

work by Torkhov A.S. and other authors [9]. This work proves the effectiveness of the load planning for a complex development of physical qualities among the students of medical Academy, taking into account bioenergetic types. In spite of the research works diversity, including the works, which take into consideration muscle activity energy-supply. We revealed no research works connected with training process planning among young hockey players at the stage of initial training, taking into account the system of muscle activity energy-supply.

The aim of the research is to create and experimentally substantiate the effectiveness of the training process planning methodology among young 7-8-year-old hockey players on the basis of taking into account muscle activity energy-supply system.

The objectives of the research:

1. To diagnose functional and reserve capacities of an organism and determine the systems of muscle activity energy-supply among young 7-8 year-old hockey players.

2. To create and experimentally check the effectiveness of the methodology of the training process planning among young hockey players, taking into account the system of muscle activity energy-supply.

Materials and methods

The following research methods were used: information sources analysis and summarizing, general physical fitness testing, method of express-diagnostics of the functional state and reserve capacities of an organism "D&K-Test", pedagogical experiment, methods of mathematical statistics.

44 boys (year of birth: 2013-2014) hockey players from junior team "Progress KIDS" took part in the experiment. Training lessons were held in the control (n=20) and the experimental (n =24) groups.

Using the method of multifactorial express-diagnostics «D&K-Test» by professor Dushanin S.A. [2], we defined functional and reserve capacities of an organism among young hockey players from the experimental group. According to the definite indices of the functional and reserve capacities of an organism we determined bioenergetic profiles of young hockey players from the experimental group. The first group of boys included the players, who had ANAMC (anaerobic metabolic capacity) (1-11%) and AMC (aerobic metabolic capacity) (89-99%) – 1 boy; the 2nd group included the boys, who have ANAMC (12-20%) and AMC (80-88%) – 1 boy; the 3rd group included the boys, who have ANAMC (21-29%) and AMC (71-79%) – 9 boys; the 4th group included the boys, who have ANAMC (30-38%) and AMC (62-70%) – 10 boys; the 5th group included the boys, who have ANAMC (39-83%) and AMC (17-61%) – 3 boys. Taking this fact into consideration, the boys of the 1st and the 2nd bioenergetic profile were included into the group of aerobic type (2 boys), hockey players of the 3rd bioenergetic profile were included into the group of the mixed type (9 boys) and the boys of the 4th-5th bioenergetic profile were included into the group of anaerobic type (13 boys).

Table 1 and picture present the distribution according to the systems of energy-supply among young hockey players "Progress KIDS" from the experimental group.

Table 1

Systems of muscle activity energy-supply among the boys from the experimental group

Types of energy-supply		
Aerobic	Anaerobic	Mixed
2	13	9
Total 24		

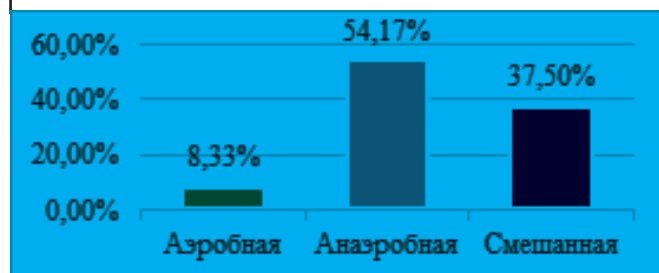


Fig. Systems of muscle activity energy-supply among the boys from the experimental group, %

The presented distribution of bioenergetic profiles into bioenergetic types of muscle activity energy-supply is offered by professor Gibadullin I.G. and other authors [4, 5].

The training lesson for young hockey players from the control group was planned in accordance with the federal standard: GPT (general physical training) – 22-24%, SPT (special physical training) – 2-4%, technical training – 33-34%, tactical training – 7-9%, theoretical and psychological training –

5-6%, medical-biological and rehabilitation measures – 24-26%. In the experimental group the load was planned according to the created by us methodology of the training process planning, taking into account the system of muscle activity energy supply: GPT – 90%, SPT – 10%. We created a weekly micro cycle, this load was differentiated depending on the system of muscle activity energy-supply in terms of the created weekly micro cycle (table 2).

Table 2

Weekly micro cycle of the experimental group and the load depending on the system of organism energy supply, %

Microcycle		Weekday	Systems of energy-supply		
weekday	Kind of the load		Aerobic	Mixed	Anaerobic
Monday	anaerobic	Monday	50%	30%	20%
Tuesday	strength oriented	Tuesday	35%	30%	35%
Wednesday	aerobic	Wednesday	20%	30%	50%
Thursday	sport games	Thursday	Sport games		
Friday	strength oriented	Friday	35%	30%	35%
Saturday	aerobic	Saturday	20%	30%	50%
Sunday	day off	Sunday	day off		

Educational-training lessons in the experimental group were held by two coaches.

On Monday anaerobic training was held, directed toward the quickness of movements. Aerobic group fulfills the load of speed oriented character 50% from the planned time for this kind of exercises, the mixed group - 30% and anaerobic group - 20%. After the exercises end the anaerobic group completes first, running is fulfilled in the tempo. It corresponds with the pulse 120-130 beats/min.

When speed-oriented exercises end young hockey players join those, who run. One of the coaches sets the pace of running. After the first circle the pulse is registered and if it is necessary the tempo of running is corrected.

On Tuesday and Friday respondents have strength oriented training. Each of the planned exercises is fulfilled for time within 20-30 seconds (depending on difficulty). The exercises were fulfilled using line method. As children are not physically developed enough, the main aim of strength oriented training was skeletal muscles strengthening.

On Wednesday aerobic training was held. The exercises, directed toward endurance development, were used. In this kind of exercises the first finished hockey players of aerobic group, then hockey players of mixed and anaerobic group. When the group finishes the exercises it starts running laps in

the tempo. It corresponds with 120-130 beats/min pulse. Tempo of running is set by the second coach. The pulse is also controlled and if it is necessary the tempo of running is corrected.

On Thursday relaxing training is organized. Sport games. The load during this day was not differentiated according to the systems of muscle activity energy-supply.

On Saturday aerobic training was held. Young hockey players from the experimental group had cross-country running. During running pulse was controlled. It was within the limits of 120-140 beats/min. The pace of running was set by the coach, each 5-6 minutes pulse was registered and if it was necessary the tempo of running was corrected. Aerobic group runs approximately 1,5-2 km, mixed – 2-2,5 km, anaerobic – 3 km.

On Sunday young 7-8 year-old hockey players from the experimental group had a day off.

Thus, the micro cycle was repeated each week during the pedagogical experiment period - since August till December, 2021. Young 7-8 year-old hockey players from the experimental group had the load according to created by us methodology of the training process planning, taking into account the system of muscle activity energy-supply.

Results and discussion

Optimal loads during the training process have a positive influence on the level of physical readiness. In order to substantiate the effectiveness of created by us experimental methodology of the training planning among young hockey players, taking into consideration the system of muscle activity energy-supply. We tested physical readiness in the control

and experimental groups at the beginning and in the end of the pedagogical experiment.

In order to test physical readiness we used generally adopted tests for young hockey players of sports-health improving stage of training: 30 m running, 500 m running and dip up in prone position. Table 3 presents the results of testing.

Table 3

The indices of testing physical readiness of 7-8 year-old hockey players at the beginning and in the end of the experiment

Tests	Stages	Experimental group			Control group		
		X ± σ	chang., %	p	X ± σ	chang., %	p
30 m running	beginning	6,44±0,62	4,57%	<0,05	6,49±0,62	1,66%	<0,05
	end	6,16±0,64			6,39±0,60		
500 m running	beginning	2,34±0,27	8,41%	<0,05	2,38±0,45	1,00%	>0,05
	end	2,16±0,39			2,36±0,51		
Dip up in prone position	beginning	21,25±7,77	26,67%	<0,05	18,70±8,66	12,03%	<0,05
	end	26,92±8,78			20,95±9,08		

"30 m running" index among young hockey players from the experimental group improves from 6,44±0,62 sec. till 6,16±0,64 sec., the increase was 4,57%, in terms of statistically valid differences (p<0,05). Young hockey players from the control group also had positive changes in this index in the end of the experiment: from 6,49±0,62 sec. till 6,39±0,60 sec., the increase was 1,66%, in terms of statistically valid differences (p<0,05).

The results of "500 m running" among young hockey players from the experimental group improve: before the experiment – 2,34±0,27 min, after the experiment– 2,16±0,39 min, the increase was 8,41%, the differences between the compared values have statistically significant character (p<0,05). Young hockey players from the control group had insignificant increase, it was 1,00%, from 2,38±0,45 min till 2,36±0,51 min, in terms of statistically insignificant differences (p>0,05).

The results of testing before and after the experiment show positive dynamics among young hockey players from the experimental and control group. In the experimental group the results in "Dip up in prone position" test improved from

21,25±7,77 times till 26,92±8,78 times, the increase was 26,67%. Hockey players from the control group also had the results increase from 18,70±8,66 times till 20,95±9,08 times, the increase was 12,03%. In both groups the results of the compared values have statistically valid character (p<0,05).

At the beginning and in the end of the pedagogical experiment we organized multifactorial express-diagnostics "D&K-Test" by professor Dushanin S.A. in order to define organism functional and reserve capacities among young hockey players from the experimental group. Table 4 presents the results of testing.

Let's consider the indices of functional and reserve capacities of an organism at the beginning and in the end of the pedagogical experiment among young hockey players from the experimental group. The index, which characterizes strength oriented endurance in c.u., improves from 36,93±8,86 till 38,64±9,24, the increase was 4,63% in terms of valid differences (p<0,05).

Table 4

Functional and reserve capacities of an organism among young hockey players from the experimental group at the beginning and in the end of the experiment

Indices	Stage	X ± σ	chang., %	p
Strength oriented endurance(c.u.)	beginn.	36,93±8,86	4,63%	p<0,05
	end	38,64±9,24		
speed endurance (c.u.)	beginn.	33,19±5,86	3,80%	p<0,05
	end	34,45±6,16		
Working capacity(c.u.)	beginn.	342,10±57,74	4,29%	p<0,05
	end	356,79±60,21		
MOC (maximal oxygen consumption) (ml/kg)	beginn.	71,00±5,34	4,35%	p<0,05
	end	74,09±5,64		
HRtanm (heart rate threshold of anaerobic metabolism)	beginn.	173,00±8,03	4,37%	p<0,05
	end	180,56±9,64		
General energetic fund(c.u.)	beginn.	209,99±12,84	4,37%	p<0,05
	end	219,16±14,66		

The index, which characterizes speed endurance in c.u., shows the improvement in the end of the experiment for 2,80% and is 33,19±5,86 at the beginning and 34,45±6,16 in the end of the experiment, in terms of statistically valid differences (p<0,05). MOC improves from 71,00±5,34 till 74,09±5,64 ml/kg, the index increases for 4,35%, in terms of statistically valid differences (p<0,05). HRtanm also changes, the index increases for 4,37% – from 173,00±8,03 till 180,56±9,64, in terms of significant differences of the compared indices (p<0,05). General energetic fund also improved for 4,37% – from 209,99±12,84 till 219,16±14,66, in terms of statistically valid differences (p<0,05).

Conclusion

The results of the pedagogical experiment analysis showed that among young hockey players from the experimental group tests results (which characterize quickness, endurance and strength) are higher than among young hockey players from the control group. There are more statistically valid differences in the experimental group, than in the control group. In the end of the pedagogical experiment all considered indices of the functional and reserve capacities improve among young hockey players from the experimental group and all compared values have statistically valid differences.

We can claim that the experimental methodology of the training process planning among young 7-8 year-old hockey players (boys) taking into account the system of muscle activity energy-supply is more effective in comparison with the standard program of the federal standard.

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