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Features of high-speed and strength qualities development in young biathlonists aged 14–15 in the preparatory period

Abstract. Purpose: to substantiate a methodology of high-speed and strength qualities development of young biathlonists aged 14–15 during the preparatory period. **Material and Methods:** young biathlonists aged 14–15 from control and experimental groups took part in the research. There were 12 athletes in each group. Pedagogical methods and methods of mathematical statistics were used in the work. Pedagogical methods of researches were used for level definition of high-speed and strength qualities development of young biathlonists. **Results:** reliable increase of motive qualities and polydynamometry results testing of young biathlonists from the experimental group due to implementation of the experimental methodology in the preparatory period is established. **Conclusions:** application of the developed complexes in the preparatory period in the experimental group of young biathlonists aged 14–15 allows to raise indices of motive qualities and polydynamometry testing statistically significantly.

Keywords: young biathlonists, testings, motive qualities, polydynamometry.

Introduction. The characteristic manifestation of complex forms of high-speed abilities in difficult motive acts, such as ability to the achievement of high level of remote speed, ability quickly to gather speed on start, to carry out with a high speed of the movement, connected with firing, dictated by the course of a competitive fight in the training and competitive activity in cross-country skiing and biathlon [1; 2; 4; 7]. The level of high-speed abilities is influenced by features of muscular tissue – a ratio of different muscular fibers, their elasticity, tensile properties, and a level of intramuscular and muscular coordination [3]. The manifestation of high-speed abilities is closely connected with a level of the development of force, flexibility and coordination abilities, the improvement of sports technique, opportunities of biochemical mechanisms to the fastest mobilization and resynthesis of alaktate anaerobic suppliers of energy, a level of strong-willed qualities [5; 6].

The objective of the research: to prove a technique of the development of high-speed and power qualities of young biathlonists of 14-15 years old during the preparatory period.

Material and methods of the research. Young biathlonists of 14-15 years old of the control and experimental groups in number of 12 sportsmen in everyone took part in the research. Pedagogical methods of researches of the definition of a level of the development of high-speed and power qualities of young biathlonists and methods of mathematical statistics were used.

High-speed and power exercises were used within two main methods in the course of physical training of young biathlonists of the experimental group – continuous and interval. The continuous method is characterized by a single performance of physical exercises which was used at an all-preparatory stage of an annual macrocycle. The interval method provided a performance of exercises with the regulated rest pauses.

Exercises were carried out as in uniform and variable modes during the usage of these methods.

Biathlonists applied a big set of exercises which can be divided into groups conditionally for the development of force of muscles and speed of their reduction. The first group – power exercises which are carried out with big weightings:

- crouches with a bar or a partner on shoulders (till the near limit weight), jumping with a weight on shoulders (20–30 and more kilogram);
- exercises with weighting and resistance for the selective development of force of separate muscular groups: muscles which bend a foot; muscles of an abdominal tension; back muscles; muscles of a back surface of a hip; muscle-benders of fingers of hands; muscle-benders of hands in an elbow joint;
- exercises on apparatus and climb a rope on hands; exercises on wall bars.

The second group – is high-speed and power exercises, which are carried out with small encumbrances, but with as is possible bigger speed. Exercises with an easy bar which are carried out at fast speed belong to this group, but the main group is formed by throwing of apparatus of different weight, different ways.

The third group – is jumping exercises with different extent of encumbrance, and also in conditions which trouble their performance (a soft ground, an increase in amplitude of bending of joints of a foot, pushing away from a high running start).

The fourth group – is jumping exercises which are carried out without encumbrance (different jumps and many-gallops).

The first four groups of exercises were used at the all-preparatory stage of an annual macrocycle, the following – is on the specially-preparatory stage.

The fifth group joined special exercises.

Young biathlonists of the experimental group applied to the purposeful development of high-speed and power abilities: special high-speed and power training with application of apparatus and exercise machines; high-speed and power training on ski-rollers; complex of imitating and preparatory exercises; change of the mode of a remote work.

High-speed and power trainings on apparatus and exercise machines were carried out by a circular method: bending and extension of hands in an emphasis on parallel bars; jumping up from a crouch; simultaneous work as hands on the exercise machine; a trunk raising from lying position on hips; jumps in attack with change of feet; attack aside to sit down, a push of a foot to transfer weight on other foot; alternate work as hands on the exercise machine; arching in a back, lying on hips; knee-bend with encumbrances; bending and extension of hands in lying position; transition from the provision of a deflection to situation hung, having bent.

The mode provided the performance of exercises with the greatest possible frequency that allows keeping a structure and amplitude of movements. The time of an exercise performance is 30 s; a rest-hour – till 1 min; quantity of series – 3; a rest-hour between series – 5–7 min.

Specially- preparatory exercises were aimed not only at the development of power and high-speed and power abilities, but also at the increase of extent of their realization in the competitive activity.

Exercises for the improvement of quality of firing after loadings in complex and shooting trainings were also used in training classes of young biathlonists of the experimental group.

As tests what answered the direction of the training process were used at stages of an annual macrocycle. The researches were conducted during 2010-2012 in two stages. At the first stage (2010-2011) two groups – control and experimental on 12 sportsmen of 14-15 years old who were distributed by results of testing of motive qualities and indicators of a functional state took part in the research.

The noted tests answer tasks of trainings of 14-15-year-old sportsmen in the preparatory period.

Results of the research and their discussion. The testing of motive qualities of young biathlonists of 14-15 years old of the control and the experimental groups held at the end of the preparatory period found an essential difference between results of tests (tab. 1).

Table 1

Results of testing of motive qualities of biathlonists of 14-15 years old of the control and the experimental groups at the end of the preparatory period (October in 2010) (n1=n2=12)

№	Indicators of testing	Control group	Experimental group	Assessment of probability	
		\bar{X}_1+m_1	\bar{X}_2+m_2	t	p
1.	Pulling up on a cross-piece, quantity of times	8,4±0,48	10,5±0,50	3,04	<0,01
2.	Bending and extension of hands in lying position, quantity of times	24,1±1,22	28,6±1,24	2,59	<0,05
3.	Raising and lowering of direct feet from a deflection on a cross-piece, quantity of times	12,3±0,74	14,8±0,75	2,36	<0,05
4.	Long jump from a place, sm	196,4±3,14	208,7±3,17	2,75	<0,05
5.	Shuttle run of 4x9 m, s	12,1±0,94	10,8±0,86	1,02	>0,05
6.	Cross run of 3000 m, s	678,2±3,10	668,1±3,08	2,31	<0,05

So, the received results of indicators which answer the general training of biathlons, are much higher in the experimental group. If a statistically reliable difference in indicators didn't exist at the beginning of the researches, they have an essential difference at the end. In the experimental group the average result in pulling up on a cross-piece made 10,5 times, while in the control group 8,4 times ($t=3,04$; $p<0,01$), in bending and extension of hands in lying position 28,6 times against 24,1 ($t=2,59$; $p<0,05$) control, raising and lowering of direct feet from a deflection on a cross-piece respectively 14,8 and 12,3 times ($t=2,36$; $p<0,05$), to a long jump from a place of 208,7 sm and 196,4 sm ($t=2,75$; $p<0,05$), to cross run on 3000 m 668,1 s and 678,2 s ($t=2,31$; $p<0,05$). That is the program which was applied in the experimental group and provided the solution of the main task at the beginning of the stage of the previous basic preparation – the increase of the level of the general physical fitness, – allowed it to solve in a bigger measure, than in the control one.

Near it the level of special power and high-speed and power preparedness of young biathlons of 14-15 years old was defined by us as a result of the training process.

The conducted measurements didn't define an advantage of one of groups at the beginning of researches ($p<0,05$).

Results of training improved in both groups after carrying out the educational and training process in the preparatory period (from May to October).

At the same time during the experiment in the experimental group (tab. 2) indicators of force of pushing away by two hands ($t=2,93$ statistically significantly improved; $p<0,05$), forces of extensions of the lower extremities ($t=2,50$; $p<0,05$), absolute value of explosive force of hands ($t=3,22$; $p<0,01$), maximum explosive force of feet ($t=5,31$; $p<0,001$), and high-speed and power to an index of explosive force of feet ($t=2,54$; $p<0,05$) why more considerable use of the sets of exercises aimed at the development of power and high-speed and power qualities which in the subsequent will provide high-speed and power potential at the movement on skis with the skating courses promoted.

Table 2

Comparative characteristic of indicators of power preparedness according to polydynamometry at young biathlons of 14-15 years old of the experimental group at the end of experiment (October) ($n_1=n_2=12$)

№	Indicators of testing	Control group	Experimental group	Assessment of probability	
		\bar{X}_1+m_1	\bar{X}_2+m_2	t	p
1.	Pushing away force by two hands, kg	26,8±1,4	32,8±1,5	2,93	<0,05
2.	Pushing away force by a foot, kg	26,3±1,8	30,7±1,7	1,77	>0,05
3.	Force of extensions of the upper humeral belt, kg/body weight	3,8±0,2	4,2±0,23	1,33	>0,05
4.	Force of extensions of the lower extremities, kg/body weight	4,2±0,27	5,1±0,25	2,50	<0,05
5.	Absolute value of an explosive force of hands, kgm	22,3±0,52	25,1±0,70	3,22	<0,01
6.	Maximum explosive force of feet, kgm	101,4±2,0	116,1±1,92	5,31	<0,001
7.	High-speed and power index of an explosive force of feet, $kg \cdot s^{-1}$	242,2±6,4	266,3±7,00	2,54	<0,05

At biathlons of the control group statistically significant shifts are received only in an absolute value of explosive force of hands ($t=2,33$; $p<0,05$) and maximum explosive force of feet ($t=3,55$; $p<0,01$) which increase is received for the account of the use of special means of trainings.

Conclusions:

1. The application of the developed complexes for the development of motive qualities (speed, force, high-speed force, coordination of movements) in the experimental group of young biathlons of 14-15 years old allowed receiving the highest results, than in the control group in indicators: pulling up on a cross-piece

($t=3,04$; $p<0,01$), bending and extension of hands, in lying position ($t=2,59$; $p<0,05$), raising and lowering of direct feet from a deflection on a cross-piece ($t=2,36$; $p<0,05$), long jump from a place ($t=2,75$; $p<0,05$), cross run on 3000 m ($t=2,31$; $p<0,05$).

2. The carried out training process in the experimental group of young biathlons of 14-15 years old allowed raising indicators in pushing away force by two hands ($t=2,93$; $p<0,05$), force of extensions of the lower extremities ($t=2,50$; $p<0,05$), absolute value of explosive force ($t=3,22$; $p<0,01$), maximum explosive force of feet ($t=5,31$; $p<0,001$), and in high-speed power index ($t=2,54$; $p<0,05$), but in high-speed power index ($t=2,54$; $p<0,05$) while indicators only of an absolute value of explosive force of hands raised in the control group ($t=2,33$; $p<0,05$) and maximum explosive force of feet ($t=3,55$; $p<0,01$). Near it the reliable difference between groups is received in an indicator of force of pushing away by two hands ($t=2,46$; $p<0,05$) in interests of the experimental group.

In prospects of **the subsequent researches** the representation of results of influence of the training process for sports results in the competitive (basic) period is planned in the preparatory period.

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