Original Article

Development of coordination abilities of mentally retarded children in physical education lessons

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ABSTRACT

The aim of the study to develop a methodology for improving the level of development of the coordination abilities of mentally retarded children aged 8-9 years in the lessons of adaptive physical education.

Methods

The study was organized at a special correctional school from September 13 to December 16, 2023. 14 schoolchildren aged 8-9 took part in the experiment. Children from the control group studied according to the usual program, and children from the experimental group performed complexes of coordination exercises and used outdoor games during lessons on adaptive physical culture. The level of development of coordination abilities of mentally retarded children aged 8-9 years was determined by three tests: 3x10m shuttle run, one-leg stand, obstacle course. The Student's T-Test was the main method of mathematical processing of the research results.

Results

Prior to the start of the study, the difference in performance in control tests in both groups was not significant and not reliable ($p>0.05$), which indicates the homogeneity of the groups. After the end of the pedagogical experiment, the indicators of coordination abilities of children from the control group improved, but not significantly or significantly ($p>0.05$). Significant positive changes occurred in the experimental group for all tests. In the shuttle run, the indicators became higher by 0.5 seconds ($p>0.05$), in the one-leg stand test, the indicators improved by 1.1 seconds ($p>0.05$), and in the obstacle course test, the indicators improved by 1.2 seconds ($p<0.05$). An intergroup comparison showed a difference in two of the three indicators of coordination abilities when the significant difference is the shuttle run ($p<0.05$) and the obstacle course ($p<0.05$).

Conclusion

The developed experimental methodology for the development of coordination abilities for mentally retarded children aged 8-9 years in the lessons of adaptive physical education has proven its effectiveness and is recommended for use in correctional schools in working with mentally retarded children.

Keywords

Children's health, Oligophrenia, Physical education, Outdoor games, Physical exercises.

INTRODUCTION

A lot of attention is paid to the health problems of schoolchildren[1,2]. A large number of studies have been devoted to the problem of childhood obesity and others[3,4]. Separately, attention should be paid to the problem of oligophrenia (human mental retardation) – a clinical manifestation of brain disease[5,6]. The main manifestation of oligophrenia is mental underdevelopment. This is a pathological condition, the result of the action of an etiological factor that causes developmental delay. Oligophrenia is characterized by the presence of congenital or acquired in early childhood (up to 3 years old) general mental underdevelopment[7,8]. In the social aspect, "oligophrenia", as defined by the American Association of Mental Retardation, is characterized by the following criteria[7,9,10]:

1) The intelligence quotient (IQ) is below 70;

2) the insufficiency of the individual's social competence;

3) the occurrence of this defect during development, that is, before the age of 18

From a pedagogical point of view, it is important to assert that a person's mental retardation is a pathological condition, which is expressed in dementia[8,11].

Improper gait (movement of legs and arms, stiffness, arrhythmia, excessive movements) was noted in 40-50% of oligophrenics. Violations in running exercises (inconsistency of arms and legs, uneven movements in amplitude, excessive rotation of the trunk, stiffness of the

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shoulder girdle) were noted in 50-60%. The inability to jump on one and two legs was noted in 90-100%. There are difficulties when crawling, climbing, throwing. Violation of fine motor skills is especially characteristic in oligophrenia because the projection area of the hand in the cerebral cortex occupies the largest area. Morphological deficiencies contribute to motor disorders. These include: pathological shape of the chest, deformity of the spine, irregular shape of the legs[6,7,12].

The formation of skills related to accuracy, speed, balance, and strength in mentally retarded children is formed more slowly than normal. And once formed, they are not always durable. The level of development of physical qualities is closely related to the degree of mental performance[5,8].

In oligophrenics, the most difficult exercises are performed in which the coordination of four limbs is required according to the cross type. Reduced performance, increased fatigue is due to the peculiarities of physiology[9,13].

Adaptive physical education of children with moderate intellectual disabilities is part of correctional work. Its goal is social adaptation, employment, and adjustment to life. The achievement of the goal is ensured by solving the following tasks[14,15]:

1. The development of all mental functions and cognitive activity of children in the learning process and the correction of their insufficiency.
2. Education, formation of correct behavior.
3. Preparation for industrial work.
4. Household orientation.

The process of physical education is aimed at solving special tasks that help this category of people to adapt socially[14,15]:

1. Correction and compensation of motor disorders;
2. Correction of physical development disorders;
3. Correction of insufficiency in the development of physical qualities;
4. Formation of age-related motor functions;
5. Education of mental functions that ensure the performance of motor acts (attention, memory, thinking).

Such children are characterized by a lag in development and a violation of both coordination abilities (accuracy of movements in space, rhythm of movements, balance) and other motor qualities (strength, speed, endurance, speed-strength qualities, flexibility, dexterity)[16-18]. The analysis of scientific and methodological literature has shown that the works of many authors are devoted to the study of the development of the motor sphere of mentally retarded children of different ages[19-21]. The use of physical exercises aimed at the formation of coordination abilities is especially favorable for the development of physical activity in children with mental retardation[22,23].

The value of coordination exercises for such children is that they affect all areas of their life. That is why, with the help of physical exercises with a coordination orientation, a child with mental retardation increases mental activity, motivation, attention, and, consequently, cognitive activity in general[22,24]. The problems of teaching, upbringing and socialization of mentally retarded children in correctional schools are interrelated with the issues of improving the process of their physical education, searching for effective methods of developing their motor sphere, correcting motor actions and increasing the level of development of physical qualities. This is especially true for the category of children aged 8-9 years who are on the verge of preparing for work. The labor activity of children of this category is possible only in physically active professions, therefore, the level of development of their motor skills and abilities, the gradual development of physical qualities plays an important role in their social adaptation. Correcting motor disorders and expanding the motor capabilities of a mentally retarded child are the main conditions for preparing him for life and subsequently for physical labor[23,25].

Coordination abilities are a set of many mastered motor coordination skills that ensure productive motor activity. This is a structurally complex ability. That is why in physical education programs in special correctional schools, the development of coordination abilities is an important part of the educational process and is considered as the basis forming the fund of new motor skills, as a prerequisite and basis for the successful development of other physical abilities[22,26].

A high level of physical condition indicators is especially important for effective mastery of professionally important skills and work skills[22,27]. A mentally retarded child has, as a rule, lower indicators

of physical condition in comparison with peers with normal intelligence[28]. In most cases, such children have motor insufficiency and coordination abilities are more likely to suffer. They are slow, clumsy, which prevents the formation of the mechanism of running, jumping, throwing. Even in adolescence, schoolchildren have difficulty accepting and maintaining a given pose, differentiating their efforts, and switching to another type of physical exercise[7,8,12].

Most authors of research on physical culture suggest using outdoor games to develop coordination abilities. The authors are sure that nowhere is a child revealed more than in games. Here, in addition to satisfying personal interests, the child, unknowingly, develops his physical qualities, learns to be friends, empathize, go to the rescue without looking back, win and lose. You just need to set it up correctly, not push it away, support it[29,30].

The game is a means of versatile education of the child. Purposefully selected outdoor games are able to develop fine motor skills, coordination of movements, balance, accuracy, differentiation of effort, time and space, improve the quality of attention, sound pronunciation; they help to master elementary mathematical concepts; stimulate the development of physical, psychomotor and intellectual abilities of children[30-32].

Outdoor games for mentally retarded children should be not only accessible in complexity, but also emotionally diverse; they should take into account the personal interests of children, bring healing joy to every child; when selecting outdoor games, it is necessary to take into account the content of the game, which should correspond to the level of intellectual and motor development, emotional state; options for complicating motor tasks are acceptable, but this only as you master the simple forms of movement; the content of the games should provide for a comprehensive nature of the impact: on coordination, on the correction of physique and motor disorders, on the development of physical qualities, on strengthening and improving the whole body as a whole; during the game it is necessary to stimulate mental processes, creativity and imagination of the child[8,9,11,33].

An analysis of literary sources has shown that education and correctional measures help children with a moderate degree of mental retardation to adapt socially. However, the authors pay attention to the training of motor skills is hampered by morphofunctional insufficiency, pathologically formed motor skills, damage to the second signaling system, which is expressed in a lag in terms of speed and coordination. In such a complex pathology, the use of such a corrective technique is of particular importance, which will effectively correct the shortcomings. One of the most comprehensive means of influencing the human body is exercise. They allow, due to their properties, not only to affect physical qualities, but also to rebuild motor skills. Many authors offer various methods for the development of the coordination abilities of mentally retarded children, these methods contain a narrowly focused use of funds, but in our opinion this is not enough for the rehabilitation of such children.

MATERIAL AND METHODS

The study was organized at correctional school No. 44 in Kirov from September 13 to December 16, 2023. The number of students who took part in the experiment was 14 people. Age of children: 8-9 years old. The children were divided into 2 groups by random sampling. The incidence was assessed according to outpatient records and certificates.

All physical education classes were scheduled 3 times a week for 35 minutes each lesson (Monday, Wednesday, Friday).

Since primary school age is the most favorable for the development of coordination abilities, in this regard, one of the main tasks that was solved in physical education classes is to ensure the versatile development of coordination abilities of children involved. The developed experimental method of practicing outdoor games of various directions was applied in the process of physical education lessons for students of the experimental group. The outdoor games used in physical education lessons in the experimental group were selected taking into account the functional capabilities and the level of physical fitness of the students. As a means of developing coordination abilities, outdoor games were used aimed at developing statistical equilibrium, orientation in space, differentiation of efforts, reaction speed, rhythmicity, correction of elementary movements, stability of the vestibular apparatus.

The main criteria for the selection of games were: emotionality, accessibility, ease of movement, purposefulness of the impact on coordination abilities, as well as the children's own attitude to each game.

Almost every game is aimed at developing one or another coordination ability:

1) Correction of elementary movements.

2) Orientation in space.

3) Rhythmicity.

4) Static coordination and dynamic equilibrium.

5) Quick response.

6) Relaxation.

Among the variety of outdoor games, such as "who is faster", "day and night", "clever guys" and many others were used.

Children from the control group of 7 people studied according to the standard methodology for correctional schools.

Motor testing:

The main guiding factor in the process of physical training is the control over the development of motor abilities. As a result, a set of control tests was selected that characterizes the level of development of the coordination abilities of mentally retarded children aged 8-9 years in the lessons of adaptive physical education.

1. 3x10m shuttle run (assessment of the level of development of general coordination abilities).
2. Standing on one leg (static balance assessment)
3. Obstacle course (comprehensive assessment of coordination abilities). From a standing position in front of the starting line, at the command "March!" the student performs a "snake" run around three racks, jumps over a gymnastic bench, climbs inside the athletics barrier, and then finishes running.

Methods of mathematical statistics

All the results of experimental studies were processed using methods of mathematical statistics and Student's t-test: Arithmetic mean – X; Sigma – δ.

RESULTS

At the beginning of the pedagogical experiment, students of the experimental and control groups were offered control tests that determine the level of development of coordination abilities. Table 1 shows the results of the control exercises before the start of the pedagogical experiment in both groups.

Table 1. Indicators of control tests before the start of the pedagogical experiment in the control and experimental groups

Control tests	The control group		The experimental group		t	p
	M	δ	M	δ		
Shuttle running (sec.)	11.3	1.31	10.1	1.45	1.701	>0.05
Stand on one leg (sec.)	9.7	1.58	10.3	1.65	0.773	>0.05
Obstacle course (sec.)	31.9	0.81	31.5	0.84	1.032	>0.05

Table 1 shows that the indicators of control exercises before the pedagogical experiment in the control and experimental groups are not significant and are not reliable in all indicators. (p0.05), which indicates the homogeneity of the groups.

Table 2. Changes in indicators of coordination abilities from the beginning to the end of the study in the control group

Control tests	Before the start of the study		After the end of the study		t	p
	M	δ	M	δ		
Shuttle running (sec.)	11.3	1.31	11.3	0.64	0.048	>0.05
Stand on one leg (sec.)	9.7	1.58	9.5	2.92	0.171	>0.05
Obstacle course (sec.)	31.9	0.81	31.6	0.93	0.632	>0.05

Table 2 shows that the indicators of coordination abilities of children from the control group improved during the study period, but not significantly or reliably (p0.05). At the same time, the indicators of children from the experimental group improved significantly, table 3 shows changes in indicators of coordination abilities from the beginning to the end of the study in the experimental group.

Table 3. Changes in indicators of coordination abilities from the beginning to the end of the study in the experimental group

Control tests	Before the start of the study		After the end of the study		t	p
	M	δ	M	δ		
Shuttle running (sec.)	10.1	1.45	9.6	1.31	0.048	>0.05
Stand on one leg (sec.)	10.3	1.65	11.4	0.87	0.171	>0.05
Obstacle course (sec.)	31.5	0.84	30.3	0.78	0.632	>0.05

Table 3 shows that during the study period, significant positive changes occurred in the experimental group for all tests. In the shuttle run, the indicators became higher by 0.5 seconds (p0.05), in the one-leg stand test, the indicators improved by 1.1 seconds (p0.05), and in the obstacle course test, the indicators improved by 1.2 seconds ($p<0.05$).

It should be noted that during the experiment, the children became more attentive and more mobile. At the beginning of the experiment, children unwillingly attended physical education classes, they often got confused in the types of building in the hall, in positions and postures of the body during the exercise, in the directions of movement around the hall. At the end of the experiment, the children of the experimental group came to physical education lessons with great desire, because instead of a standard lesson, an outdoor game was conducted with them in the preparatory part of the lesson, in the main part of the lesson, an outdoor game solved the main task of the lesson, and in the final part, an outdoor game was held to relax after classes. Table 4 shows the results of the control exercises after the pedagogical experiment in both groups.

Table 4. Indicators of control tests after a pedagogical experiment in the control and experimental groups

Control tests	The control group		The experimental group		t	p
	M	δ	M	δ		
Shuttle running (sec.)	11.3	0.64	9.6	1.31	3.267	<0.05
Stand on one leg (sec.)	9.5	2.92	11.4	0.87	1.812	>0.05
Obstacle course (sec.)	31.6	0.93	30.3	0.78	3.085	<0.05

Table 4 shows that the difference in two of the three indicators of coordination abilities reached significant differences, shuttle running ($p<0.05$) and obstacle course ($p<0.05$). Such results indicate the effectiveness of the experimental methodology for the development of coordination abilities in comparison with the usual program.

DISCUSSION

There are more than 300 million people with mental retardation in the world. Specialists studying this category of children define mental retardation not as a disease, but as a state of mental underdevelopment characterized by diverse signs, both in the clinical picture and in the complex manifestation of physical, mental, intellectual, and emotional qualities[5,8,10].

The issue of the social status of persons with intellectual disabilities in society, due to the deterioration of the environmental situation and the social situation remains relevant. Therefore, the question arises about their education, carrying out corrective measures that help this category of children to adapt socially. However, learning motor skills is hampered by morphofunctional insufficiency, pathologically formed motor skills, damage to the second signaling system, which is expressed in a lag in terms of speed, coordination[8,11,13]. With such a complex pathology, the use of such a corrective technique is of particular importance, which will effectively correct the shortcomings. One of the most comprehensive means of influencing the human body is physical exercise[14,18,21]. It is important to develop the skills of safe behavior of children with

mental retardation in physical exercises[15,19].

It was found that according to most indicators of basic coordination abilities, children with developmental abnormalities lag behind the parameters of healthy peers, with the most significant deviations revealed in primary school age[22,24,25].

In students with intellectual disabilities, most of the sensitive periods of development of basic coordination abilities occur in the age range of 8-9 years, therefore, it becomes relevant to search for the most effective methods of their development[23,25,27].

With all the variety of means and methods of developing coordination abilities, in our opinion, one of the most effective is outdoor games, which are already a means, a method. Their use in physical education lessons makes it possible to comprehensively solve the problems of developing the coordination abilities of mentally retarded children[22-25,28].

In the new pedagogical experiment on the control tests "shuttle run" and "obstacle course", significant changes occurred ($p<0.05$), which indicates the effectiveness of the experimental methodology for the development of coordination abilities for mentally retarded children aged 8-9 years in the lessons of adaptive physical education. However, the control test "standing on one leg" showed an unreliable result, which means that more attention should be paid to exercises that develop coordination abilities, as well as, probably, the short duration of pedagogical research.

The theoretical significance lies in the fact that the development of an experimental methodology for the development of coordination complements the theoretical issues of the theory and organization of adaptive physical culture in the development of physical qualities of persons with intellectual disabilities.

Practical significance. The developed correctional method of conducting classes with children with mental retardation aged 8-9 years, allows them to better socially adapt and form vital skills and increase the level of development of coordination abilities.

Practical recommendations

To develop the coordination abilities of mentally retarded children in the system of adaptive physical education, the following means are offered:

1. Exercises for "rocking" and relaxation - "a mark on the glass".
2. Adapted sports games - volleyball, handball, football and others with any moving object and game exercises - throwing and hitting the ball over short distances in series, followed by sending the ball a long distance to the target; throwing the ball up with one or two hands, followed by feeding to a given part of the court; turning the body under left and right hand, leg; sending the ball to the target by throwing or hitting in a jump with a 90-180 degree turn; throwing the ball with the hand held aside under visual control; throwing the ball from one hand to another; dribbling the ball (on the floor) with turns of the body without the ball; hitting the ball into a target that suddenly appears from various sides for a short time; the thrower stands in the center of a circle (square, triangle) that raises the targets. Adapted outdoor games - "Hit the target", "Day and night".
3. Sports and outdoor games with a ball or other moving objects without force contacts with rivals - tennis (table tennis), badminton, throwing rings, throwing at a target.
4. Specialized visual games - "Which team are the smart guys from", "Catch a bunny", "Colored dreams".
5. Exercises for training static strength endurance of the muscles of the trunk (stretching, lying on your stomach, on the floor, across the gymnastic bench; stretching in the vise facing the gymnastic wall, on the crossbar; stretching, standing on one leg - "Swallow", holding your hands on the gymnastic wall; lifting your legs in the vise or stop to a straight line angle; lifting the legs, lying on your back, parallel to the floor, lifting the legs lying on your back, keeping the heels at a height of 5-10 cm. from the floor; lifting the trunk, lying on the back, with the head held at a height of 5-10 cm from the floor.
6. Yoga exercises - snake pose; cobra pose; locust pose; swing pose; bow pose; lifting the trunk; lifting the legs; touching the knee of the head; semi-lunar pose; moon pose; lifting the trunk with a turn; lifting the trunk, lying sideways; head tilts forward and backward; head tilts rested on the knees.
7. Exercises for correcting posture - "Sentry"; "Scales"; "Straight line"; "Figure skater"; "Stork"; "Swallow"; "Bunny"; "Christmas tree".

These exercises contribute to the normalization of

posture, visual acuity, improve hemodynamics, develop motor qualities - strength, endurance, dexterity, flexibility, speed and the formation of various motor skills.

CONCLUSION

The developed experimental methodology for the development of coordination abilities for mentally retarded children aged 8-9 years in the lessons of adaptive physical education has proven its effectiveness and is recommended for use in correctional schools in working with mentally retarded children.

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REFERENCES

1. Philippova, A., Malkina, O., Korotun, V., & Shatova, E. (2023). The role of somatic factors in early childhood and adolescent psychosomatic disorders. Bangladesh Journal of Medical Science, 22(3), 687–694. https://doi.org/10.3329/bjms.v22i3.66964
2. Yusoff, N., Mohamed, N. A., & Noh, N. A. (2022). Cognitive process in high neuroticism: incompatible flexibility in frontal brain region. Bangladesh Journal of Medical Science, 21(1), 129–134. https://doi.org/10.3329/bjms.v21i1.56338
3. Ahmad, R., & Haque, M. (2023). Obesity: A Burden Borne by the Global Economy. Bangladesh Journal of Medical Science, 22(3), 465–471. https://doi.org/10.3329/bjms.v22i3.66958
4. Rashid, T. J., & Haque, M. (2022). Overweight and Obesity in Childhood and Adolescence in Bangladesh and Its Consequences and Challenges. Bangladesh Journal of Medical Science, 21(4), 667–675. https://doi.org/10.3329/bjms.v21i4.60245
5. Kumar, I., Singh, A. R., & Akhtar, S. (2009). Social development of children with mental retardation. Industrial psychiatry journal, 18(1), 56–59. https://doi.org/10.4103/0972-6748.57862
6. Halvorsen, M. B., Helverschou, S. B., Axelsdottir, B., Brøndbo, P. H., & Martinussen, M. (2023). General Measurement Tools for Assessing Mental Health Problems Among Children and Adolescents with an Intellectual Disability: A Systematic Review. Journal of autism and developmental disorders, 53(1), 132–204. https://doi.org/10.1007/s10803-021-05419-5
7. Shuoqi, L. I., Rong, G., Chunjing, L., Jiali, Z., Keke, L. I., Shiming, L. I., & Wenbing, Y. U. (2023). Effects of moderate-intensity aerobic exercise combined with acupuncture on attention function of mentally-retarded adolescents: a randomised controlled trial. Journal of traditional Chinese medicine = Chung i tsa chih ying wen pan, 43(1), 154–159. https://doi.org/10.19852/j.cnki.jtcm.20220425.003
8. Koly, K. N., Saba, J., Christopher, E., Hossain, A. N. N., Akter, T., Rahman, Z., Ahmed, H. U., & Eaton, J. (2024). Assessment of the feasibility of a community-based mental health training programme for persons with disabilities by non-specialists from different stakeholders' perspectives in Bangladesh. BMC health services research, 24(1), 270. https://doi.org/10.1186/s12913-024-10742-5
9. Akrout Brizard, B., Limbu, B., Baeza-Velasco, C., & Deb, S. (2021). Association between epilepsy and psychiatric disorders in adults with intellectual disabilities: systematic review and meta-analysis. BJPsych open, 7(3), e95. https://doi.org/10.1192/bjo.2021.55
10. Xia, C., Jing, Q., Chen, G., Sun, M., & Lu, J. (2022). Association between Participation of Children with Disabilities and the Child, Family, and Environmental Factors in Shanghai, China: A Cross-Sectional Study. International journal of environmental research and public health, 20(1), 615. https://doi.org/10.3390/ijerph20010615
11. Ahmad, W., Arun, P., Nazli, N., Ratnam, V., Mehta, S., & Raina, D. (2022). Understanding of Behavioral Problems Among Young Persons with Intellectual Disability: A Self-Report. Journal of neurosciences in rural practice, 13(2), 295–300. https://doi.org/10.1055/s-0042-1743213
12. Hwang, A. W., Chang, C. H., Granlund, M., Imms, C., Chen, C. L., & Kang, L. J. (2020). Longitudinal Trends of Participation in Relation to Mental Health in Children with and without Physical Difficulties. International journal of environmental research and public health, 17(22), 8551. https://doi.org/10.3390/ijerph17228551
13. Lynch, P., Nabwera, H. M., Babikako, H. M., Rasheed, M., Donald, K. A., Mbale, E. W., Stockdale, E., Chand, P., Van den Heuvel, M., Kakooza Mwesige, A., & Gladstone, M. (2023). Experiences of identifying pre-school children with disabilities in resource limited settings - an account from Malawi, Pakistan

and Uganda. Disability & society, 39(8), 2053–2073. https://doi.org/10.1080/09687599.2023.2181769

14. Köse, S., Sezer, H. K., & Kucukoglu, S. (2024). The Psychological Symptoms and Difficulties Experienced By Parents of Children with Autism. Bangladesh Journal of Medical Science, 23(1), 179–188. https://doi.org/10.3329/bjms.v23i1.70715
15. Özkan, Z., & Kale, R. (2021). Investigation of the effects of physical education activities on motor skills and quality of life in children with intellectual disability. International journal of developmental disabilities, 69(4), 578–592. https://doi.org/10.1080/20473869.2021.1978267
16. Jacinto, M., Matos, R., Gomes, B., Caseiro, A., Antunes, R., Monteiro, D., Ferreira, J. P., & Campos, M. J. (2023). Physical Fitness Variables, General Health, Dementia and Quality of Life in Individuals with Intellectual and Developmental Disabilities: A Cross-Sectional Study. Healthcare (Basel, Switzerland), 11(19), 2688. https://doi.org/10.3390/healthcare11192688
17. Aksović, N., Dobrescu, T., Bubanj, S., Bjelica, B., Milanović, F., Kocić, M., Zelenović, M., Radenković, M., Nurkić, F., Nikolić, D., Marković, J., Tomović, M., & Vulpe, A. M. (2023). Sports Games and Motor Skills in Children, Adolescents and Youth with Intellectual Disabilities. Children (Basel, Switzerland), 10(6), 912. https://doi.org/10.3390/children10060912
18. Ferreira, J. P., Matos, R., Campos, M. J., Monteiro, D., Antunes, R., & Jacinto, M. (2022). Effects of Physical Exercise Program in Adults with Intellectual and Developmental Disabilities-A Study Protocol. Journal of clinical medicine, 11(24), 7485. https://doi.org/10.3390/jcm11247485
19. Jacinto, M., Matos, R., Monteiro, D., Antunes, R., Caseiro, A., Gomes, B., Campos, M. J., & Ferreira, J. P. (2023). Effects of a 24-week exercise program on anthropometric, body composition, metabolic status, cardiovascular response, and neuromuscular capacity, in individuals with intellectual and developmental disabilities. Frontiers in physiology, 14, 1205463. https://doi.org/10.3389/fphys.2023.1205463
20. Zaragas, H., Fragkomichelaki, O., Geitona, M., Sofologi, M., Papantoniou, G., Sarris, D., Pliogou, V., Charmpatsis, C., & Papadimitropoulou, P. (2023). The Effects of Physical Activity in Children and Adolescents with Developmental Coordination Disorder. Neurology international, 15(3), 804–820. https://doi.org/10.3390/neurolint15030051
21. Salomon, C., Bellamy, J., Evans, E., Reid, R., Hsu, M., Teasdale, S., & Trollor, J. (2023). 'Get Healthy!' physical activity and healthy eating intervention for adults with intellectual disability: results from the feasibility pilot. Pilot and feasibility studies, 9(1), 48. https://doi.org/10.1186/s40814-023-01267-5
22. Polevoy, G. G. (2024). Development of coordination abilities in children aged 9-10 years with a diagnosis of myopia. Bangladesh Journal of Medical Science, 23(2), 507–513. https://doi.org/10.3329/bjms.v23i2.72192
23. Polevoy, G. G. (2023). Stributing the Attention of Schoolchildren and Its Development with the Help of Classical Exercises. Bangladesh Journal of Medical Science, 22(3), 604–611. https://doi.org/10.3329/bjms.v22i3.66966
24. Philippova, A., Malkina, O., Korotun, V., & Shatova, E. (2023). The role of somatic factors in early childhood and adolescent psychosomatic disorders. Bangladesh Journal of Medical Science, 22(3), 687–694. https://doi.org/10.3329/bjms.v22i3.66964
25. Zhao, P., Zhu, G., Chen, S., Pan, Y., Chen, K., Huang, L., & Guo, L. (2024). Effects of Aquatic Exercise and Floor Curling on Balance Ability and Lower Limb Muscle Strength in Children with Intellectual Disabilities: A Pilot Study in China. Children (Basel, Switzerland), 11(1), 85. https://doi.org/10.3390/children11010085
26. Gao, J., Song, W., Zhong, Y., Huang, D., Wang, J., Zhang, A., & Ke, X. (2024). Children with developmental coordination disorders: a review of approaches to assessment and intervention. Frontiers in neurology, 15, 1359955. https://doi.org/10.3389/fneur.2024.1359955
27. Rinat, S., Izadi-Najafabadi, S., & Zwicker, J. G. (2020). Children with developmental coordination disorder show altered functional connectivity compared to peers. NeuroImage. Clinical, 27, 102309. https://doi.org/10.1016/j.nicl.2020.102309
28. Smits-Engelsman, B., & Verbecque, E. (2022). Pediatric care for children with developmental coordination disorder, can we do better? Biomedical journal, 45(2), 250–264. https://doi.org/10.1016/j.bj.2021.08.008
29. Polevoy, G. G., Sablin, A. B., & Chernishev, S. V. (2024). Development of endurance in physical education lessons with the use of outdoor games. Bangladesh Journal of Medical Science, 23(1), 254–261. https://doi.org/10.3329/bjms.v23i1.70758
30. Gibson, J. L., Pritchard, E., & de Lemos, C. (2021). Play-based interventions to support social and communication development in autistic children aged 2-8 years: A scoping review. Autism & developmental language impairments, 6, 23969415211015840. https://doi.org/10.1177/23969415211015840
31. Emonson, C., McGillivray, J., Kothe, E. J., Rinehart, N., & Papadopoulos, N. (2019). Class Time Physical Activity Programs for Primary School Aged Children at Specialist Schools: A Systematic Mapping Review. International journal of environmental research and public health, 16(24), 5140. https://doi.org/10.3390/ijerph16245140
32. Jaramillo-Alcázar, A., Arias, J., Albornoz, I., Alvarado, A., & Luján-Mora, S. (2022). Method for the Development of Accessible Mobile Serious Games for Children with Autism Spectrum Disorder. International journal of environmental research and public health, 19(7), 3844. https://doi.org/10.3390/ijerph19073844
33 Heath, G. W., & Levine, D. (2022). Physical Activity and Public Health among People with Disabilities: Research Gaps and Recommendations. International journal of environmental research and public health, 19(16), 10436. https://doi.org/10.3390/ijerph191610436