Optimization of recovery processes for athletes using bioenergy means

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Abstract

Objective of the study was to assessment of the influence of bioenergetic exercises on the recovery process of track and field athletes specializing in 400 m running.

Methods and structure of the study. The experimental group consisted of 16 male athletes specializing in 400 m running at the age of 20,3 ± 1,5 years. The anaerobic glycolytic load corresponded to performing the main competitive exercise three times. During recovery periods between training tasks, bioenergetic recovery agents were used. Bioenergetic indicators characterizing the intensity of adaptation processes to the training load were recorded.

Results and conclusions. It has been established that the use of bioenergetic exercises during the recovery process accelerates the decrease in heart rate and oxygen consumption without causing accelerated removal of lactate from the blood plasma. The results of changes in heart rate and oxygen consumption indicate that bioenergetic exercise has a positive effect on the recovery processes of athletes.

Keywords: *track and field athletes, bioenergetic exercises, bioenergetic parameters.*

Introduction. Due to competition in elite sports, the level of volume and intensity of the training load has come very close to prohibitive indicators [4, 6]. Despite the fact that three training sessions a day are becoming the norm in some sports, there is an obvious tendency towards an additional increase in the extensiveness and intensity of training loads [2]. This is possible with regular planning of training work and activation of recovery processes [1].

One of the methods that helps accelerate the processes of adaptation to the training load is the use of bioenergetic exercises, the effect of which on recovery processes in sports has not been thoroughly studied [3, 5].

The means of bioenergetic recovery include bioenergetic breathing exercises, the development of elasticity of ligaments and the ability of muscles to stretch, movements to balance the energy fields of various bodily locations, massage products that improve the conductivity of nerve pathways, correction of energy meridians and emotional states associated with them, etc.

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Methods and structure of the study. The experimental group consisted of 16 male athletes specializing in 400 m running at the age of 20,3 ± 1,5 years. Each of the athletes participated in four tests, the content of which included a preliminary measurement of bioenergetic indicators at rest, warm-up, completion of the main training task, and measurement of bioenergetic indicators during the recovery period.

Basal metabolism was measured using a Quark metabolograph (Cosmed, Italy). Oxygen consumption (VO_2) in ml/min/kg was recorded. The anaerobic glycolytic load corresponded to three repetitions of the main competitive exercise in the 400 m race, which caused a high heart rate and lactic acid content in the blood. During rest periods between sets for five minutes, the pulse value and blood lactate concentration were recorded.

Bioenergetic recovery tools, including stretching, breathing exercises, and manipulative proce-

dures with the athletes muscles (massage, kneading), were used during recovery periods between training tasks.

The study analyzed 11 variables. Eight variables related to rates of heart rate decline during recovery. Declining indices are obtained by subtracting the heart rate value at a specific minute of recovery from the heart rate max value and dividing by the product of the number sixty per minute of recovery: HRi = (HR max – HR n) / 60×n.

Variables associated with blood lactate concentration (LT_2, LT_2, LT_2) characterize the decrease in values, which were calculated based on the difference between lactate concentrations in the first minute of rest and subsequent minutes of recovery. At the end of the training load, as well as in the second and third minutes of recovery, oxygen consumption was measured (VO_2 1, VO_2 2, VO_2 3).

Statistical analysis of the results was carried out using Statistica algorithms for Windows 8.0. Univariate analysis of variance (ANOVA) was used to analyze differences between group means.

Results of the study and discussion. In the standard recovery mode, indicators related to oxygen consumption have lower average values. Higher average values of VO_2 1 were found when using bioenergetic exercises (Table 1).

For all eight indicators of heart rate index reduction, the highest average values were observed when using bioenergetic exercises. Significant statistics of differences in means were obtained for 7 out of 15 variables, or in 46,7% of cases.

The reduction in blood lactate concentrations was minimal for all variables, both with the use of bioenergetic exercises and with the standard recovery regimen. No statistically significant differences were found for any pair of variables.

When interpreting the data obtained, it should be taken into account that the athletes body strives to maintain internal constancy both during training and during subsequent recovery, aimed at returning all body functions to their original state.

At the same time, an excessive amount, as well as a deficiency of bioenergy, disrupts the energy balance of the body, which makes it difficult to maintain homeostasis.

Taking into account that bioenergetics has a strong potential to influence the bodily and motor well-being of the body, the attributive connections of bioenergetic exercises contribute to the stabilization of the energy field and the intensive restoration of homeostasis. The additional energy generated by bioenergetic exercises stimulates the functioning of the sympathetic and parasympathetic systems, which determines their balanced state. Increased activity of one of the systems - sympathetic or parasympathetic - causes a neurophysiological imbalance, causing the resonant nature of autonomic reactions. High-intensity sympathetic stimulation of bioenergetics subsequently, predominantly through vagus nerve impulses, excites the parasympathetic part of the autonomic nervous system, which leads to vasodilation of blood vessels. According to recovery theory, this should result in a reduction in blood

Table 1. Indicators of bioenergy variables

Bioenergy parameters	Bioenergetic regulation	Standard holiday	F	p
HRmax	177,4±,5	178,7±7,2	4,53	< 0,05
VO_2 1, ml/min/kg	55,8 ± 5,8	51,2±5,4	3,48	< 0,05
VO_2 2, ml/min/kg	54,7±4,9	43,2±3,7	3,13	< 0,05
VO_2 3, ml/min/kg	39,2±37,6	36,5±28,6	3,65	< 0,05
HRi1	0,627±0,22	0,563±0,21	1,76	> 0,05
HRi2	0,538±0,17	0,498±0,58	3,64	< 0,05
HRi3	0,436±0,23	0,401±0,25	3,35	< 0,05
HRi4	0,344±0,35	0,327±0,34	1,63	> 0,05
HRi5	0,263±0,73	0,284±0,42	2,25	> 0,05
HRi6	0,637±0,54	0,533±0,56	4,78	< 0,05
HRi7	0,452±0,47	0,466±0,26	1,22	> 0,05
HRi8	0,368±0,55	0,357±0,44	1,69	> 0,05
LTi_2	0,99±0,02	1,32±0,08	1,87	> 0,05
LTi_2	0,75±0,09	0,86±0,04	0,89	> 0,05
LTi_2	0,73±0,06	0,84±0,06	1,57	> 0,05

pressure, oxygen consumption, heart rate, and blood lactate levels.

When considering the results obtained, some contradictions arise. When using bioenergetic recovery means, heart rate and oxygen consumption indicators show a dynamic trend toward an intense decrease in values, while the change in lactate concentration is diametrically opposite. Perhaps the described phenomenon is a consequence of the relative conservation of the physiological mechanism of lactate removal from muscles into the bloodstream.

Presumably, additionally obtained bioenergy quanta help to accelerate the process of restoration of all body systems, including muscle, to their original stable state. This ensures accelerated removal of lactate from muscle tissue into the bloodstream, which allows muscle cells to get rid of acidosis products as quickly as possible.

Thus, the concentration of lactic acid in the muscles quickly decreases, as a result of which its short-term accumulation in the blood plasma is observed. In this regard, a short-term increase in the concentration of lactate in the blood is only a transitional stage, helping to accelerate the process of excretion of ATP hydrolysis products in general, and is not a symptom of dysfunction in the athletes body.

Conclusions. Bioenergetic exercises have a positive effect on the recovery processes of track and field athletes specializing in 400 m running. The utilization of blood lactate after anaerobic exercise, in the case of bioenergetic exercises, goes beyond the scope of one session, but is also intensive in nature compared to the standard recovery regime for athletes.

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