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Rationale for determining the types of adaptation to predict in sport

Abstract. ***Purpose:*** *theoretical and practical study adaptation types beginners.* ***Materials and Methods:*** *the analytical synthesis of scientific literature data, the determination of the concentration of lactic acid testing of motor activity.* ***Results:*** *based on the parameters set lactate types of adaptation: «sprinters», «stayers», «mixed type».* ***Conclusions:*** *the establishment of types of adaptation makes it possible to recommend a special focus budding athletes in the sport.*
Keywords: *adaptation, types of adaptation, physical loading, growth of functional and physical indexes rates.*

Introduction. The research of a problem of adaptation allows predicting the level of physical and functional development and achievement in sport. It is shown by many authors that adaptation opportunities can develop only in the presence in an organism of certain genetic prerequisites [1; 3; 4; 6; 14]. This mechanism testifies to pre-adaptation or perspective adaptation that is to forestalling of some evolutionary processes.

In opinion [8; 20], evolutionary-phylogenetic signs possess a rather bigger heredity.

A doctrine about adaptation types in biology appeared in the seventies of the last century. On the basis of these data some models of types of adaptation are developed, however these results of researches generally showed the adaptation of a person to certain social and climatic conditions [3; 7; 10].

The process of the research of types of adaptation in sports activity began from 80th years of the last century actually and is relevant now [7; 8; 10; 15; 16; 21; 22]. So, V.P. Kaznacheyev [7] defines quantitative signs at the foundation of types of adaptation in the conditions of sports activity: “sprinters”, “stayers” and persons with the mixed adaptive “strategy”.

Features of a metabolism which are under the genetic control can be a probable basis of the arising distinctions in adaptation. However the author doesn’t show that it is possible to use as backbone factors which would reflect features of a metabolism at adaptation to specific physical activities.

Being guided by the theory of functional systems of P. K. Anokhin [2], many authors come to opinion that the result of action of this system acts as a backbone factor [5; 13]. Explaining this mechanism, they proceeded from such positions: 1) the anaerobic glycolysis is an indicator of urgent adaptation to muscular loadings, to a stress and a deviation indicator in a state of health; from a position of long-term adaptation metabolic process is defining at a certain neurohumoral regulation; 2) the anaerobic process prevails in fast motive units; 3) the anaerobic exchange of carbohydrates is followed by the formation of the metabolic deadlock (lactic acid). Therefore the lactate is an objective marker of anaerobic opportunities of adaptation to physical activities.

The objective of the research: the purpose of the real researches consists in an explanation of mechanisms of emergence of types of adaptation and their use for the determination of specifics of sports activity.

Materials and methods of the research. Annual observations of the same boys and girls are made (50 people – the experimental group and 50 people – the control group). Boys and girls of EG were engaged in running types of track and field athletics according to the program of initial sports preparation. Boys and girls of CG went in for physical culture according to the program of the comprehensive school. During a year the estimation of level of physical development, biological maturity, health, development of the leading qualities of biomobility, metabolic profile were carried out at children 4 times.

The tests recommended for the establishment of physical activity of pupils and young sportsmen were applied to the determination of nature of metabolic reactions. One of these tests was run of 300 m with the maximum speed. The response of organism of pupils was investigated on haemo-dynamics, biochemical indicators, and condition of the neuromuscular device. Blood sampling from pulp of a finger was carried out before and after loading. Lactate, glucose, urea, pH, parameters of red blood were defined. In a year examinees carried out step loading on the stationary bicycle in vitro for the determination of level of the general working capacity and indicators of adaptability of vegetative systems.

Results of the research and their discussion. Results of year researches on the same children who are engaged and not playing sports allowed to note that nature of metabolic reactions at muscular loadings is genetically predetermined and authentically interconnected with the nature of adaptation of organism of children to physical activities.

Already at this age (9–10 years old) boys and girls differed on the level of development of the process of anaerobic glycolysis. Three types of adaptation metabolic reactions are established.

The first type of metabolism - “stayer” – is characterized by that anaerobic glycolysis is involved slightly at physical activity (run on 300 m). The work is carried out mainly due to aerobic providing. The quantity of lactate in blood doesn’t exceed the relative level PANO (4,0 mmol • l^{-1}).

The second type of metabolism – “sprint” – is characterized by that anaerobic glycolysis is pronounced at physical activity (run of 300 m). The concentration of lactic acid is within 8 mmol • l^{-1}.

The third type of metabolism – “mixed” – is characterized that the concentration of lactic acid is in organism of children ranging from 5 till 0,8 mmol • l^{-1}.

Analyzing the received results, it is established that features of metabolic reactions under the influence of the training program fluctuated wavy and didn’t keep within any rigid borders. However the established dependence defines conditions of fitness after loading (tab. 1).

The presented results accurately define a dependence of speed – a lactate which gives the grounds to conclude: high-speed endurance develops depending on the level of anaerobic glycolysis [17–20].

Table 1

Dynamics of biochemical indicators at run of 300 m who are engaged and not playing sports

Indicators	EG (n=50)	CG (n=50)	Reliability of distinctions
Dormant state			
HR (bpm^{-1})	88,05±3,12	87,6±3,05	p>0,05
Lactate (mmol·l^{-1})	88,03±0,07	4,02±0,03	p<0,05
Glucose (mmol·l^{-1})	7,08±0,09	4,53±0,7	p<0,01
Urea (mmol·l^{-1})	5,45±0,36	6,73±0,41	p>0,05
Work			
Time (s)	59,05±1,07	63,05±3,05	p<0,05
Speed (m·s^{-1})	6,4±0,03	4,7±0,7	p<0,05
1-st minute of restoration			
HR (bpm^{-1})	1,78±19	1,85±12,0	p<0,05
Lactate (mmol·l^{-1})	15,37±2,9	14,28±6,3	p<0,05
Glucose (mmol·l^{-1})	5,71±1,03	6,37±0,83	p<0,05
10-th minute of restoration			
HR (bpm^{-1})	123,5±9,1	138,8±8,1	p<0,05
Lactate (mmol·l^{-1})	14.78±1,25	17,83±9,1	p<0,05

At influence of the unambiguous training program in which there was no purposeful development of high-speed endurance, it is revealed that boys of the "sprint" type of a metabolism and with the "mixed" type had almost identical rates of its gain (24,9% and 23,8%), whereas rates of a gain of indicators of high-speed endurance made only 16,5% at boys with the "stayer" type of a metabolism.

At girls in a year of sports activities rates of a gain of indicators of high-speed endurance made: the "sprint" type of a metabolism – 26,6%, with the "mixed" type – 19,5% and with the "stayer" – 8,75%. At the girls who aren't playing sports such dependence was defined: the "sprint" type – 14,4%, the "mixed" type – 14,0% and the "stayer" type – 3,96%.

Long-term researches testify that specifics of metabolic reactions are in considerable dependence on features of the neuromuscular device [11; 12]. So, children with the type "sprint" of a metabolism authentically exceeded in indicators of the maximum "explosive" force, and with the type "stayer" – indicators of power endurance.

At the age of 9–10 years old boys and girls with the type "sprint" of a metabolism were ahead of the contemporaries in the weight, growth, the circle body sizes, and with the "stayer" – were less than growth easier. Already from the first investigation phases it is established that boys and girls of the type "sprint" of a metabolism surpassed the contemporaries in test indicators with a breath delay.

A certain interest was shown by authors [9; 12] to a condition of the cardiovascular system. Girls and boys of 9-10 years old with the "sprint" type of a metabolism are ahead of the contemporaries on the development of myocardium (tab. 2).

The reliable distinctions between indicators of children are established in the response of an organism to loading and restoration processes. The deepest shifts were installed in the haemo-dynamics at persons with the "sprint" type of a metabolism, the smallest – with the "stayer" type.

To concretize an adaptive typology in sport more, we suggest altering some her concept presented in the monograph of T. I. Alekseeva [1].

The adaptive type is the adaptation of a human body to physical activities which is representing a norm of biological reactions to physical impact and having external expression in specifics of biomobility and morphofunctional manifestations. Any type of adaptation is predetermined genetically.

Features of a metabolism at physical activities and nature of adaptation of organism of children (9–10 years old) are authentically interconnected with the formation of specifics of constitutional typology: "sprint", "stayer", "mixed" [7].

The constitutional type of "sprinter" is characterized by the high level of not only aerobic, but also anaerobic glycolytic exchange, ability adequately to transfer the hypoxemic influences arising at muscular activity. Children with such constitutional feature are ahead of the contemporaries in rates of physical development, physical working capacity, in the level of manifestation of force, speed, high-speed and power endurance. At this age category – 9–10 years old – the carbohydrate anaerobic exchange is early very much interfaced with proteinaceous one that is a specific adaptation manifestation.

Children with the constitutional type of "sprinter" quickly adapt for physical activities of high-speed and power character. A sportsman can execute for training classes the considerable volume of work with high intensity. It causes considerable deviations in a homeostasis of muscles and blood. The excess accumulation of a lactate causes a decrease and blocking

Table 2

Dynamics of biochemical indicators at run of 300 m who are engaged and not playing sports (according to L. G. Kharitonova, 1991)

Indicators	EG (n=50)	CG (n=50)	Reliability of distinctions
Girls of 9-10 years old			
Sinus arrhythmia	18,7	10,2	25,5
Sinus tachycardia	6,2	38,3	41,5
Signs T-infantile	6,2	50	16,5
Regular rhythm, reaction to adequate loading	68,8	2,8	16,5
Boys of 9-10 years old			
Sinus arrhythmia	36,5	14,2	35,5
Sinus tachycardia	15,5	35,7	11,7
Signs T-infantile	0	28,5	11,7
Regular rhythm, reaction to adequate loading	48,1	21,6	41,1

of an oxidizing way of resynthesis of ATP during a restoration. The organism of sportsmen is more slowly restored in such constitutional typology. Sportsmen of this population have most often certain deviations in a condition of cardiovascular system at sports that is they are most sensitive from the point of view of an assessment of a state of health.

The constitutional type "stayer" is characterized by slightly other fenogenetic properties – low rates of the level of physical development, low ability to transfer hypoxemic influences. The development of organism of children of this constitutional typology is carried out generally due to oxidizing resynthesis of ATP.

Specific features in physical activity are shown at children of the constitutional type "stayer". They are capable to perform work of power, high-speed and power character in a lesser extent. But they are capable to manifestation of types of endurance; there are no pronounced functional shifts in acid-base balance and haemo-dynamics.

The constitutional type "mixed" is intermediate between two extreme types. However depending on an orientation of purposefulness of the motive activity their adaptation opportunities come nearer either to "sprint", or to "stayer" type.

Conclusions:

1. The offered results of the research allow defining objectively types of adaptation of sportsmen-beginners that gives the grounds to recommend a special orientation in sport specifically.

2. The correction of the educational-training process of sportsmen-beginners on the basis of types of adaptation opportunities provides achievements of high level of fitness in a concrete kind of activity.

Prospects of further researches. It is necessary to establish adaptation types at the initial stages of the training process which will provide a purposeful development of special working capacity.

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