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# Coordinating abilities development among skiers at the stage of initial training taking into account functional asymmetry

***Marat R. Gibadullin*, Rustem Sh. Fayzrakhmanov, Adel I. Garifullin, Dmitriy I. Basin, Alina V. Esina***
*Volga region State University of Physical Culture, Sports and Tourism*
*Kazan, Russia*
*ORCID: 0000-0001-6217-0054, gmr_001@mail.ru**
*ORCID: 0000-0002-6950-0009, fshrustam@gmail.com*
*ORCID: 0000-0002-5234-7749, adel.garifullin@mail.ru*
*ORCID: 0000-0002-9733-7210, ba.sindm@gmail.com*
*ORCID: 0000-0002-0074-7214, yes.al99@icloud.com*

**Abstract:** Coordinating abilities, together with quickness and endurance, have a great influence on the results in cross-country skiing. It is conditioned by the fact that a racing skier should have the skill of rhythm holding, should reproduce and measure out time, spatial and strength parameters, keep the balance and etc. Sensitive period for coordinating abilities development is 8-11 years-old. That is why it is reasonable to develop them at the stage of initial training. The exercises directed toward coordinating abilities development are different and have different modification. For their effective use it is necessary to take into consideration individual characteristics of a child. One of such characteristics is a functional asymmetry. ***Materials.*** The article considers functional asymmetry of 9-11 year-old skiers and its influence on coordinating abilities development. ***Research methods.*** Information sources analysis and summarizing, pedagogical observation, pedagogical testing, pedagogical experiment, methods of mathematical statistics. ***Results.*** We created a complex of exercises, directed toward coordinating abilities development. It included the exercises of a cyclic, acrobatic character, skiing exercises and outdoor games, the final part included the exercises from remedial gymnastics. We meant not only coordinating abilities development, but also asymmetry of movements decrease. The first two weeks we taught skiers to fulfill the exercises correctly. The instruction started from the leading hand, we also used reflecting fulfillment for right and left- handed children. As the skiers mastered the exercises, we made them more complicated by means of outer factors or the elements of novelty. ***Conclusion.*** The effectiveness of the created complex was proved by pedagogical testing. It included 6 control tests, estimating 6 coordinating abilities. Valid differences of the indices at the beginning and the end of the experiment were revealed in 4 out of 6 control tests.
**Keywords:** functional asymmetry, coordination abilities, skiers, individual asymmetry profile.

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## Introduction

Coordinating abilities, together with quickness and endurance, have a great influence on the results in cross-country skiing. It is conditioned by the fact that a racing skier should have the skill of rhythm holding, should reproduce and measure out time, spatial and strength parameters, keep the balance and etc. Sensitive period for coordinating abilities development is 8-11 years-old, that is why it is reasonable to develop them at the stage of initial training. The exercises directed toward coordinating abilities development are different and have different modifications. For their effective use it is necessary to take into consideration individual characteristics of a child. One of such characteristics is a functional asymmetry.

The aim of the research is to create and experimentally substantiate complex of exercises, directed toward coordinating abilities development among 9-11 year-old skiers, taking into account functional asymmetry.

## Material and methods

The research was held on the basis of a Municipal budgetary establishment “Sports school of the Olympic reserve “Favorite”” in Syktyvkar, Republic of Komi. 28 skiers at the age of 9-11 took part in the research. They formed the control and experimental

group, each group included 14 people. Both groups trained according to the program of the Federal standard of sports training in "Cross-country skiing" – 4 days a week. During the research we used the following methods:

1. Information sources analysis.

We analyzed 5 literature sources, connected with the topic of the research. We considered the kinds of coordinating abilities, effective methods and means of coordinating abilities development at the stage of initial training and their evaluation criteria. We also studied the notion of functional asymmetry and its significance in coordinating abilities development, in particular teaching difficult motor actions.

2. Pedagogical observation.

Pedagogical observation is a method with the help of which we realized data gathering, concerning the level of coordinating abilities development and an individual asymmetry profile determination among 9-11 year-old skiers. For the pedagogical observation organization we used the methodology of documentation, results of control tests registration.

3. Pedagogical testing.

Pedagogical testing was organized in order to get the indices of coordinating abilities development level among 9-11 year-old skiers. We defined the following control tests for the level of coordinating abilities determination:

1. Dribbling with the leading hand in running with the direction of movement change– in order to estimate the absolute indices of coordinating abilities in sports-game motor actions.

2. Jumping on a mark– for the ability estimation to realize kinesthetic differentiation.

3. Balancing on a gymnastic bench – for dynamic balance ability estimation.

4. Standing on one leg with the eyes closed– for the ability to keep static balance.

5. Sprint in a given rhythm– for the ability to feel the rhythm estimation.

6. Stepping over the gymnastic handle – in order to estimate co-ordination ability [1].

The control tests were held during 2 days. During the 1st day we held the following tests: dribbling with the leading hand in running with the direction of movement change, jumping on a mark, balancing on a gymnastic bench. During the second day we held the following tests: standing on one leg with the eyes closed, sprint in a given rhythm, stepping over the gymnastic handle.

4. Pedagogical experiment was used in order to check the validity of our hypothesis.

5. Methods of mathematical statistics.

The received results handling was realized with the help of the method of mathematical statistics. We defined arithmetic mean of skiers' indices and mean error of the average result. Further the results of pedagogical testing of the control and experimental groups were calculated with the help of Student's criterion in order to define valid difference of the results at the beginning and the end of the experiment.

**Results and discussion**

The training plan of the skiers from the experimental group included created by the authors complex of exercises, directed toward coordinating abilities development. Before the control tests organization we defined the individual asymmetry profile of each skier in the experimental group. We organized motor tests for the leading hand, ear and eye determination. The dominating cerebral hemisphere was revealed according to the following formula:

CA=(total number of points)/(number of tests) ×100%,

where CA –coefficient of asymmetry [2,3].

Figure presents the profile of functional asymmetry among the skiers from the experimental group.

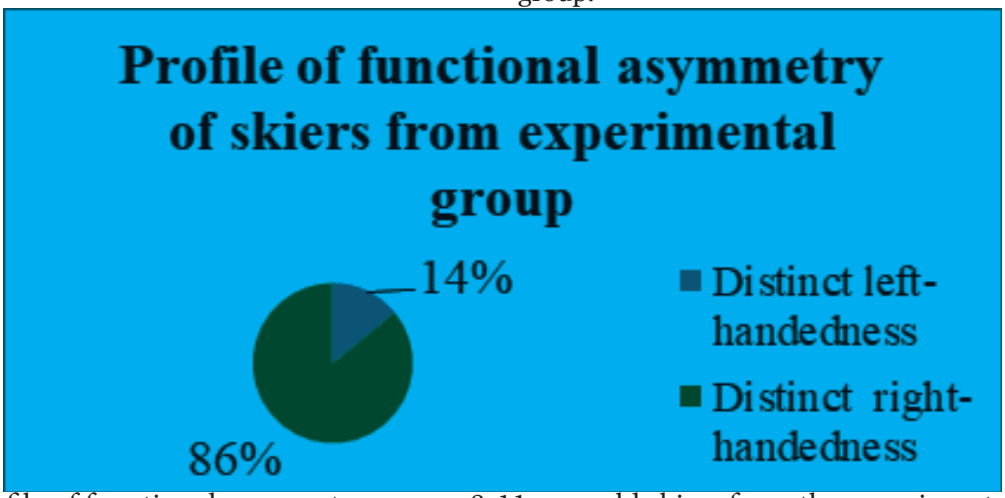


Fig. Profile of functional asymmetry among 9-11 year-old skiers from the experimental group

As the diagram shows, 14%, or 2 children, had a distinct left-handedness and 86%, or 12 children, had distinct right-handedness. There were no ambidexters in the group.

During the complex of exercises creation we took into account the fact that there are both left-handed and right-handed children in the group. For us it was important not only to increase the level of coordinating abilities development, but also teach children to fulfill different difficult for coordination exercises for both hands, in order to level asymmetry during the period of our research work.

Leveling asymmetry provides wider base of motor skills and their fulfillment economization in different conditions. It is especially important while moving using classical alternate two-step course, as in case of push strength difference, the leading side (hand) takes greater load and it leads to quicker tiredness of a child [3].

We created 4 complexes of exercises for each training day in order to develop not only coordinating abilities, but also the abilities, which were planned in accordance with the training plan of the experimental group. We not only added new exercises into the training plan, but also changed the form of lesson organization, in order to provide several qualities development. We also added the 5th training day in a week, but didn't consider it full-rate training, as didn't set the definite objectives for this lesson. It was added for an active rest of children and their coordinating abilities development by means of games. The lesson was held in a gym (60 minutes) [4,5].

The first two weeks we taught skiers to fulfill the exercises correctly. The education process started from the leading hand. The motor action was mastered with the leading hand. It was fulfilled with the other hand till the skier could fulfill it quickly and confidently. We also used reflecting exercises fulfillment separately for right and left-handed children. We can define several general theses of lessons organization:

1. The complex of exercises was used during the first part of the main part of the training lesson. It is necessary to fulfill difficult for coordination exercises before tiredness.

2. The preparatory part of each lesson included the exercises for balance and skiing 100 meters of plain route with the eyes closed. It provides so called "sense of snow" development.

3. The final part of each training lesson included the exercises from remedial gymnastics (duration 10 minutes). Such exercises are necessary for flexibility development and the ability improvement to realize random contraction and relaxation of muscles.

5. We used symmetrization of movements: the exercises were fulfilled for both hands in equal proportions.

Table 1 presents the complex of exercises, directed toward coordinating abilities development, taking into account functional asymmetry.

Table 1

The complex of exercises, directed toward coordinating abilities development among 9-11 year-old skiers

| Training day (in a week) | Exercises |
|---|---|
| The 1st day | Biathlon on the plain:<br>1. Speed-up 60 m<br>2. Wave-marching speed-up 80 m<br>3. Speed-up with one ski-stick 60 м x 2<br>4. Speed-up on one ski without ski-sticks x 2<br>6. Chain speed-up 60 m |
| The 2nd day | Obstacle course overcoming skiing (300 m):<br>1. Stepping over the strained tape at the altitude 40 cm (10 m)<br>2. Going under the strained tape at the altitude 1 m (10 m)<br>3. Overcoming snow-covered rise with the grade 8-10° sidestep (50 m)<br>4. Overcoming the plain without ski-sticks with 1 kg stuffed ball in one hand and tennis ball in the other hand (30 m)<br>5. The same with the stuffed balls change (30 m)<br>6. Crawling under the strained tape at the altitude 40 cm (10 m)<br>7. Overcoming the slope in a high and low stand according to visual signal (100 m) |

| | |
|---|---|
| The 3rd day (gym) | 1. Cyclic exercises (walking, run, climbing gym wall-bars)<br>2. Exercise for relaxation<br>3. Acrobatic exercises (roll-over, roll)<br>4. Exercise for relaxation<br>5. Exercises with a big ball (throws, catching)<br>6. Exercises with a small ball (throws, tossing, catching)<br>7. Exercise for relaxation<br>8. Walking and running to the music<br>9. Exercise for relaxation<br>10. Running toward the enumerated balls<br>11. Exercise for relaxation |
| The 4th day | 1. Skiing along the marked route<br>2. Skiing with the direction of movement change according to the signal<br>3. Skiing with skiing step change according to the signal<br>4. Reverse running the circle |
| The 5th day (additional) | Outdoor games (“Sparrows and Ravens”, “Tag”, “Tails”, “Bouncer” and others) |

Table 2 presents validity of differences of the independent samplings before and after the experiment.

Table 2

Comparative analysis of coordinating abilities indices among skiers from the control and experimental groups

| Exercise | Stage of the research | EG | CG | T | tbv | P |
|---|---|---|---|---|---|---|
| Dribbling with the leading hand in running with the direction of movement change | P | 14,95±0,38 | 14,85±0,31 | 0,20 | 2,06 | >0,05 |
| | 2 | 13,05±0,33 | 14,09±0,36 | 2,11 | 2,06 | <0,05 |
| Jumping on a mark | 1 | 6,38±0,48 | 6,72±0,52 | 0,49 | 2,06 | >0,05 |
| | 2 | 5,49±0,36 | 6,52±0,46 | 1,77 | 2,06 | >0,05 |
| Balancing on a gymnastic bench | 1 | 9,19±0,25 | 9,30±0,46 | 0,20 | 2,06 | >0,05 |
| | 2 | 7,99±0,21 | 9,07±0,46 | 2,14 | 2,06 | <0,05 |
| Standing on one leg with the eyes closed | 1 | 12,16±1,27 | 11,75±1,66 | 0,20 | 2,06 | >0,05 |
| | 2 | 16,86±1,41 | 11,96±1,72 | 2,20 | 2,06 | <0,05 |
| Sprint in a given rhythm | 1 | 1,83±0,10 | 1,86±0,08 | 0,24 | 2,06 | >0,05 |
| | 2 | 1,37±0,39 | 1,94±0,10 | 1,40 | 2,06 | >0,05 |
| Stepping over the gymnastic handle | 1 | 19,28±0,31 | 19,13±0,41 | 0,30 | 2,06 | >0,05 |
| | | 18,06±0,22 | 19,60±0,62 | 2,34 | 2,06 | <0,05 |

The results of the control tests at the first stage in the control and experimental groups were at the same level. The greatest difference turned out to be in the control test “Stepping over the gymnastic handle”. After the results of the second testing mathematical handling we can say about a valid indices improvement in the experimental group in 4 out of 6 tests. It means that the created complex

of exercises, directed toward coordinating abilities development, and the way of its application on the basis of the created individual asymmetry profile of each athlete can be considered effective.

**Conclusion**

1. As a result of scientific-methodical literature analysis we revealed, that coordinating abilities are divided into three groups: special, specific, general. The indices of different components of coordinating abilities most intensively increase since the age of 7 till the age of 9 and since the age of 9 till the age of 11-12. We defined the most effective means and methods. The widest group of means for coordinating abilities development is formed by the exercises of dynamic character. They are able to cover several main groups of muscles. The qualitative evaluation criteria of coordinating abilities, which are the main ones, include the following: expediency, adequacy, initiative and promptness. The quantitative criteria include stability, accuracy, efficiency and speed.

In many research works we see that it is important to take into account an individual asymmetry profile not only for more effective coordinating abilities development, but also for a wide base of motor skills formation.

2. First of all we revealed an individual asymmetry profile of the skiers from the experimental group. It is necessary in order to teach and master new motor action quicker. 86% of skiers had a distinct right-handedness and 14% had a distinct left-handedness. On the basis of these results we created the complex of exercises, directed toward coordinating abilities development. They included the exercises of cyclic, acrobatic character, skiing exercises. During the final part of each training lesson we fulfilled the exercises from remedial gymnastics for flexibility development and the ability to random muscles tension and relaxation. We also included an additional lesson into the training plan in order to realize an active rest of children and a complex development of coordinating abilities. During this lesson we held outdoor games and sports games of different character.

3. Created by us and used complex of exercises, directed toward coordinating abilities development , can be considered effective, as it showed valid differences in 4 out of 6 control tests. We consider that the absence of valid differences in “Jumping on a mark” and “Sprint in a given rhythm” tests is connected with insufficient duration of the experiment. These exercises are difficult to understand and fulfill, that is why for the rhythm and kinesthetic differentiation ability development among 9-11 year-old children it is necessary to have more time for realization.

***References***

1. Lyakh V.I. *Koordinacionnye sposobnosti: diagnostika I razvitie* [Coordinating abilities: diagnostics and development]. Moscow: TVT Division. 2006: 151-167 [In Russ.].

2. Aleksandrov S.G *Funkcioanl’aya assimetriya I mezhpolusharnye vzaimodejstviya golovnogo mozga: uchebnoe posobie dlya studentov* [Functional asymmetry and interhemispheric interactions of cerebrum: manual for students]. Irkutsk: Irkutsk State Medical University. 2014: 46-56 [In Russ.].

3. Berdichevskaya E.M., Gronskaya A.S. *Funkcional’naya ssimetriya I sport: rukovodstvo po funkcional’noj mezhpolusharnoj assimetrii* [Functional asymmetry and sport: functional interhemispheric asymmetry manual]. Moscow: Scientific world. 2009: 647-691 [In Russ.].

4. Bernshteyn N.A. *O lovkosti I ee razvitii* [About dexterity and its development]. Moscow: Physical culture and sport. 1991: 47 [In Russ.].

5. Issurin V.B., Lyakh V.I. *Koordinacionnye sposobnosti sportsmenov* [Coordinating abilities of athletes]. Moscow: Sport. 2019: 79 [In Russ.].

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***Author’s information:***

***Marat R. Gibadullin*** *– Candidate of Pedagogics, Associate Professor, Volga region State University of Physical Culture, Sports and Tourism, 410031, Russia, Kazan, Territory of Universiade Village, House 35, e-mail: gmr_001@mail.ru*

***Rustem Sh. Fayzrakhmanov*** *– Senior Lecturer, Volga region State University of Physical Culture, Sports and Tourism, 410031, Russia, Kazan, Territory of Universiade Village, House 35, e-mail: fshrustam@gmail.com*

***Adel I. Garifullin*** *– Senior Lecturer, Volga region State University of Physical Culture, Sports and Tourism, 410031, Russia, Kazan, Territory of Universiade Village, House 35, e-mail: adel.garifullin@mail.ru*

***Dmitriy I. Basin*** *– Senior Lecturer, Volga region State University of Physical Culture, Sports and Tourism, 410031, Russia, Kazan, Territory of Universiade Village, House 35, e-mail: ba.sindm@gmail.com*