

THE INFLUENCE OF SWIMMING ON SENSORY FUNCTIONING, QUALITY OF LIFE AND BEHAVIOR OF CHILDREN WITH AUTISM

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INTRODUCTION

Many children with autism spectrum disorders (ASD) are characterized by disturbances in the regulation of muscle activity, as a result of which control over motor acts is not formed in a timely manner, difficulties arise in the formation of voluntary movements, in establishing their purposefulness and coordination, and spatial orientation suffers. Many children have synkinesias, as well as visual-motor coordination difficulties¹. At the same time, the motor components of speech, which are closely related to the general development of both gross and fine motor skills, turn out to be severely impaired. Violations of the motor sphere are deepened by characteristic behavioral features of autistic children with insufficient social interaction, mutual communication, underdevelopment of imagination².

A wide range of violations occurs even against the background of shallowly impaired intellectual functions. A child suffering from autism and having a high tested intelligence may have severe violations of the motivation of actions. Children suffering from disorders of the autistic spectrum need specially organized classes aimed at correction and development of the motor sphere³.

Motor development of a child with autism is not so much the development of motor skills of adaptation to the surrounding world as the accumulation of stereotyped means of obtaining pleasant vestibular,

¹ Створення індивідуальної програми розвитку для дітей з особливими освітніми потребами: методичний посібник / Під заг. ред. Софій Н. З. К. : ТОВ «Видавничий дім «Плеяди», 2015. 66 с.

² Fragala-Pinkham MA, Haley SM, O'Neil ME. Group swimming and aquatic exercise programme for children with autism spectrum disorders: a pilot study. *Dev Neurorehabil.* 2011. 14 (4). P. 230–41. doi: 10.3109/17518423.2011.575438.

³ Schmitz OS, McFadden BA, Golem DL e.a. The Effects of Exercise Dose on Stereotypical Behavior in Children with Autism. *Med. Sci. Sports Exerc.* 2017; 49 (5) : 983–990. doi: 10.1249/MSS.0000000000001197.

proprioceptive, tactile sensations. A deep delay in the development of household skills, clumsiness when performing any actions with objects are combined with exceptional dexterity of movements in the stereotype of autostimulation. For years, a child may not be able to master the simplest self-care skills, but he can make complex patterns from small objects, climb on furniture without falling and getting stuck, selectively tense and relax certain muscles, focusing on his sensations.

Children on the autistic spectrum, as a rule, have difficulties with imitation, with imitation of movements. Not only in children, but also in adults with autism, there is a violation of the ability to reproduce movements according to the model⁴. This is mostly related not to motor insufficiency, but to impaired perception and communication. During corrective work, one should also take into account such an important fact that children on the autistic spectrum often have a disturbed so-called "body scheme" – that is, an idea of the structure of the body, the feeling of one's body and its movements. The main features characteristic of the motor sphere of children with autism complicate the development of their motor skills, increase with age and increase depending on the severity of the autistic disorder.

Currently, it is recognized that a child with autism needs educational help no less, and in many cases even more, than medical help. On the other hand, it is not enough to simply teach an autistic child: even his successful accumulation of knowledge and development of skills alone do not solve his problems. It is known that the development of a child with autism is not just delayed, it is distorted: the system that supports the child's activity, directs and organizes his relations with the world is broken. That is why it is difficult for a child with autism to apply the knowledge and skills he has in real life. All children with RSA, despite the significant heterogeneity of this group in terms of composition, need therapeutic education, the task of which is, first of all, the development of meaningful interaction with the surrounding world⁵.

The motor sphere of children with autism is characterized by the presence of stereotyped movements, difficulties in the formation of objective actions and household skills, and violations of fine and gross motor skills. Children are characterized, in particular, by disturbances in basic movements: heavy, jerky gait, impulsive running with a distorted

⁴ Huebner RA. Autism: A Sensorimotor Approach to Management. Gaithersburgh : Aspen publishers, 2000. 176 p.

⁵ Dunn W. Short Sensory Profile: User's Manual. San Antonio, TX: Psychological Corporation. 1999. 20 p.

rhythm, excessive hand movements or senselessly splayed arms that do not participate in the process of motor activity, single-support push-off when jumping from two legs. Children's movements can be sluggish or, on the contrary, tensely stiff and mechanistic, with a lack of plasticity. Exercises and activities with the ball are difficult for children, which is associated with violations of sensorimotor coordination and fine motor skills of the hands⁶.

Many children at the lesson of adaptive physical education show stereotyped movements: rocking the whole body, patting or combing, monotonous turns of the head, swinging movements with hands and fingers, hand movements similar to flapping wings, walking on tiptoes, circling around its axis and other movements that associated with self-stimulation and lack of self-control. Pupils with autism have impaired regulation of muscle activity, control over motor actions is not formed in a timely manner, difficulties arise in the formation of purposeful movements, and spatial orientation suffers⁷.

Practice shows that reduced arbitrariness of movements in autistic children leads primarily to impaired coordination. The stability of a vertical posture, the preservation of balance and confident gait, the ability to coordinate and regulate one's actions in space, performing them freely, without excessive tension and stiffness – all this is necessary for a person for normal life activities, meeting personal, household and social needs. Most often, the insufficiency of these characteristics limits motor activity.

Physical culture, adapted to the characteristics of children with autism, is not only a necessary means of correcting movement disorders, stimulating physical and motor development, but also a powerful “agent of socialization” of the individual. The conscious nature of motor learning is important for the development of the motor sphere of autistic children. It is difficult for an autistic child to regulate voluntary motor reactions in accordance with language instructions. She cannot control the movement according to the instructions of another person and is not able to fully subordinate the movements to her own language commands.

⁶ Caputo G, Ippolito G, Mazzotta M, Sentenza L, Muzio MR, Salzano S, Conson M. Effectiveness of a Multisystem Aquatic Therapy for Children with Autism Spectrum Disorders. *J Autism Dev Disord*. 2018. 48(6). 1945–1956. doi: 10.1007/s10803-017-3456-y.

⁷ Toscano CVA, Carvalho HM, Ferreira JP. Exercise Effects for Children With Autism Spectrum Disorder: Metabolic Health, Autistic Traits, and Quality of Life. *Percept. Mot. Skills*. 2018. 125 (1): 126–146. doi: 10.1177/0031512517743823.

Therefore, the main goals of teaching autistic children in adaptive physical education classes are⁸:

- improvement of sensory integration;
- development of imitation abilities (ability to imitate);
- stimulation to follow instructions;
- formation of skills of arbitrary organization of movements (in the space of one's own body and in external space);
- education of communication functions and the ability to interact in a team.

Sensory processing – processing, integration and modulation of sensory information from the environment and from one's own body. Sensory integration is a person's ability to organize sensations for movement, learning and normal behavior. Sensory processing disorder is a complex cerebral disorder in which a child incorrectly interprets everyday sensory information, which can lead to problems with coordination of movements, language, behavior, learning, etc. In clinical practice, the term sensory integration dysfunction is accepted, within which sensory modulation disorders and sensory-related motor disorders are distinguished⁹.

In this case, it is difficult for a person to determine which sensory information is important and which is not, it is difficult to adapt to the situation. Violation of sensory information processing can manifest itself in the form of hyposensitivity or hypersensitivity to certain stimuli.

In addition to all of the above, an important issue is the functional state of the body's organs and systems in conditions of insufficient motor activity of children with RSA. In them, the phenomena of hypodynamia and hypokinesia and accompanying changes in the state of health are often observed¹⁰.

⁸ Robertson CE, Baron-Cohen S. Sensory perception in autism. *Nat. Rev. Neurosci.* 2017. 18(11). 671-684. doi: 10.1038/nrn.2017.112.

⁹ Zysk V, Notbohm E. 1001 Great ideas for teaching or raising children with ASD. Arlington, Tex.: Future Horizons, 2004. 166 p.

¹⁰ Rafie F, Ghasemi A, Zamani Jam A, Jalali S. Effect of exercise intervention on the perceptual-motor skills in adolescents with autism. *J. Sports Med. Phys. Fitness.* 2017. 57(1-2). 53-59. doi: 10.23736/S0022-4707.16.05919-3

1. The influence of swimming classes on the behavior, sensory profile, emotional condition and quality of life of children with autism spectrum disorders based on the results of a parent questionnaire

Three 8–9 year old male children took part in the experiment. All children who were involved in swimming lessons had the so-called low-functioning autism (disability subgroup A). They did not speak, could neither read nor write, had problematic behavior, stereotyped movements, a large number of inappropriate movements, impaired coordination of movements, aggression and autoaggression. Children attended swimming lessons twice a week for 40 minutes in the pool from September 1, 2021 to March 10, 2022. Classes were individual. Each of them started with a warm-up (5 min.), in the main part, children were taught to stay afloat, swimming skills (25 min.) and were engaged in learning communication skills (game with a partner) (10 min.).

Pedagogical observations during swimming lessons were carried out constantly, recording children's behavior (desirable and undesirable), determining their capabilities and the tasks available to them.

Before the classes start (August 2021), parents were surveyed about the psychophysical condition of the children who were included in the experiment. Parents filled out such a questionnaire every three months during the experiment, where they indicated changes in the psychophysical state of their children.

Additionally, we used the EQ-5D-5L questionnaire¹¹ to assess the quality of life of children with ASD, answers were given by parents at the beginning and at the end of the experiment. The questionnaire made it possible to assess the ability of children with ASD to move, self-care (self-care), usual daily activities, the presence of pain/discomfort, anxiety/depression.

In addition to surveying parents, we used the method of expert evaluations in our research. The expert was a specialist in correctional pedagogy and physical culture. He evaluated the following parameters on a 10-point scale: children's emotional state, presence of problematic behavior, movement skills, swimming skills, communication skills.

¹¹ Williams D. Autism and Sensing: The Unlost Instinct. London: Jessica Kingsley Pub., 1998. 220 p.

Table 1

**Psychophysical condition of children with autism
(Questionnaire for parents)**

Dear parents, please evaluate the psychophysical condition of your child and describe it.

Child's name

Age of the child

Presence of stereotyped movements (describe)	
Spinning in place or grasping at spinning objects	
Protest behavior regarding changes in lifestyle or environment (describe)	
The presence of aggression	
The presence of autoaggression (beating oneself, biting, etc.)	
Specific use of objects (toys) or excessive interest in their parts (describe)	
Excessive fascination with some action, subject (describe)	
Plays not with toys, but with unusual things (describe)	
It is difficult to stop, distract from monotonous, repetitive actions.	
Problem behavior (mark or indicate something else):	
• disinhibition	
• tantrums	
• scream	
• excessive passivity	
• oppositional behavior	
• self-stimulation	
Predominant emotions (positive, negative)	
Willpower (does the child overcome difficulties and what behavior is accompanied by this?)	
Cognitive qualities (opportunities, desires, successes) – describe the features.	
Orientation in space (describe)	
Coordination of movements (walking, running, jumping, other movements) – describe the features.	
Writing skills (opportunities, desires, successes).	
Other school skills (describe)	

Separate (additional) questions regarding the quality of family life (in March 2020):

How does the child behave in public places?

The circle of preferences of the child (describe).

Your emotions during communication with the child.

Are your child's movements (walking, running, squatting, jumping, etc.) correct?

Does your child want to do physical exercises and games that require movement?

Also, an expert together with parents assessed the sensory profile of each child twice in August 2021 and in March 2022 using the Short Sensory Profile method, developed and recognized by The Psychological Corporation (USA)¹².

2. The influence of swimming on the sensory profile, coordination of movements, problem behavior, emotional state of children with ASD by the method of expert assessment

Before the experiment starts, a survey of parents about the psychophysical state of their children showed that all the children we examined had significant disinhibition of movements, significant manifestations of stereotypic behavior and self-stimulation (shaking, clicking with the tongue and fingers, specific hand movements, etc.). Two children had manifestations of aggression (beating their parents, strangers, hitting surrounding objects with their hands and feet). All three examined children had manifestations of autoaggression (beating themselves on the head, legs, hands, biting their hands), used toys for the wrong purpose (knocked them, examined their individual parts, broke them). The emotional condition of all examined children was very labile. Two of them had hysterical manifestations and oppositional behavior. With regard to willpower, all the children had it broken, it was very difficult to insist on some actions, the children did not want to overcome even the slightest difficulties on their own. All the boys had impaired coordination of movements, although each in their own way (E. and B. walked on tiptoe, K. bumped into people and objects while moving, had a disturbed gait, walked in a crosswalk, shuffled his feet, had an imperfectly cross-coordinated act of walking), all examined children had unskilled movements of large muscle groups, had a tendency to slouch, made many unnecessary movements during motor tasks. Regarding cognitive qualities: they were significantly reduced in all examined children, school skills (knowledge of letters and numbers, reading and writing) were not sufficiently formed, extremely great difficulties with learning to write and draw (inability to hold a pencil correctly, insufficient endurance of the muscles of the hand and fingers to hold a pencil for a certain time, lack of motivation for learning to write).

In addition to the questionnaire about the psychophysical condition of children, we used the EQ-5D-5L questionnaire to assess the quality of life of children with ASD, the answers were given by parents at the beginning

¹² <http://kinetickidstherapy.com/wp-content/uploads/2016/06/5Short-Sensory-Profile.pdf>

and at the end of the experiment. The EQ-5D-5L questionnaire is intended for patients to answer on their own. Since children with ASD could not answer the questions on their own, their parents did it for them. In August 2021, before the experiment, all parents indicated minor difficulties with movement, significant difficulties with self-care and washing, moderate difficulties with usual daily activities, occasional pain, almost constant discomfort in the body, the presence of anxiety or sometimes depression. On the scale of the quality of life of their children, they put 42 ± 8 points out of a possible 100, which indicates a rather low quality of life of their children as patients (people with special needs).

Based on the expert assessment of the functioning of children with ASD (Fig. 1), it can be stated that at the beginning of swimming lessons (September 2019) they had significant problematic behavior, estimated at 9.8 ± 0.2 points, a poor emotional condition (1.2 ± 0.3 points), low motor skill (1.3 ± 0.2 points), undeveloped communication skills (1.0 ± 0.2 points), swimming skills at the elementary level in all children.

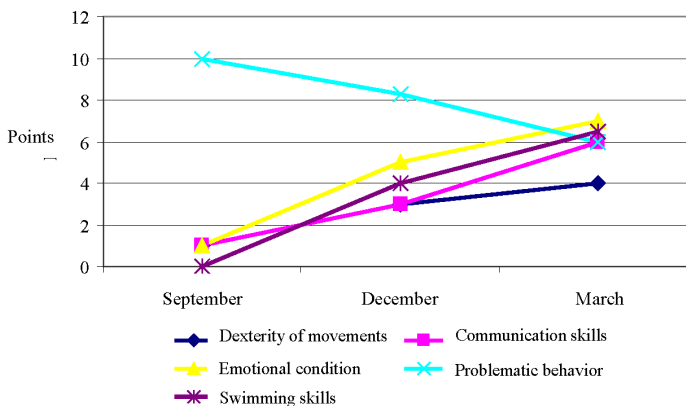


Fig. 1. Results of an expert assessment of the functioning of children with ASD during the experiment

After 3 months of swimming lessons, parents did not notice significant changes in the children's behavior, they observed significant problem behavior, motor disinhibition, stereotypies and self-stimulation, although according to the results of an expert assessment in December 2021, a trend towards improvement was noted. Thus, the expert assessed movement dexterity and communication skills as 3 points, swimming skills also improved reliably ($P > 0.95$) (4.0 ± 0.4 points). The emotional state of children improved significantly (5.2 ± 0.4 points), the reliability of

the difference is $P > 0.99$, that is, physical exercises in classes already caused such a violent negative reaction, children gradually began to get used to them, which is also evidenced by a slight decrease in problematic behavior in swimming lessons from 10.0 ± 0.2 to 8.0 ± 0.4 points ($P > 0.95$).

During this period, according to the results of the parents' questionnaire, a positive trend was noted regarding the manifestations of aggression and auto-aggression. These manifestations in children became rarer, less long-lasting, fewer stimuli caused them. There was also a positive trend in emotional and volitional qualities: parents of boys emphasized that their children became less stubborn, showed much less oppositional behavior when their parents insisted on something, more willingly performed tasks at home and at school that they previously refused to perform. Regarding the coordination of movements, there were no significant changes during this period, motor clumsiness remained. The skills of holding a pencil, drawing geometric shapes and lines and other simple drawings have not changed yet.

In March 2022, there were significant reliable ($P > 0.99$) changes in the functioning of the examined children, compared to the data of previous periods. In the questionnaires, the parents of all the boys note that their children have become calmer, their motor disinhibition has significantly decreased, stereotyped movements have occurred less often, the children need less self-stimulation, aggressive and auto-aggressive behavior still occurs, but much less often (two boys E. and K. had such manifestations every other day, B. every day). The boys' emotions became less labile, more relevant to the situation, the number of positive emotions increased. Children's movements have become more coordinated and skillful. Children E. and B. continued to walk on their tiptoes, but sometimes (especially after physical exercises) they began to fall on their heels while standing, K. began to pay attention more often to an object or a person who might be in his way and bypass them. The boy K.'s gait improved – he shuffled his legs less and wobbled less while walking. In all three children, the number of unnecessary movements decreased and there was a tendency to decrease stooping. There was a slight progress in school skills: hand movements during drawing and writing became more skillful, children were more calm about these tasks.

In the questionnaire for parents that we gave them in March 2022, we included several additional questions that characterize the functioning of children with ASD, although we did not work directly on these qualities. Yes, to the question: "How does the child behave in public places?" the parents of all the boys answered that it is quite calm now, their children

began to understand that being in public transport, the supermarket, at the station, etc. is safe, the manifestations of anxiety decreased. When asked about the circle of preferences of the child, all parents answered that now it became easier to involve children in joint activities, that children began to be interested in everyday life (cooking). When asked about the emotional color of communication with the child, all five parents answered that the children learned to respond more correctly to the manifestations of their parents' emotions. For example, K. began to often hug his parents, E. began to look into their eyes and smile more often, B. listened to requests more willingly than before. When asked about the children's movements, the parents answered that their dexterity improved significantly, the children began to move more briskly with a certain purpose, some of the inappropriate movements and stereotypes (wobble, spinning in place, shaking hands, jumping) decreased. To the question: "Does the child have a desire to do physical exercises?" all five parents answered that from now on it became much easier to involve children in various physical activities (not only swimming), children began to accept these activities with joy and enjoy physical exercises.

At the end of our experiment, we again asked parents to answer questions from the EQ-5D-5L survey about the quality of life of their children and the family as a whole. Parents noted that from now on their children began to have fewer problems with movement, their movements became more coordinated and it became easier to move. In terms of self-care, the difficulties became less significant (average level), the usual daily activities also became easier, the phenomenon of discomfort and anxiety decreased.

On the scale of the quality of life of their children, they scored 74 ± 6 points out of a possible 100, which indicates a significant ($P > 0.99$) increase in the quality of life of their children as patients (people with special needs). Children with ASD have not ceased to be disabled, but the quality of life increased significantly, which added positive emotions to the difficult life of these children and their parents.

The results of the expert assessment reflected the results of the parent questionnaire. In March 2020, the expert noted a significant decrease in problematic behavior (by 4 points) of children against the background of an increase in the results of motor skills (by 3 points), communication skills (by 5 points), swimming skills (by 6 points), a significant increase in positive emotions (by 6 points). The reliability of the difference of all indicators with the results of previous periods is $P > 0.99$.

To assess the sensory functioning of the examined children, we used the Short Sensory Profile method developed by Winnie Dunn (USA) from The Psychological corporation¹³. The sensory profile was determined before the start of the experiment (August 2021) and at the end of the experiment (March 2022). In August 2021 and March 2022, the assessment of the sensory profile of the children participating in the study was carried out, and the following data were obtained (Table 2).

Table 2

**Assessment of sensory functioning of children with autism
by method Short Sensory Profile at the beginning (August 2021)
and at the end (March 2022) of the experiment, points**

Types of sensitivity	August 2021	March 2022
Tactile sensitivity	13±3	24±4
Sensitivity to taste and smell	7±2	8±2
Motor sensitivity	5±2	9±2
Insufficient response/aspiration to sensation	12±3	18±4
Auditory filtering	9±3	9±2
Low energy/weakness	10±2	17±3
Visual/auditory sensitivity	10±2	13±3

In the course of the study, we established significant violations of the sensory sphere of children with autism who participated in the experiment. All considered types of sensitivity were violated. Some of them were restored or formed during swimming lessons, but were not restored or formed completely, remaining at a level insufficient for normal functioning. Yes, from the table. 1 shows that the levels of tactile and motor sensitivity during the experiment are approaching normal values, other sensations are significantly improved, only the sensitivity to taste and smell, which is not affected by swimming, does not change.

We established the improvement of the following types of sensitivity, which are taken into account in the Short Sensory Profile¹⁴:

- Tactile sensitivity – avoiding walking barefoot, especially on sand or grass; emotional or aggressive reaction to touch; fear of splashing water;

¹³ Dunn W. Short Sensory Profile: User’s Manual. San Antonio, TX: Psychological Corporation. 1999. 20 p.

¹⁴ <http://kinetickidstherapy.com/wp-content/uploads/2016/06/5Short-Sensory-Profile.pdf>

- Motor sensitivity – discomfort or distress when the feet do not touch the ground; avoiding activities when the head is down (overturns, racks);
- Insufficient reaction/desire for sensation – desire for all kinds of movement, which interferes with daily routines, restlessness; excessive excitability during motor activity; touching (pushing) people and things; switching from one activity to another when it interferes with the game;
- Low energy/weakness – weakness (insufficient tone) of muscles; easy fatigue, especially when standing or maintaining a certain body position; weak grip; the need for support (even during activities); poor endurance;
- Visual/auditory sensitivity – distress to bright lights after others have adapted to the light; covering the eyes or mowing to protect the eyes from light.

Quantitative reflection in points of improvement of these types of sensitivity is given in the table. 2.

Swimming had no effect on taste and smell sensitivity and auditory filtering.

During swimming lessons, the muscles are noticeably strengthened, the cardiovascular system is trained. In addition, regular swimming lessons develop flexibility and plasticity of movements, improve coordination of movements, increase hand strength, contribute to the development of emotional and volitional qualities and increase self-esteem [8; 16]. Since the most characteristic disorders in autism are disorders of the human sensory sphere, it is necessary to look for ways of versatile influence on the sensory systems of the body, especially on the processes of sensory processing, sensory modulation, and sensory integration of information from the external environment and one's own body.

In our opinion, swimming serves, first of all, as a powerful stimulus for influencing the sensory system of the body (tactile sensitivity, proprioceptive system, visual analyzer). During swimming, all the muscles of the body are activated, afferent nerve stimuli are sent to the central nervous system from the proprioceptors of muscle fibers, and after processing, the central nervous system sends impulses along efferent fibers to the muscles. During such processes, the central nervous system “learns” to correctly recognize nerve impulses from working organs and create an adequate picture of the body's activity in the brain. Since a child suffering from autism very often tries to avoid physical exercises and any physical activity, in particular due to pleasant sensations, swimming is a factor that cannot be avoided (the child is in a pool or in a body of water from which it is impossible to get out at the

same moment). As a result, the central nervous system must work, processing stimuli first “forced” (stress), and later in a calmer mode (adaptation).

Tactile sensations are included during swimming lessons in children. In the process of swimming, the child feels the temperature of the water, its current, waves, changes in sensations from motor activity in the water with fingers, palms, feet and the whole body. In the course of classes, children develop hand strength. Along with that, warm water also creates a calming effect on the central nervous system.

In addition to the development of sensory perception and information processing, such physical qualities as strength, flexibility and endurance are developed during swimming lessons, the development of which is indirectly related to sensors (the better these qualities are developed, the more adapted sensory systems and more coordinated movements). Thus, swimming through sensory integration can significantly improve the quality of life of both children with ASD and their families.

CONCLUSIONS

The conducted research made it possible to write the following conclusions:

1. Swimming is a powerful sensory stimulus for children with ASD.
2. As a result of swimming lessons in children with ASD, there is an improvement in behavior: a decrease in aggression and auto-aggression, a decrease in the frequency of stereotypic movements, a decrease in oppositional manifestations, an improvement in the emotional state, an improvement in willpower, an increase in coordination and dexterity of movements, and an improvement in communication between game partners.
3. According to the results of an expert assessment of the psycho-physical condition of children with ASD who attended swimming classes, it can be stated that against the background of the growth of the results of movement skills, improvement of swimming skills, a significant increase in positive emotions, there is a significant decrease in problem behavior and the development and formation of communication skills.
4. Swimming classes contribute to a significant increase in the quality of life of both children with ASD and their parents.
5. Swimming lessons for children with ASD contribute not only to learning swimming techniques, but also create conditions for acquiring other skills, in particular, communication skills, which is extremely important for these children.

6. Individual swimming lessons for children with ASD can be recommended as an effective means of adaptive physical education.

SUMMARY

The aim of the work is to establish the influence of swimming as a means of adaptive physical education on behavior, emotional state, sensory, motor coordination and quality of life of children with autism spectrum disorders (ASD). Three children with autism who were swimming were examined. We conducted research using the following methods: pedagogical observations, pedagogical experiment, method of expert evaluations, questionnaires. There is a significant improvement in the behavior of children with ASD: reducing aggression and auto-aggression, reducing the frequency of stereotyped movements, reducing opposition, improving emotional state, improving willpower, improving coordination and dexterity. According to the results of expert assessment, against the background of increasing the results of dexterity, the formation of swimming skills, a significant increase in positive emotions, the acquisition of communication skills there is a significant reduction in problem behavior. Swimming is a powerful sensory stimulus for children with ASD, they improve their sensory profile by promoting proper sensory responses. Swimming contributes to a significant increase in the quality of life of both children and their parents.

Swimming is a powerful sensory stimulus for children with ASD. As a result of swimming lessons in children with ASD there is an improvement in behavior, development of communication skills, development of smooth movements, growth of positive emotions, development of swimming skills. Swimming also helps to improve the quality of life of children with ASD and their parents. In children with ASD, swimming helps to improve certain indicators of the sensory profile. Individual swimming lessons can be recommended for children with ASD as an effective means of adaptive physical education.

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