The evolution of performance indicators in high-intensity and high-speed training for boys aged 10 to 13, with varying levels of physical activity

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Abstract

Objective of the study was to discern the effects of age on the performance metrics of speed and power-speed fitness in boys aged 10 to 13, with varying levels of physical activity.

Methods and structure of the study. The students of the school in Qinhuangdao (China) took part in the scientific work. Starting at the age of 10, 83 students were tested for three years at the end of the school year. At the same time, 42 boys were engaged in the school athletics section, and the rest did not play sports. The dynamics of speed and speed-strength abilities were determined using tests that are widely described in the specialized literature and recommended for assessing the physical fitness of schoolchildren of various ages [1, 5, 7].

Results and conclusions. Additional and purposeful motor activity contributes to a faster mastery of the required level of physical fitness by boys aged 10-13 years, and the predominant effect on their motor abilities, which are at the stage of accelerated age development, leads to significant shifts in the development of the latter. To increase the speed abilities of boys, the most favorable age is 10-11 years old, and speed and strength - 12-13 years old.

Keywords: *schoolchildren aged 10-13, speed and speed-strength abilities, young athletes, dynamics.*

Introduction. Numerous scientific studies indicate that each period of school age has its own characteristics, which must be taken into account when developing methods and organizing classes, selecting means and methods of pedagogical influence and their correlation in the most favorable age periods for this [1, 3, 4].

A significant difference between longitudinal studies and “cross-sections” is the ability to analyze the dependence of the current state of a certain indicator on its state for a specific period of time, which makes it possible to construct “norms” for age-related changes.

Objective of the study was to identify age-related changes in indicators of speed and speed-strength readiness of boys 10-13 years old with different amounts of motor load.

Methods and structure of the study. Pupils from a school in Qinhuangdao, Hebei Province (China) took part in a longitudinal study. Starting at the age of 10, 83 schoolchildren (born in January-March) were tested at the end of the school year for three years. At the same time, 42 boys were involved in the school athletics section, and the rest did not play sports. Speed abilities were assessed by the time of running 20 m on the move and 30 m from a high start, speed-strength abilities were assessed by the results in the standing long jump and triple jump, standing high jump, pushing off with two legs (according to Abalakov), and long jump from a run and throw a medicine ball (1 kg) forward from behind the head.

Results of the study and discussion. As can be seen from the table, the speed and speed-strength abilities of boys aged 10-13 years are constantly changing throughout the age period under consideration, and the latter occurs unequally and unevenly. Thus, speed abilities, which we assessed by running a

20-meter segment on the run, increase up to 11 years, after which the running time improves slightly even among those involved in athletics. A decrease in the increase in results in the 20-meter run by the age of 13 does not mean that an increase is impossible at this age stage. This indicates the need for careful selection of means and methods for developing speed abilities. The overall increase in results over three years was 0,51 s (13,6%) for young track and field athletes and 0,36 s (9,6%) for those not involved in sports. Thus, it can be assumed that the training-based gain in this test exercise was 4,0%.

The picture is approximately the same when analyzing the dynamics of the result in the 30 m run from a high start. A more significant improvement in results is observed from 10 to 11 years, and then the annual increase in running time decreases. In general, the difference between the two groups over three years was slightly greater than in the previous test (5,6%), which can be explained not only by the greater motor activity of young athletes, but also by better mastery of running technique from the start.

The standing long jump results for boys are constantly increasing over the period of longitudinal observations, and the most significant growth is observed from 12 to 13 years, where the increase in results, compared to the previous year, was 15,1 cm for young athletes, and for their peers 10,7 cm ($p<0,05$). In general, over a three-year period, the changes in young athletes in this test amounted to 40,3 cm (27,4%), and among their peers - 20,5 cm (11,1%). The increase due to training influences is 16, 3%.

Indicators in the triple jump at the ages of 10 to 13 years increase evenly and over three years of training, young athletes add 53,2 cm to the initial result, and those boys who do not play sports only 36,0 cm, which in percentage terms is, respectively, 9,8 and 6,6%.

This is the smallest increase in results over three years of all the tests analyzed.

An analysis of the dynamics of results in the standing high jump, pushing off with both legs, shows that from 10 to 13 years of age there is a steady increase in the ability of boys to demonstrate explosive power. But if in the first year this indicator among young track and field athletes increases by 10,3%, and among those who did not engage in sports by 6,3% ($p<0,05$), then in the period from 12 to 13 years a decrease in the increase in the indicator was recorded explosive force. In general, both groups showed the largest increase in the tests we used – 28,1% in the sports group and 17,4% in peers. Thus, if at the age of 10 the initial result was almost the same, then we can assume that the influence of specialized motor load by the age of 13 was 10,7%.

Dynamics of results in tests assessing speed and speed-strength abilities in schoolchildren aged 10–13 years, involved (1) and not involved (2) in sports

Tests	Groups	Changes in indicators by year											
		10 years	11 years			12 years			13 years			Change over 3 years	
		$\bar{X}$	$\bar{X}$	growth	%	$\bar{X}$	growth	%	$\bar{X}$	growth	%	growth	%
Running 20 m on the move, s	1	3,74	3,48	0,26	6,9*	3,35	0,13	3,7	3,23	0,12	3,6	0,51	13,6*
	2	3,75	3,61	0,14	3,7	3,49	0,12	3,3	3,39	0,10	2,9	0,36	9,6*
30m sprint from a high start, s	1	5,88	5,59	0,29	4,9*	5,32	0,27	4,8*	5,11	0,21	3,9	0,77	13,1*
	2	5,86	5,66	0,20	3,4	5,51	0,15	2,7	5,42	0,09	1,6	0,44	7,5*
Standing long jump, cm	1	146,9	158,7	11,8	8,0*	172,1	13,4	8,4*	187,2	15,1	8,8*	40,3	27,4*
	2	145,8	150,3	4,5	3,1	155,6	5,3	3,5	166,3	10,7	6,9*	20,5	11,1*
Standing triple jump, cm	1	545,4	560,4	15,0	2,8	578,2	17,8	3,2	598,6	20,4	3,5	53,2	9,8*
	2	543,6	550,2	6,6	1,2	561,3	11,1	2,0	579,6	18,3	3,2	36,0	6,6*
Standing high jump, pushing off with both legs, cm	1	34,9	38,5	3,6	10,3*	42,5	4,0	10,4*	44,7	2,2	5,2*	9,8	28,1*
	2	35,1	37,3	2,2	6,3*	39,6	2,3	6,2*	41,2	1,6	4,0*	6,1	17,4*
Running long jump, cm	1	351,6	380,3	28,7	8,2*	415,6	35,3	9,2*	449,1	33,5	8,1*	97,5	27,7*
	2	353,3	372,8	19,5	5,5*	395,1	22,3	6,0*	410,9	15,8	4,0	57,6	16,3*
Medicine ball throw (1 kg) from behind the head, cm	1	523,5	543,8	20,3	3,9	578,1	34,3	6,3*	631,8	53,7	9,3*	108,3	20,7*
	2	525,2	544,3	19,1	3,6	567,3	23,0	4,2*	612,6	45,3	8,0*	87,4	16,6*

*Note: * – the differences are statistically significant at $p<0,05$; 1 - going in for sports, 2 - non-sports people.*

The dynamics of results in the running long jump look somewhat different. Along with the annual increase in results from 11 to 12 years, there is a certain weakening of its growth in the period from 12 to 13 years, both among those involved in sports and those who did not engage in sports. Perhaps this is due to a decrease in the growth of speed abilities of boys in this age interval, and the result in the long jump is largely determined by the speed acquired by the athlete in the run-up. The overall increase in results in running long jumps over three years reached 97,5 cm (27,7%) for those involved in athletics and 57,5 cm (16,3%) for non-athletes. It can be assumed that the impact of training load in this test is 11,4%. In this case, one should take into account the fact that the result in running long jumps also depends on the technical preparedness of the athletes.

The total increase in the result in throwing a medicine ball among boys from 10 to 13 years old was 20,7% for young athletes and 16,6% for their peers. There is an insignificant role of training in this test - 4,1%. At the same time, at the age of 12-13 years, the greatest increase in results was found, which is explained by the sensitive period of increasing the strength capabilities of the muscles of the upper extremities [3, 4].

It must be emphasized that, despite the fact that Chinese schoolchildren participated in the survey, the composition of the subjects in no way influenced the results of the survey of a similar age group of children. Thus, research data obtained more than 40 years ago [4] conducted on schoolchildren showed that the most favorable age period for the development of speed abilities in boys is 9-11 years. Results similar to ours are also given in publications from the beginning of this century [1, 7]. This indicates that, regardless of national and temporal factors, sensitive periods for the development of speed and speed-strength abilities remain constant.

Thus, it can be stated that knowledge and consideration of sensitive periods - time ranges that are most favorable for the development of a particular human function or ability - contributes to the effectiveness of educational and training sessions with schoolchildren, since these are periods of decreased genetic control and increased sensitivity of the body to environmental factors. influences, including pedagogical and training [3, 6].

Conclusions. Data from a longitudinal study of speed and speed-strength indicators in young track and field athletes (10-13 years old) and children not involved in sports revealed statistically significant (for a 5% significance level) changes in them over a three-year period, which made it possible to specify changes in these indicators , determined not only by age-related growth in muscle strength, but also by training influences. The latter confirms the working hypothesis that an additional and targeted volume of physical activity for children of different school ages contributes to a more rapid acquisition of the required level of physical fitness, and priority stimulation of motor abilities that are in the stage of accelerated age-related development leads to significant shifts in the development of the latter. Moreover, as the skill of a young athlete grows, the organization of training influences in its focus should correspond to the mode of activity of his musculoskeletal system in the main specialized exercise [2].

References

1. Volkov L.V. Teoriya i metodika detskogo i yunosheskogo sporta. K.: Olimpiyskaya literature publ., 2002. 294 p.
2. Vrublevskiy E.P., Khorshid A.Kh., Albarkayi D.A. Vliyaniye napravlennosti treniruyushchikh vozdeystviy na rost sily myshts yunykh begunov na korotkiye distantsii. Teoriya i praktika fizicheskoy kultury. 2019. No. 4 (970). pp. 3–5.
3. Guba V.P., Bulykina L.V., Achkasov E.E., Bezuglov E.N. Sensitivnyye periody razvitiya detey. Opredeleniye sportivnogo talanta: monografiya. M.: Sport publ., 2021. 176 p.
4. Guzhalovskiy A.A. Razvitiye dvigatelnykh kachestv u shkolnikov. Mn.: Narodnaya asveta publ., 1978. 88 p.
5. Sergiyenko L.P. Sportivnyy otbor: teoriya i praktika: monografiya. M.: Sovetskiy sport publ., 2013. 1048 p.
6. Solodkov A.S., Sologub E.B. Fiziologiya cheloveka. Obshchaya. Sportivnaya. Vozrastnaya. Textbook. 5th ed., corr., sup. M.: Sport publ., 2015. 620 p.
7. Wychowański M. Wybrane metody oceny dynamiki układu ruchu człowieka. Warszawa: AWF, publ., 2008. 209 p.