RUSSIAN JOURNAL OF
SPORTS SCIENCE
2024, Vol. 3, № 4(12)

Publication date: 15.12.2024
DOI: 10.24412/2782-6570-2024_03_04_6
UDC 376

DEVELOPMENT OF STATIC AND DYNAMIC BALANCE OF 11-12-YEAR-OLD SCHOOLCHILDREN WITH INTELLECTUAL DISABILITIES BY MEANS OF OUTDOOR GAMES

N.L. Litosh
FSBI "North-Caucasian Federal Research-Clinical Center of Federal Medical and Biological Agency", Essentuki, Russia

Abstract. The purpose of the study was to develop and experimentally substantiate a method for developing static and dynamic balance in children of secondary school age with intellectual disabilities. The results of the pedagogical experiment proved the effectiveness of the designed method, the content of which included specially selected physical exercises and outdoor games aimed at developing the ability to maintain balance in static poses and when performing motor actions on a narrow support. The growth rate in motor tests revealed a high and average level of the studied indices after the pedagogical experiment.
Keywords: schoolchildren with intellectual disabilities, static and dynamic balance, physical exercises and outdoor games.

Introduction. An ability to maintain posture stability (balance) is a main component of a complex structure of man's motor coordination abilities. Abilities to control movements, learn new motor actions, reconstruct existing motor skills and form physical qualities in accordance with alternating conditions and motor experience require a sufficient level of the musculoskeletal system development. For social and labor adaptation of schoolchildren with intellectual disabilities and graduates of special (correctional) educational institutions, an ability to maintain balance or posture stability for a long time in professionally applied physical exercises of static and dynamic nature is of vital importance [1-3].

An ability to maintain balance in various body positions or when performing motor actions is necessary in any activity of schoolchildren with intellectual disabilities in special (correctional) general education schools: production training, educational and extracurricular events, physical education, health improving and sports activities [4-8].

As the studies show, children and adolescents with intellectual disabilities are significantly behind the normally developing peers in motor tests that determine the level of development of coordination abilities, the balance function in particular. According to the researchers' opinion, this is due to the disorder of integrative brain activity in intellectual disabilities, since the manifestation of coordination abilities is provided by a complex combination of actions of various analyzers: motor, vestibular, auditory, visual, skin, united by the regulatory influence of the central nervous system [1, 2, 9, 10].

The balance function development in the process of adaptive physical education of students of secondary school age with intellectual disabilities helps to improve the technique of existing motor skills and facilitates the mastery of new motor actions in accordance with the content of the "Physical Education" program's subject field [9, 11].

In order to develop the ability to maintain posture stability (balance) during adaptive physical education classes it is necessary to apply both ways and methods associated with the basic movements – walking, running, jumping, throwing, climbing, climbing over, as well as specially selected and modified physical exercises and outdoor games that contribute to the formation of static and dynamic balance of students with intellectual disabilities [1, 3, 9, 11].

The aim of our study – to develop and experimentally justify the methodology of development of static and dynamic balance function in children of middle school age with

intellectual disabilities.

Methods and organization. In this study, we used the following methods: pedagogical testing, pedagogical experiment, math-and-stats methods.

The pedagogical testing was conducted to identify an ability to maintain balance in 11-12-year-old children with intellectual disabilities, we performed the following tests.

The "Sideways (right/left side) bench walk" test was conducted to determine the dynamic balance development. Testing protocol: the subject stands with their right (left) side on the edge of a bench and walks with side steps. Length of the bench – 4 m, height – 20 cm, width – 25 cm. The countdown began with placing the foot on the bench and ended after the subject's descent from the bench. The result was measured in seconds.

The "Backwards bench walk" test was also used to determine the dynamic balance in more complicated conditions. Testing protocol: the subject walks backwards on the bench, arms to the sides, and as quickly as possible. Length of the bench – 4 m, height – 20 cm, width – 25 cm. The countdown began with placing the foot on the bench and ended after the subject's descent from the bench. The result was measured in seconds.

The Tandem Romberg Test was used to identify static balance. Testing protocol: the subject stands, soles of the feet are positioned on the same line, the heel of the right foot touches the toe of the left foot, arms to the sides, eyes closed. The result was determined by how long the subject could hold this pose (in seconds)

The Stork Romberg Test was also used to identify static balance. Testing protocol: the subject takes the initial position – stands on one leg, the other leg bent at the knee, the foot of the bent leg touches the knee of the other, arms stretched forward, eyes closed. The result was determined by how long the subject could hold this pose (in seconds).

To identify the effectiveness of the designed method for the development of balance function, we have carried out a 3-month pedagogical experiment in the Shadrinsk Special (Correctional) Boarding School No 11 for children of middle school age with intellectual disabilities. The experimental method included specially developed physical exercises and outdoor games aimed at the development to maintain posture stability in conditions of physical education classes.

After the pedagogical testing, the subjects were randomly divided into the experimental and control groups of 12 children each. The sessions were held 2 times a week, 26 sessions in total. The experimental group was training according to the designed method for the balance function development, the control group – according to a special (correctional) school program in compliance with the Federal State Educational Standard for Education of Schoolchildren with Mental Retardation (Intellectual Disabilities, Variant 1).

The statistical data processing of the pedagogical testing and experiment ds was done in Microsoft Excel, Statistica 13.0. The significance of differences was assessed with the Student's T-test, normality of distribution was identified with the Shapiro-Wilk test. The data are presented in a form of arithmetic mean and mean square deviation, the growth rate was calculated with the Brody's equation.

Results and discussion. Before the pedagogical experiment, there were no significant differences in the performance of motor tests reflecting the balance function development (table 1).

The results of the pedagogical experiment have shown that the experimental group children had positive changes in the studied indices compared to the initial data ($p \leq 0.05$) (table 2).

Moreover, the growth rate results also reflect an effective influence of special physical exercises and outdoor games included in the experimental method aimed towards the static and dynamic balance development (table 3).

Table 1

Balance function development of 11-12-year-old children with intellectual disabilities before the pedagogical experiment

№	Test	Experimental group (n=12)	Control group (n=12)
1	“Sideways bench walk” test, left side, s	5.2±1.8	5.1±2.1
2	“Sideways bench walk” test, right side, s	5.7±1.7	5.5±2.0
3	“Backwards bench walk” test, s	4.2±1.5	4.1±1.8
4	Tandem Romberg Test, s	18.9±6.2	20.3±6.3
5	Stork Romberg Test, s	9.3±4.3	9.1±4.5

Table 2

Development of the ability to maintain balance in 11-12-year-old children with intellectual disabilities after the pedagogical experiment

№	Test	Experimental group (n=12)	Control group (n=12)
1	“Sideways bench walk” test, left side, s	3.3±0.7*	4.8±2.6
2	“Sideways bench walk” test, right side, s	3.8±0.8*	5.2±2.1
3	“Backwards bench walk” test, s	2.8±0.8*	4.0±1.5
4	Tandem Romberg Test, s	27.4±6.4*	21.1±4.9
5	Stork Romberg Test, s	15.9±4.9*	9.0±4.5

Note: * – significance of difference between the studied indices after the experiment ($p \leq 0.05$)

Table 3

Growth rates of the balance function development indices in 11-12-year-old children with intellectual disabilities, %

№	Test	Experimental group (n=12)	Control group (n=12)
1	“Sideways bench walk” test, left side, s	45.5	2.0
2	“Sideways bench walk” test, right side, s	45.8	5.3
3	“Backwards bench walk” test, s	36.8	2.2
4	Tandem Romberg Test, s	38.5	3.4
5	Stork Romberg Test, s	54.8	4.2

The experimental method was the most effective in the static balance test. After the Stork Romberg Test, we discovered significant changes ($p \leq 0.5$): time of holding the pose in the experimental group has changed from 9.3 seconds at the beginning of the experiment to 15.9 seconds after the experiment. The growth rate amounted to 54.8%. The control group showed insignificant changes in the absolute values of this test: 9.1 seconds before the experiment and 9.0 seconds after the experiment. The growth rate of the studied index in the control group was 4.2%.

In the Tandem Romberg Test, which also reflects the level of static balance development, the experimental group has shown significant changes in the results after the experimental method's introduction: from 18.9 seconds to 27.4 seconds. The growth rate in the experimental group was 38.5%. The control group also demonstrated positive changes in the indices of this test, but they were insignificant, as evidenced by the growth rate of 3.4%.

Significant ($p \leq 0.5$) positive changes were also found in the "Sideways bench walk" test (right side) in the experimental group after the pedagogical experiment. The time of performance has changed from 5.2 seconds at the beginning to 3.3 seconds after the experiment. The growth rate of this task amounted to 45.5% in the experimental group. In the control group, insignificant changes in the absolute values were revealed from 5.1 seconds at the beginning to 4.8 seconds after the experiment. The growth rate in the control group was 2%.

The same tendency was revealed on a significant level ($p \leq 0.5$) in the "Sideways bench walk" test (left side) that evaluated an ability to maintain balance while moving on a narrow support. The result in the experimental group before the test was 5.7 seconds, after the test – 3.8 seconds, as also evidenced by the growth rate – 45.8%. In the control group, we have found insignificant changes: 5.5 seconds before the experiment and 5.2 seconds after the experiment, the growth rate – 5.3%.

In our opinion, such significant positive changes in absolute values before and after the experiment are due to the accessibility of the content and performance of the proposed control tasks and the selection of special physical exercises and outdoor games aimed at the development and improvement of the studied motor abilities.

We have also found significant changes in the indices of the "Backwards bench walk" test ($p \leq 0.5$): in the experimental group, the performance time before the experiment was 4.2 seconds, after – 2.8 seconds, the growth rate in this test was 36.8%. The control group has demonstrated insignificant changes in the absolute values of the studied ability: 4.1 seconds before the experiment and 4.0 seconds after, the growth rate was 2.2% (table 3).

Conclusion. Therefore, the designed experimental method for the balance function development in 11-12-year-old schoolchildren with intellectual disabilities had a positive effect on the development of static and dynamic balance. High growth rates of the studied indices were revealed in the tests reflecting the level of static balance development: Stork Romberg Test – 54.8%. Average growth rates were observed in the following tests: "Sideways bench walk" test (right/left side) – 45.5% and 45.8%, respectively, "Backwards bench walk" test – 36.8%. The growth rate indices in the Tandem Romberg test – 38.5% – also corresponded to the average level.

The obtained results of the pedagogical experiment prove the effectiveness of the designed experimental method for the development of static and dynamic balance of 11-12-year-old children with intellectual disabilities studying in special (correctional) schools and correctional classes of general education schools.

Conflict of interest. The author declares no conflict of interest.

REFERENCES

1. Artemenko E.P., Lobanova M.A., Litosh N.L., Timchenko T.V. Substantiation of the program for the development of motor and coordination abilities in children 12–13 years old with intellectual disabilities engaged in table tennis. *Adaptive Physical Education*, 2022, no. 3(91), pp. 29–31. (in Russ.)

2. Kalmykov D.A., Deryabina G.I. Peculiarities of the coordinating ability of children with mental fences. *Fizicheskaya kul'tura, sport i zdorov'e*, 2017, no. 29, pp. 130–134. (in Russ.)

3. Tiraspol'skaya V.A., Naryshkina E.Yu Integrated approach to the development of coordination abilities of the VIII type special school pupils. Relevant Tasks of Pedagogy: materials of

the III International Scientific Conference (Chita, February 2013). Chita: Young Scientist, 2013. pp. 231–234. (in Russ.)
4. Artemenko E.P., Litosh N.L. Development of motor coordination abilities of children with intellectual disabilities engaged in table tennis. *Modern Issues of Biomedicine*, 2022, vol. 6, no. 4(36). DOI: 10.51871/2588-0500_2022_06_04_44
5. Zajtseva M.V. Correction of the disorders of the musculoskeletal system of children with intellectual disabilities by the means of fitball gymnastics. Relevant Issues of Modern Pedagogy: materials of the VIII International Scientific Conference (Samara, March, 2016). Samara: ASGARD LLC, 2016. p. 209–211.
6. Kurch N.M., Ovsyannikova I.A. Coordination abilities development methodology in young athletes with mental retardation. *Modern Issues of Biomedicine*, 2021, vol. 5, no. 3. DOI: 10.51871/2588-0500_2021_05_03_20 (in Russ.)
7. Ovsyannikova E.Yu., Fominykh V.K. Development of coordination abilities of children of secondary school age by means of swimming with the use of specific exercises. *Young Scientist*, 2018, no. 25 (211), pp. 266–270. (in Russ.)
8. Raguzov A.A. Development of coordination abilities of children of secondary school age with mental disabilities in swimming classes. Improvement of the System of Physical Education, Sports Training, Tourism, Psychological Support and Health Improvement of Different Population Groups: Materials of the XX International Scientific and Practical Conference (Surgut, November 2021). Surgut: Publishing house of the SUSU, 2022. pp. 571–574. (in Russ.)
9. Nikiforova T.Yu. Method of correction of coordination abilities in adolescents c intellectual disabilities. *Izvestiya Tula State University. Physical Culture. Sport*, 2019, no. 10, pp. 45–52. (in Russ.)
10. Suyanguloba L.A., Kharchenko L.V., Gorskaya I.Yu. Age-related regulations and peculiarities of some coordination manifestations of 8-15-year-old pupils of general schools and children with intellectual disabilities. Scientific works of the Siberian State University of Physical Culture and Sports. Omsk: SibSUPC, 1996. pp. 116–119. (in Russ.)
11. Boldyreva V.B., Kejno A.Yu., Gritskov P.M. The development of coordination abilities of mentally retarded children 9-11 years old by means of physical education. *Tambov State University Review. Series: Humanities*, vol. 22, no. 6(170), pp. 151–159. (in Russ.)

INFORMATION ABOUT THE AUTHORS:

Nina L. Litosh – Candidate of Pedagogical Sciences, Associate Professor, Senior Researcher of the Center of Biomedical Technologies, FSBI "North-Caucasian Federal Research-Clinical Center of Federal Medical and Biological Agency", Essentuki, e-mail: omsafk@mail.ru.

For citation: Litosh N.L. Development of static and dynamic balance of 11-12-year-old schoolchildren with intellectual disabilities by means of outdoor games. *Russian Journal of Sports Science: Medicine, Physiology, Training*, 2024, vol. 3, no. 4(12). DOI: 10.24412/2782-6570-2024_03_04_6