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DEVELOPMENT OF COORDINATION QUALITIES IN CROSS-COUNTRY SKIERS AGED 13-14 YEARS IN THE PREPARATORY PERIOD OF THE ANNUAL MACROCYCLE

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Purpose: determine the influence of coordination qualities on the results of the special physical fitness of cross-country skiers aged 13-14 years in the preparatory period. **Material and Methods:** the study involved 30 athletes aged 13-14 years, whose experience of cross-country skiing 4-5 years, the qualification of athletes III - II category. The following methods are used in the work: analysis and generalization of scientific and methodological literature, pedagogical observation, pedagogical testing, pedagogical experiment. The methods of mathematical statistics to analyze the obtained data were used.

Results: the use of special training for the development of coordination qualities young cross-country skiers led to improved results in overcoming the competitive distance in rollersking with a free style of 5000 m by 12.5%, at a distance of 100 m in a free style by 8.7% and a classic style on 8.5% ($p<0.05$).

Conclusions: the use of exercises for the development of coordination qualities among 13-14 year old cross-country skiers and riders during the preparatory period made it possible to improve the results in rollersking with a classic and free style of movement.

Keywords: cross-country ski, young cross-country skiers, coordination qualities,

preparation period, free style, classic style.

Introduction

It is known that the modern system of training in sport of higher achievements causes profound functional changes in the activity of the whole body of the athlete [6; 14; 15].

The level of development of physical qualities of a person reflects a harmonious combination of innate psychological and morphological abilities and acquired in the course of life and training of opportunities. The higher the level of development of physical qualities of a person, the higher his ability to work [1; 3; 16].

The specifics of the current activities of the competition can be attributed to cross-country skiing to the sports complex of technical-tactical activity that requires a high level of development of coordination abilities. This is because the athlete at high speed must quickly and accurately assess the situation, which is constantly changing, and to make the right decision, to be able to overcome unexpected obstacles in the race with a mass start and relay races, to be able to respond to a sharp change of direction and speed of rivals in the sprint race, the coordination to respond to race the skiathlon, when you change the style of movement, the right to place in the group of opponents the elements of skiing equipment. All the above mentioned skills are formed on the basis of coordination qualities [2; 4; 6; 7]. For balance of the body crucial information about gravitational vertical from the vestibular apparatus and from proprioceptors body in contact with the plane of the support. Ancillary, but very significant role playes visual information about gravitational vertical. With unstable support leading reference system can be a tactile contact with a fixed object of the environment that surrounds, and even without the props on it [5; 8; 9].

The analysis of domestic and foreign scientific and methodological literature shows that there are different views on the development of coordination qualities in the process of athletes training. Some authors propose to integrate their development in the course of technical training [2; 7; 8; 10]. Others believe that the development

of coordination qualities does not boil down to either side of the preparation, but forms the basis [3; 5; 9]. Still others continue to consider the place of coordination training through the lens of agility in the physical training system [13; 16]. Finally, a number of scientists and coaches are convinced of the need to allocate coordination training as an independent and important section of the athlete's training, which is characterized by certain tasks, means and methods of developing coordination qualities in a particular sport [4; 11; 12; 14].

According to experts, the most important specific coordination qualities include: the ability to orientation in space; the ability to balance; the ability to rhythm; the ability to playback, differentiation, evaluation and measuring the spatial, temporal and force parameters of movements; responsiveness; ability to rebuild the motor activity; the ability to harmonize movements, random muscle tension and relaxation; statoconia resistance [8].

The age of cross-country skiers aged13-14 years is the most responsible period in the formation of the basic potential of human motility and coordination qualities, so the question of the development of coordination of movements and balance is of practical interest [3; 13; 15]. When training young cross-country skiers, as a rule, is not planned separate activities that develop coordination qualities. In our opinion, insufficient attention to the development and improvement of coordination qualities is one of the reasons for the unsuccessful performances of Ukrainian cross-country racers at international competitions. Therefore, it is important to look for ways to improve the training process for young cross-country skiers, using exercises to develop coordination qualities and balance in the preparatory period.

Purpose of the study: determine the influence of coordination qualities on the results of the special physical fitness of cross-country skiers aged 13-14 years in the preparatory period.

Material and Methods of the research

Choice of research methods was determined by the goal, objectives and existing requirements to conduct educational research. The study was used following methods: analysis and generalization of scientific-methodic literature, pedagogical

observation, pedagogical testing, pedagogical experiment. For the data analysis we used generally accepted methods of statistical processing. All calculations were carried out on Statistica 12, SPSS and Excel.

The study involved 30 athletes (15 control group and 15 experimental group) aged 13-14 years, experience of which is cross-country skiing 4-5 years, qualification athletes III - II level. To address the main objectives of the study program training in groups of temporary measures did not differ in each weekly regime of training and work was 20 hours. The volume and intensity of training loads were not significant differences between groups who participated in the study. The control group studied the traditional curriculum of cross-country skiers for children and youth sports schools in Ukraine, while the experimental group according to the method, which included special exercises on development of coordination skills, and balance. Performed exercises to develop equilibrium in the static regime, exercises for balance with the use of rollersking, hemisphere, balance-bordo.

Tests were conducted in which assessed: the level of development stability of the vestibular reactions, the ability to perform difficult coordination of movements, ability to rebuild motor actions, spatial-temporal and dynamic parameters of movements, maintaining equilibrium, orientation in space.

To assess the level of development of the coordination qualities of the athletes were used the following test exercises: the test for determination of motor memory, the test to determine the level of movement coordination test to determine the balance (according to the method of V. I. Liah); the test to determine the ability to estimate dynamic and spatial-temporal parameters (according to the method of D. K. Miller); the test to assess the ability of coordination and rhythmicity of movements (according to method F. Raczek); the test in which we evaluated the level of stability of the vestibular reactions (according to the method of K. I. Arikov and A. A. Matvienko); to identify the static coordinate were used improved sample Romberg (on one and two feet in the ski rack on the platform-skiing). To evaluate the start coordination and technical actions during acceleration used to overcome rollerskiing segments of 100 m and 20 m from the personal and the general launch.

Communication of work with scientific programs, plans, themes. The study was performed in accordance with the plan of scientific-research work of the department winter sports, cycling and tourism of Kharkiv state academy of physical culture of the Ministry of education and science of Ukraine for the years 2019-2023 on the topic of "Optimization of training process in cyclic and extreme sports" (state registration number 0119U100439).

Results of the research

To determine the level of special physical fitness at the beginning of the pedagogical study, pedagogical testing of cross-country skiers aged 13-14 years was conducted, in which no significant differences in the results of testing between groups were found ($p>0.05$).

After the preparation in the preparatory period of the annual macrocycle, pedagogical testing of cross-country skiers aged 13-14 years was carried out. As a result of testing, it was found that the cross-country skiers of the experimental group who used training to develop coordination qualities and balance, the results of overcoming the distance on the rollersking 5000m free style improved by 12.5%, the distance 100m free style, 7% and classical by 8.5% ($p<0.05$), while in the control group the growth results were: 5000 m – 9,7%; 100 m free style – 2,0% and classic style – 1,8% (Table 1, Fig. 1).

Table 1

Indicators of special fitness after conducting a study of pedagogical study of young cross-country skiers aged 13-14 years at the beginning of the study

($n_1=n_2=15$)

Indexes	Group - K $X_1 \pm m$	Group - E $X_2 \pm m$	t	P
Running on 30 м, *sec*	5,15 ± 0,05	4,97 ± 0,06	2,21	<0,05
Rollersking free style 5000 м, *sec*	755,12 ± 8,21	733,10 ± 5,12	2,28	<0,05
Shuttle running 4x9 м, *sec*	12,71 ± 0,14	11,22 ± 0,21	6,71	<0,05
Rollersking free style 100 м, *sec*	25,37 ± 0,51	24,01 ± 0,33	2,24	<0,05
Rollersking classic style 100 м, *sec*	26,80 ± 0,72	24,71 ± 0,52	2,43	<0,05
Rollersking free style 20 м, *sec*	6,10 ± 0,03	5,86 ± 0,02	6,66	<0,05
Rollersking classic style 20 м, *sec*	7,05 ± 0,08	6,53 ± 0,06	5,22	<0,05

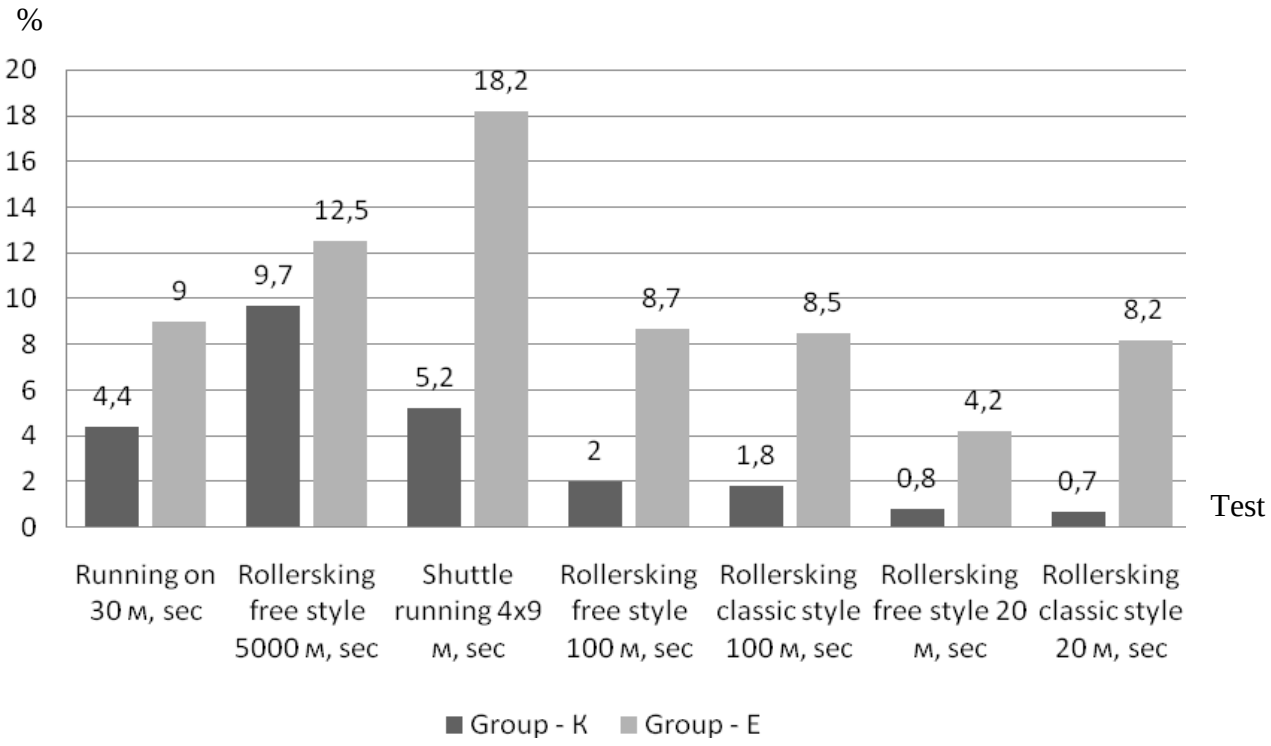

Fig. 1. Percentage increase in the results of special testing in the control and experimental groups after the study

Analysis of the results of special tests on rollersking revealed that the results of the distance overcome improved in both groups, but in the experimental group the increase was 18.2 - 4.2%, and in the control - 9.7 - 0.7% ($p < 0.05$) (Fig. 1).

Significant ($p < 0.05$) differences in indicators of special preparedness revealed the advantage of skiers of the experimental group over the control: in speed rollersking free style at 100 m by 5.1% and classical style by 7.8%; in the length of the cycle on the plain free style by 9.2% and classical style 10.7%; in speed of acceleration free style 3.9% and classical style 7.4% (Table 1, Fig. 1).

To identify the relationship between the indicators that characterize the coordination ability and the result of the control of the distance the rollersking free style 5000 м, a correlation analysis was conducted (Table 2).

The result of the analysis revealed a high correlation between running distance and ability to respond ($r=0.94-0.78$; $p<0.05$), ability to coordinate and rhythmic movements ($r=0.98-0.84$; $p<0.05$), dynamic equilibrium ($r=0.97-0.89$; $p<0.05$) and average speed of sprinting by free and classic style of 100 m, respectively.

Table 2

Significant correlation between the indicators characterizing the coordination ability and the result of the control of the distance race of the classic and skating style cross-country skiers at the stage of preliminary basic training (n=30); p <0,05

№	Indexes	1	2	3	4	5	6	7	8	9	10
1	Rollersking free style 5000 м	1,00									
2	Rollersking classic style 100 м	0,37	1,00								
3	Rollersking free style 100 м	0,46	0,58	1,00							
4	Dynamic equilibrium	0,78	0,81	0,73	1,00						
5	Ability to coherence and rhythm of movements	0,84	0,98	0,92	0,44	1,00					
6	Ability to evaluate and regulate dynamic and space-time motion parameters	0,39	0,53	0,46	0,19	0,31	1,00				
7	Time to maintain the stability of the posture	0,70	0,57	0,89	0,35	0,41	0,63	1,00			
8	Motor memory	0,91	0,81	0,92	0,13	0,78	0,64	0,21	1,00		
9	Coordination of movements	0,86	0,89	0,78	0,32	0,81	0,62	0,16	0,86	1,00	
10	Responsiveness	0,78	0,92	0,94	0,13	0,35	0,27	0,47	0,23	0,51	1,00

Therefore, it can be concluded that the coordination capabilities make a significant contribution to the overall result in racing in the classic and free style on rollersking.

Noteworthy is the presence of correlation relationships between indicators that characterize coordination abilities: level of coordination of movements and motor memory (r=0.86; p<0.05); rhythmicity and consistency of movements and dynamic equilibrium (r=0.81; p<0.05) and results in rollersking (r=0.94-0.78; p<0.05).

Thus, the study of training cross-country skiers aged 13-14 years in the preparatory period of the annual macrocycle at the stage of preliminary basic training revealed the effectiveness of the experimental method, in which increased the development of coordination qualities and balance.

Conclusions / Discussion

In the special literature covering sports training in cross-country ski racing, the problems of development and improvement of the required coordination qualities in

accordance with the modern requirements of training athletes, is not given sufficient attention. The greatest number of experts believe that only the development of endurance and speed-power qualities can lead to success in the training of racers.

But German experts believe that good coordination in cross-country ski racing is an indispensable factor in sportsmanship [12].

In their turn, Austrian experts [10] point out that the modern technical requirements in cross-country skiing are extremely complex and assume the presence of a whole set of coordination abilities, which include spatial orientation, taking into account the changing conditions of terrain and route, subtle perception reactions of the body when sliding, complex reaction and adaptation when changing the quality of snow or in extreme situations and the ability to adjust their own rhythms of movement when moving [4; 10].

Coordination qualities, previously being the leading physical quality of cross-country skiers, with the advent of the program of competitions in ski racing the sprint disciplines, skiathlon, the new discipline in ski cross, resulting in different kinematic and dynamic structure of movements, physiological tension, and also the peculiarities of technical and tactical solutions motor tasks, determine the feasibility of directed their development and improvement in the structure of the annual cycle of sport training of young cross-country skiers.

Therefore, to improve the coordination qualities of cross-country skiers aged 13-14 years in the preparatory period at the training stage of training, it is necessary to start with the exercise in static mode without the use of different shells and simulators (different stands, straps, etc.), dynamic balance exercises (exercises in the rollersking, hemisphere, balance board and more), exercises to develop the ability to relax muscles.

Insufficient number of scientific studies on the problem of development of coordination qualities in young cross-country skiers substantially reduces the effectiveness of the training process, improvement of technical skill that affects athletic performance.

Significant differences in the indicators of special preparedness showed the advantage of cross-country skiers of the experimental group over the control in overcoming the competitive distance the rollersking 5000 m freestyle 2.8%, in the speed of 100 m free style 5.1% and classic style 7.8%; cycle length on plain free style by 9.2% and classic style 10.7%; speed of acceleration in 20 m free style 3.9% and classic style 7.4% ($p < 0.05$).

The results of correlation analysis between the results of passing of competition distance of rollersking 100 m free and classic style, and rollersking free style 5000 m found a close correlation between the responsiveness ($r=0.94-0.78$; $p<0.05$), the ability to coherence and rhythm of movements ($r=0.98-0.84$; $p<0.05$), dynamic balance ($r=0.97-0.89$; $p<0.05$) and average speed of passage.

According to the results of the survey coordination qualities, you can make individual conclusions about the level and dynamics statodynamic stability in the structure of the functional and technical preparedness of young cross-country skiers.

Therefore, it can be concluded that the use of exercises for the development of coordination qualities among 13-14 year old cross-country skiers and riders during the preparatory period made it possible to improve the results in rollersking with a classic and free style of movement.

Prospects of further studies lie in the theoretical and experimental justification and the development of model characteristics of the coordination qualities of qualified cross-country skiers.

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