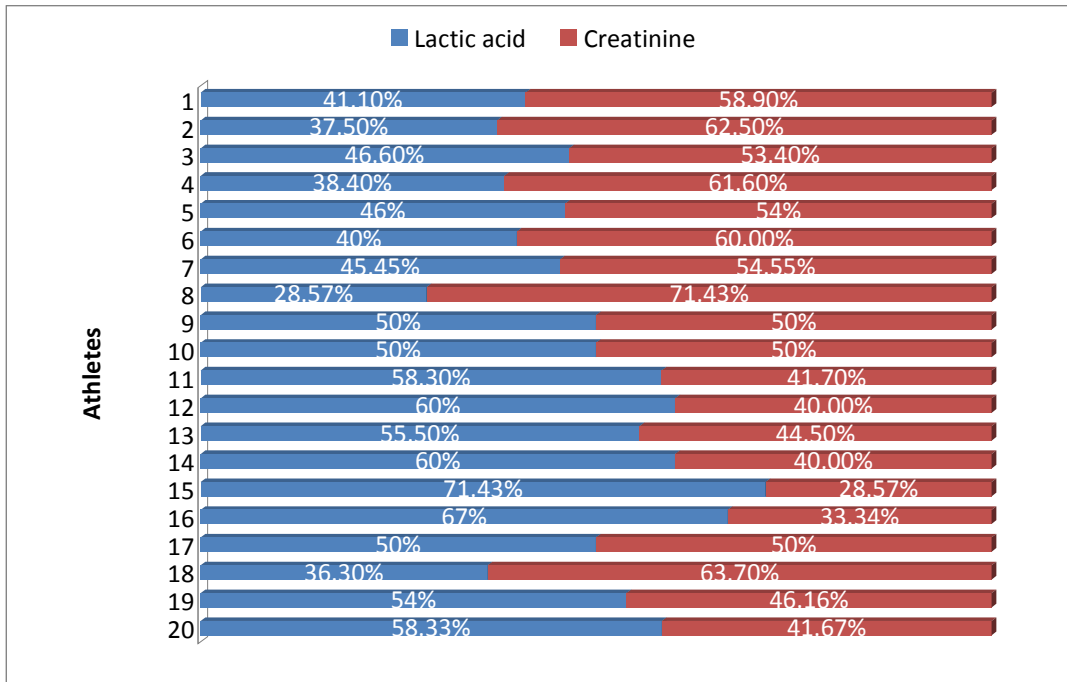


Fig. 3. Ratio of anaerobic components of energy supply in wrestlers before the experiment.

A similar biochemical screening was conducted in terms of severity of "alactics-lactics" after the experiment. As shown in Fig. 4 and Table 1, the representatives of the experimental group improved their "lactics", which was poorly expressed in them before the experiment (from 3.34% to 10%).

To the contrary, others – improved their lagging "alactics" (from 3.75% to 9.51%) with the exception of three representatives, whose results were close to the equivalent output values and weakly expressed difference is inherent to them, which determines their "alactics" or "lactics", i.e. they were close to the mixed type athletes. Interestingly, those athletes who had mixed type of realization of muscular efforts of anaerobic type remained so after the experiment.

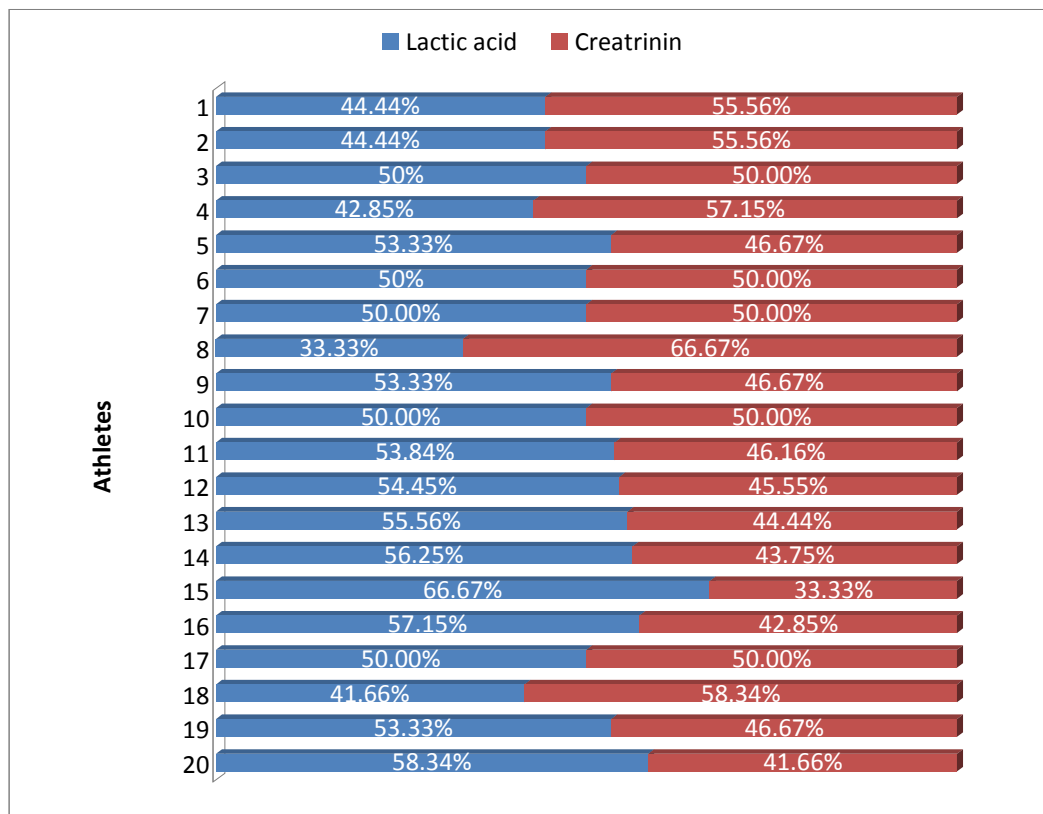


Fig. 4. Ratio of anaerobic components of energy supply in wrestlers after the experiment.

Table 1

Distribution of wrestlers' growth of anaerobic components of energy supply after the experiment

	rank	Lactics	rank	Alactics	rank	Mixed
1	11	4.46%	1	3.34%	9	3.33% (lact.)
2	12	5.55%	2	6.94%	10	-
3	13	0.6%	3	3.4%	17	-
4	14	3.75%	4	4.45%		
5	15	4.76%	5	7.3%		
6	16	9.51%	6	10%		
7	19	0.51%	7	4.55%		
8	20	0.1%	8	4.76%		
9			18	5.33%		

We have not observed similar changes in skilled freestyle wrestlers belonging to the comparative group.

Periodically, a checkup test together with a biochemical screening was carried out within a mesocycle. Again, the results were subjected to the cluster analysis, the current "alactics-lactics" was revealed and the individual loading was corrected according to the previously described method.

Discussion.

The obtained experimental data in the focus group confirms the effectiveness of the author's technique regrading individualization of the training process of freestyle wrestlers. As it was mentioned earlier, the author's program on wrestlers training was based on the singling out of the individual characteristics of anaerobic energy supply of the athletes. The individuals with a dominant alactic anaerobic component in the energy supply of muscle efforts were suggested the program for the development of their lagging lactic component, and vice versa. Thus, the suggested technique was aimed at expansion of the amount of exercises, which are dependent on glycolytic ATP resynthesis or creatine phosphokinase.

These actions were permanently repeated. As a proof of the effectiveness of the permanent corrective technique and use of the author's approach with the account of the degree of "alactics-lactics" in the implementation of muscular efforts pedagogical checkup data can be used. According to this part of the work, we can claim that the participants of the main group of the experiment have developed the speed-power qualities that contributed to the pronounced improvement of sports skills and performance in general. In particular, one athlete raised his skills from the Master of Sports to the Master of Sport of International Class, three athletes developed from the Candidate Masters of Sports to the Masters of Sports, three athletes from the first class to the Candidate Masters of Sports, three athletes got into the national team of Ukraine and eight athletes into the Regional team, which was not observed in the representatives of the comparative group.

Conclusions:

Thus, our research has created the foundation for experimental justification of our hypothesis that permanently targeted impact on the specific links of the mechanisms of energy supply leads to the expansion of boundaries of adaptation of the one, which is influenced. This approach, in particular, allows increasing the power-speed capabilities of athletes and their sports skills, overcoming individual genetically limiting restrictions inherent to every athlete in general.

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