Publication date: 01.09.2021
DOI: 10.51871/2588-0500_2021_05_03_20
UDC 616.89-008.454-053.2; 796.42

COORDINATION ABILITIES DEVELOPMENT METHODOLOGY IN YOUNG ATHLETES WITH MENTAL RETARDATION

N.M. Kurch, I.A. Ovsyannikova
Siberian State University of Physical Education and Sport, Omsk, Russia

Key words: mental retardation, coordination abilities, training methods, track-and-field athletics, sports training.

Annotation. The purpose of the research is theoretical and experimental substantiation of the methodology for the development of coordination abilities in young athletes with intellectual disabilities. The methodology of training classes, aimed at the development of coordination abilities among athletes with intellectual disabilities at the stage of initial sports training, using TRX bands, speed ladder, balance ball and slacklining, is proposed. Application of the methodology in the preparatory and competitive periods led to a statistically significant improvement in stabilometry indices, tests for coordination abilities.

Introduction. Intellectual disabilities in children are directly related to a gap in the development of motor skills in comparison with their peers [1]. The biggest gap is revealed in the development of strength, speed, endurance and coordination [2]. It was also shown, that the most frequent and pronounced disturbances in the motor area of mentally retarded children is the coordination abilities disorder [3].

Despite the positive worldwide experience of attracting people with intellectual disabilities to sports activity, information on creating the training process for this category of athletes is not presented in an appropriate way. According to authors' opinions, issues of developing and correcting coordination disorders in children with mental retardation within sports training in track-and-field are not sufficiently revealed and require further development [4-5].

The purpose of this study – theoretical and experimental substantiation of the methodology for the development of coordination abilities in young athletes with intellectual disabilities.

Methods and organization. The study was carried out on the base of the Budgetary Educational Institution of Preschool Education "Regional children's and youth sports and adaptive school", located in Omsk oblast'. Ten children, aged 12-15 years, with mild mental retardation, were included in the experimental group.

The level of the coordination abilities development was defined using special motor tests [6]. To evaluate orientation in space, following tests were used: 3×10 m shuttle run, dribbling with changing directions; for evaluating the kinesthetic differentiation – throwing a ball at the goal, standing with the back in the direction of the throw, jumping down on a mark; for evaluating the static balance – plank position with the one leg raised.

The level of static-dynamic stability of athletes was evaluated on the "Stabilan" force plate with biofeedback. During the examination, following characteristics were obtained: quality of balance function, frontal and sagittal dislocation, frontal and sagittal spread [7].

The data obtained were statistically processed using the SPSS Statistics 17.0 program. In order to compare differences between related selections in dynamics, the Wilcoxon test was used, the Friedman test was used to evaluate differences between three indicators in dynamics. Critical value of the significance level was accepted if it was equal to 5%.

Results and discussion. The aim of developing this method is the formation of motor abilities and skills, directed towards the development of coordination abilities, as well as learning basics of the "Sports for people with intellectual disabilities" in the track-and-field discipline.

When implementing the methodology, following methods and means were used:

- conjugate influence on coordination and physical abilities in various combinations of general and special preparatory coordination exercises, including game method (passing an obstacle course, relay race, circuit training, active and sports games);

- strictly regulated variation (walking, running with changing direction);

- change in components of strength (differentiated jumps), speed or movement tempo (use of metronome), initial position (balance ball, TRX bands), space boundaries, in which an exercise is performed (performing exercises for balance on a balance ball, slacklining), changing the way of performing a move (long jump using different jumping techniques).

The methodology of developing coordination abilities in athletes with intellectual disabilities had several features:

1. Development of the ability to differentiate the duration of the whole movement, separate movement phases, movement tempo, controlling muscle tension (TRX bands, jumping, speed ladder, throwing a medical ball, exercises performed in pairs).

2. Inclusion of exercises, which make increased requirements to coordinating, arranging movements, their organizing them into a single whole, which have an

important coordination complexity, containing elements of novelty, unusualness, characterized by a variety of forms of performing movements and unexpected solutions to motor tasks (speed ladder).

3. Performing tasks for regulating, controlling and evaluating different parameters of movement by activating the work of separate analyzers or by stopping their activity. This included tasks for the accuracy of differentiating movement parameters (contrast tasks, convergent tasks).

4. Improving an ability to maintain balance using exercises that make it difficult to achieve stability of body position (balancing in poses, maintaining the pose in statics and dynamics, preservation of static and dynamic stability after performing a series of rolling and passing on a gymnastic bench with/without visual control, active and simple sports games).

Increase in loads was carried out gradually with a variety of types in the nature of the exercises. The offered sets of exercises were repeated 6-8 times on one class.

Following conditions were considered to successfully implement the methodology, directed towards the development of coordination abilities in track-and-field athletes with intellectual disabilities:

1. Main loads of coordination training classes were distributed in preparatory and competitive periods, taking into account the initial level of coordination fitness according to results of the pedagogical testing, as well as conditions and material-technical support of the training process.

2. The coordination training class, aimed at the development of balance, were conducted in preparatory, competitive and transition periods of sports training.

3. The coordination training classes were conducted twice during the weekly micro cycle with the implementation into the main part.

The developed methodology included exercises of various difficult, combined into the training class that is aimed at learning, technical elements of track-and-field exercises.

The training class № 1 develops a differentiating ability using TRX bands, a speed ladder, exercises with a ball, jumping on set distance, running through segments with a given speed and/or frequency of steps. Exercises with TRX bands: TRX-squats on the right, left leg, squats, half-squats, torso lifting, sprint start, presses, lunges for balance at a moderate pace with an emphasis on the technique of performing and proper breathing.

The training class № 2 develops rhythmical and reactive abilities using a speed ladder, obstacle course, running in set tempo, running with the crouch start, exercises for the speed of reaction to a signal. Performing exercises on a speed ladder was made difficult in the process of learning technique of the task by increasing a number of times for a specific amount of time, movement speed, isolated work of arms and

legs, using weights and resistance. Running, bounded running, side steps and side jumps were applied.

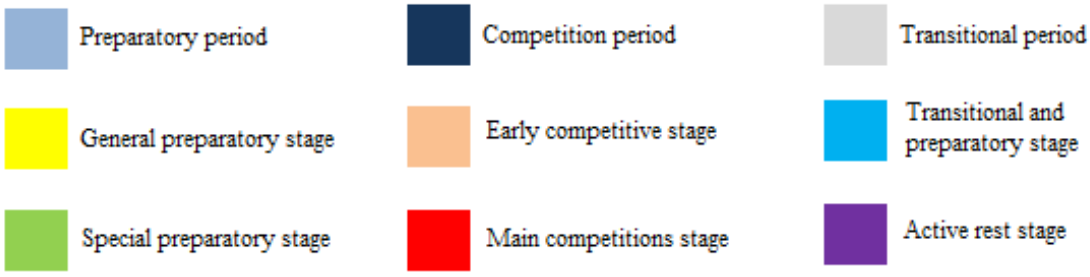
The training class № 3 is aimed at learning and mastering the technique of running and jumping using special running exercises, active and sports games.

The training class № 4 develops orientation in space using TRX bands, exercises with a ball: without visual control (in special classes), after jumps, turns, from different initial positions, when interacting with a partner.

The training class № 5 develops the balance ability using exercises on the BOSU balance ball, slacklining, changing between active and passive movements, exercises in pairs.

In order to successfully implement the suggested methodology, exercises, included into training classes, were used without increasing the total volume of classes. Mainly, they were implemented into the main part of the training class. The set of exercises for balance from the training class № 5 was included mainly into the preparatory and final parts of the training class.

The base for planning the training process included mesocycles, which lasted up to four weeks: shock, basic, preparatory, control and preparatory, precompetition, competition and recovery mesocycles, as well seven-day micro cycles, aimed at solving specific tasks of each period and stage of the annual cycle of sports training. An order of implementing micro cycles and their combination was defined by a general logic of training process and by features of the initial sports training stage (Fig).



PERIOD												
MONTH	September	October	November	December	January	February	March	April	May	June	July	August
STAGE												
Training class	1, 2, 4, 5	1 – 5	1 – 5	1, 3, 5	1 – 5	3 – 5	1, 3, 5	3, 5	1, 3, 5	1, 3, 5	5	2, 5

Fig. Structure of the methodology of the coordination abilities development, taking into account periods of the year-round sports training

Inclusion of special exercises, aimed at the coordination abilities development, in training classes contributed to the improvement of indicators of the test for coordination abilities (Table 1).

Table 1

Indicators of the test for coordination abilities (M±s)

Test name, measuring units	At the beginning	In the middle	At the end	pF
3×10 m shuttle run, s	8,6±0,4	8,4±0,4	8,0±0,3	0,001
Dribbling with changing directions, s	21,0±6,6	20,8±6,5	19,3±5,3	0,001
Throwing a ball while standing with the back to the goal, points	7,6±2,5	8,0±2,4	11,1±1,9	0,001
Jumping down on a mark, cm	4,2±2,6	2,4±1,8	0,9±0,8	0,001
Plank position with the one leg raised, s	7,1±3,8	10,4±5,6	17,4±9,1	0,001

A statistically significant improvement in tests "3×10 m shuttle run" by 9% and "Dribbling with changing directions" by 10% was revealed in comparison with these indicators before the experiment. The indicator of the "Throwing a ball while standing with the back to the goal" test increased by 35% after the experiment. More changes that are significant were noted in the "Plank position with the one leg raised" test. Time of holding balance during the experiment increased by 2,5 times. The biggest growth rate among indicators among other indicators was revealed when performing the "Jumping down on the mark" test and amounted to 4,7 times compared to the same indicator before the experiment. Same dynamics of test results indicates positive effect of the methodology of the coordinate abilities development in young track-and-field athletes.

Table 2

Indicators of the static-dynamic stability in athletes (M±s)

Indicators	At the beginning	At the end	pW
Frontal dislocation, mm	2,63±6,87	-4,25±6,76	0,004
Sagittal dislocation, mm	-30,14±11,26	-10,04±20,72	0,009
Frontal spread, mm	2,24±0,60	2,00±0,51	0,262
Sagittal spread, mm	3,54±0,73	3,66±1,36	0,646
Mean spread, mm	3,68±0,67	3,67±1,21	0,959
Quality of the balance function, %	80,0±5,0	94,0±2,0	0,005

At the end of the pedagogical experiment, indicators of quality of the balance function on the force plate significantly increased by 14% an amounted to 94% (Table 2). The sagittal dislocation indicator reduced 3 times, which is possibly related to processes of compensating the disturbance of the linearity of movements due to a disorder of coordination and a shift in the general center of gravity. Furthermore, at the end of the experiment, such indicators of the static-dynamic stability as the frontal, sagittal and mean spreads remained unchanged, which indicates a preservation of athletes' stability in both planes.

Conclusion. Thus, the statistically significant improvement of indicators in coordination ability tests and indicators of the static-dynamic stability indicates a positive effect of the developed methodology and allows us to recommend it to use

in the training process of young track-and-field athletes with mental retardation at the stage of the initial sports training.

References

1. Ponomarev M.N. Development of physical qualities in students with intellectual disabilities / M.N. Ponomarev // Material of the II Regional Scientific and Practical Conference "Sports Trans-Urals". – 2013. – P. 34-36.

2. Kalmykov D.A. Features of the manifestation of coordination abilities in children with mental retardation / D.A. Kalmykov, G.I. Deryabina // Physical Culture, Sport and Health. – 2017. – No. 29. – P. 130-134.

3. Gorskaya I.Yu. Basic coordination abilities of schoolchildren with different levels of health / I.Yu. Gorskaya, L.A. Suyangulova // Omsk: SibSAPC. – 2000. – 210 p.

4. Boldyreva V.B. Development of coordination abilities of 9-11 year old mentally retarded children by means of physical education / V.B. Boldyreva, A.Yu. Keino, P.M. Gritskov // Bulletin of the Tambov University. Series: Humanities. – 2017. – Vol.22. – No.6(170). – P. 151-159.

5. Trubina K.D. Impact of adaptive sports means on physical development of children with mental retardation / K.D. Trubina, T.V. Abyzova // Proceedings of the conference "Physical culture, sports, tourism: scientific and methodological support" – Perm. – 2014. – P. 151-154.

6. Kubryak O.V. Study of human support reactions (posturography, stabilometry) and biofeedback in the STPL program / O.V. Kubryak, S.S. Grokhovskij, A.V. Dobrorodnyj // Moscow. – 2018. – 121 p.

7. Lyakh V.I. Coordination abilities: diagnostics and development / V.I. Lyakh // M.: Division. – 2006. – 290 p.

Spisok literatury

1. Ponomarev M.N. razvitie fizicheskikh kachestv u uchashchikhsya s narusheniem intellekta / M.N. Ponomarev // Sbornik trudov II regional'noj nauchno-prakticheskoj konferentsii «Zaural'e sportivnoe». – 2013. – S. 34-36.

2. Kalmykov D.A. Osobennosti proyavleniya koordinatsionnykh sposobnostej detej s umstvennoj otstalost'yu / D.A. Kalmykov, G.I. Deryabina // Fizicheskaya kul'tura, sport i zdorov'e. – 2017. – № 29. – S. 130-134.

3. Gorskaya I.Yu. Bazovye koordinatsionnye sposobnosti shkol'nikov s razlichnym urovnem zdorov'ya / I.Yu. Gorskaya, L.A. Suyangulova // Omsk: SibGAFK. – 2000. – 210 s.

4. Boldyreva V.B. Razvitie koordinatsionnykh sposobnostej umstvenno otstalykh detej 9-11 let sredstvami fizicheskogo vospitaniya / V.B. Boldyreva, A.Yu. Kejno, P.M. Gritskov // Vestnik Tambovskogo universiteta. Seriya: Gumanitarnye nauki. – 2017. – T.22. – №6(170). – S. 151-159.

5. Trubina K.D. Vozdejstvie sredstv adaptivnogo sportana fizicheskoe razvitie detej s umstvennoj otstalost'yu / K.D. Trubina, T.V. Abyzova // Sbornik trudov konferentsii «Fizicheskaya kul'tura, sport, turizm: nauchno-metodicheskoe soprovozhdenie». – Perm'. – 2014. - S. 151-154.

6. Kubryak O.V. Issledovanie opornykh reaktsij cheloveka (posturografiya, stabilometriya) i biologicheskaya obratnaya svyaz' v programme STPL / O.V. Kubryak, S.S. Grokhovskij, A.V. Dobrorodnyj // Moskva. – 2018. – 121 s.

7. Lyakh V.I. Koordinatsionnye sposobnosti: diagnostika i razvitie / V.I. Lyakh // M.: Divizion. – 2006. – 290 s.

Information about the authors: Natal'ya Mikhajlovna Kurch – Associate Professor of the Department of Theory and Methods of Adaptive Physical Culture of the Siberian State University of Physical Culture and Sports, Omsk, e-mail: nkurch@mail.ru; **Irina Aleksandrovna Ovsyannikova** – Master's Student of the Department of Theory and Methods of Adaptive Physical Culture of the Siberian State University of Physical Culture and Sports, Omsk.