

PECULIARITIES OF VESTIBULAR TRAINING IN ADULTS WITH CEREBRAL PALSY IN AIKIDO CLASSES

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INTRODUCTION

Inclusive education in Ukraine and around the world is gaining momentum, but the lack of relevant experience and practical skills in this field leads practicing instructors and scholars to unite in search of new methods of work that are not only universal and effective. However, they also performed an educational function, preparing our society and the system of education and culture for the level of inclusiveness and accessibility to which we aspire.

In particular, this research was a manifestation of the search for non-trivial and effective solutions for an athlete with cerebral palsy in the form of spastic diplegia, who came to aikido classes in the adult general group of the primary educational level. Of course, the experience of working with one athlete with cerebral palsy may not be acceptable for each such a case. However the physical, technical results, as well as a high level of psychological comfort and emotional openness, achieved in close work with an athlete, is one of the most important factors in assessing the effectiveness and comfort of the method. That allows us to talk about the feasibility of this research and its high importance in sports training of people with cerebral palsy and the possibility of their classes in inclusive groups with aikido and other martial arts.

It is known that the signs of cerebral palsy are detected in early childhood¹; in our case, such signs were noted at the age of one and half year, after which the boy was prescribed multiple courses of therapeutic massage and exercise, which lasted up to six years. After this age, no physiological and preventive measures were taken; the boy was able to move independently, although the existing problems with the operation of the lower extremities, foot posture and sitting were pronounced. Despite the end of the state program of prevention of the cerebral palsy, the person continued to lead an active lifestyle, i.e.: running, riding

¹ Cerebral Palsy. MedlinePlus. 2017. URL: <http://www.nlm.nih.gov/medlineplus/ency/article/000716.htm>

a bike, is actively engaged in daily activities, and quite independent in matters of self-care. The ward joined the aikido group at the age of twenty-two having no previous experience in wrestling or gymnastics.

The problems we encountered in the first trainings were:

- 1) The inability to control steps and movements;
- 2) The inability to be in a sitting position on a horizontal surface, and, as a result, the inability to perform a series of exercises from the section *suwari waza* (sitting position of both the partners), *hanmi handachi waza* (*nage* is in a sitting position and *uke* attacks being standing), preparatory exercises;
- 3) Almost completely absent adaptability of the vestibular apparatus to inclinations, oscillating movements, which completely excluded the possibility of performing self-insurance – *ukemi* and provided only conditional participation in the development of aikido techniques in the role of *uke*.

In addition, despite the individual approach to training an athlete with special needs, in the first lessons he constantly noted nausea, dizziness and inability to reproduce the movements of the instructor, explaining this by the fact that the body does not listen to him.

Thus, we had a task to make aikido training possible and valuable for a person with cerebral palsy, without disturbing his mental balance, making the adaptation process acceptable and comfortable for the disabled athlete and for the group. At the same time fostering mutual respect, mutual assistance and understanding the need of progress of each participant of the educational process, because these principles form the concept of *Budo*, that underlies the study of aikido as an art of peace.

1. The problem's formulation

As already mentioned, the general task of an aikido instructor is not only to teach the group how to perform techniques and prepare for certification, but also to make aikido accessible to everyone, regardless of physiological, gender, age, or any other aspects². In this particular case, we were faced with the task of making it possible and effective to train a person with cerebral palsy in the general group of aikido for adults and help him to reach the technical level of certification requirements at the initial level. At the same time, the focus of our study was, first, the moral, mental and psychological state of our ward, because his sense of comfort and trust was for us in the first place.

² Ueshiba, K. *The spirit of aikido*. 1st ed. Kodansha International. 1984; 128 p.

Spastic dysplasia, which is diagnosed in 40 % of cerebral palsy patients, is considered the most favorable for social adaptation³ – that is why we determined to this experiment. In addition, the initiative and open interest of the ward was the driving force and the main motivating factor.

It is known spastic dysplasia, or Little's disease is characterized by dysfunction of the arms and legs, tetraparesis, but the legs suffer much more than the hands. According to statistics, about a quarter of patients learn the ability to walk and fully serve themselves⁴.

Among the causes of spastic dysplasia are:

1) Prematurity, which may be preceded by early placental abruption, incompatibility of maternal and fetal blood, uterine abnormalities, maternal diseases such as diabetes, preeclampsia, renal pathology;

2) Birth injuries that may have been inflicted on the fetus during prolonged or rapid labor, including in conditions of excessively narrow pelvis. Very often birth injuries are the result of intrauterine developmental disorders;

3) Asphyxia of the fetus caused by hypoxia during pregnancy and childbirth;

4) Toxic effects on the fetus due to maternal abuse of alcohol, drugs, nicotine, as well as taking drugs prohibited for pregnant women⁵.

Thus, as noted earlier, in our case, a mild form of spastic dysplasia, in which there is full functionality of the hands and a high level of mental qualities, but reduced leg activity. In addition to existing physiological features caused by cerebral palsy, manifested as hypertonicity of leg muscles, incorrect feet posture, were as follows: inability to maintain balance, to stand on one leg, inability to sit on a horizontal surface, insufficient training of the vestibular apparatus, manifested by constant dizziness, nausea and low orientation in space.

The purpose of research, first of all, was to acquaint the ward with the basic movements in aikido (taisabaki) and basic techniques, so that, knowing the scheme of movements, he avoided sharp and enslaved movements, gradually trying to coordinate movements of arms and body

³ Facts About Cerebral Palsy. Centers for Disease Control and Prevention. April 18, 2018. URL: <http://www.cdc.gov/ncbddd/cp/facts.html>

⁴ Евсеев С. П. Адаптивная физическая культура в практике работы с инвалидами и другими маломобильными группами населения : учебное пособие. М. : Советский спорт, 2014. 298 с.

⁵ Abdel-Hamid HZ. Cerebral Palsy. Medscape Reference. August, 2016 ; URL: <http://emedicine.medscape.com/article/1179555-overview>

with legs. In addition, due to the underdevelopment of the vestibular apparatus, it was very difficult for the athlete to perform body insurance (ukemi) in any form and at any level. However, the performance of ukemi is a prerequisite for the athlete's participation in the certification, as well as an important aspect of the training process, because each aikidoka must act as a nage (one who performs the technique) and uke (an athlete who performs body insurance, avoiding injury from the use of technique). Also problematic for the athlete was to perform exercises to coordinate the right and left hemispheres of the brain, which again is evidence of underdevelopment of the vestibular apparatus.

If we talk about the strengths of the ward, the high level of prior physical training, in particular the upper body is worth noting. The young man has strong, well-developed muscles of the arms, back, also, despite the spastic dysplasia, as much as possible, he tried to maintain high physical activity, walked a lot, did physical work, deftly rides a bike, has a high level of intellectual development.

Talking about the benefits of our situation, which resulted in this study, the subject came to a new group that functioned for about two months – a time when all the participants are on the basic level but managed with being acquainted with each other as well as with the basic movements and techniques in Aikido. However, they have not yet immersed themselves in the study of the program deeply enough. Therefore, our ward did not have to catch up with the group, but he got into an already close-knit team, where he was received friendly, have been willing to share knowledge and offering their help in learning aikido.

The choice of the aikido section was also not accidental, because in aikido there are no competitions, in addition, there is no concept of weight category and sparring partner. The fight as such, as well as the competition, each person leads only with himself, focusing only on one's own progress and achievements, but trying to reach constant improving one's technique, making it effective and efficient on any partner⁶.

The lack of competition also has the advantage for a person with cerebral palsy, because one can engage in a general group, not just people with disabilities – so that we bring a person closer to the fact that he can live like everyone else, not just in its micro-world. In addition, certification and membership in a sports organization provides an

⁶ Saotome, M. Aikido and the Harmony of Nature. Boston & London : Shambhala Publications Inc., 1993. 251 p.

opportunity to participate in local, national and international training seminars in aikido, which is a stimulus not only to physical self-improvement, but also to freer communication, travelling, new acquaintances, self-belief and one's strength, raising the standard of living to the highest possible levels.

2. The analysis of the methods of solving the problem

Cerebral palsy is a constantly present complex of disorders, among which the determinants are impaired movement and posture, caused by non-progressive brain damage, limiting functional activity⁷.

In the case of cerebral palsy, it is better not to talk about rehabilitation, but about habilitation, i.e. the formation or compensation of functions that are absent from birth.

Nowadays there are a number of methods to solve the problem of rehabilitation of cerebral palsy and, in particular, training their vestibular apparatus, however, to choose the right tactics of motor habilitation, it is necessary to take into account the severity (level) of motor disorders and motor functions at different ages.

The degree of impaired motor function is assessed by the international GMFCS system, according to which⁸:

Level 1 – Moves independently, without restrictions, but have difficulty with more complex motor skills.

Level 2 – Moves independently with restrictions.

Level 3 – Moves independently with the help of additional devices: canes, walkers, etc.

Level 4 – Can sit on their own, but cannot walk; moves in an active chair or with an electric drive.

Level 5 – Unable to move without assistance, sometimes can move in an adapted electric chair.

Objectives of habilitation of persons with cerebral palsy depending on the level of GMFCS⁹:

Level 1 – 2: maintaining freedom of movement; improving motor functions, including precise hand motility; prevention of contractures; language and intelligence development; socialization.

⁷ Spastic diplegia cerebral palsy. Cerebral palsy guidance. URL: <https://www.cerebralpalsyguidance.com/cerebral-palsy/types/spastic-diplegia/>

⁸ Cerebral Palsy. MedlinePlus. 2017. URL: <http://www.nlm.nih.gov/medlineplus/ency/article/000716.htm>

⁹ Там само.

Level 3: maintaining verticality and movement; improving and maintaining motor functions; development of the optimal motor pattern; maximum independence in movement and self-service; posture correction; prevention of contractures; training in the use of auxiliary devices; language and intelligence development; socialization.

Level 4: maintaining the possibility of passive verticalization and a stable position in the chair; preservation and maintenance of hand function; maximum possible independence in self-service; posture correction; prevention of contractures; pain relief, ease of care; language and intelligence development; socialization.

Level 5: the possibility of comfortable positioning; pain reduction and care relief; adjustment of feeding; establishing contact and learning alternative communication.

Among the general goals of rehabilitation and habilitation of adults with cerebral palsy are increasing mobility, developing and maintaining optimal motor patterns; prevention of injuries and orthopedic complications; maintaining and improving language and mental abilities. Moreover, important are psychological and psychotherapeutic correction, daily activity, support of self-service skills, and acquisition of new skills, facilitation of care, the possibility of affordable educational or employment activities, socialization¹⁰.

The peculiarity of the rehabilitation of adults with cerebral palsy is that the person has already reached the maximum possible level of recovery or compensation for impaired functions. The adult has already undergone many courses of rehabilitation treatment, knows his abilities, trained in the use of assistive devices. In some cases, people diagnosed with cerebral palsy can get a good education, a profession, and be quite successful despite their illness. Some people with disabilities are unable to study or work, but they may learn self-care skills to facilitate care from loved ones. Maintaining and developing existing skills, improving motor, speech and mental abilities throughout life is a task that faces any adult diagnosed with cerebral palsy.

Today there are a number of methods for solving problems of vestibular function for people with cerebral palsy. However each of the methods involves a comprehensive approach, i.e. regardless of baseline and age group, each lesson for persons with cerebral palsy should include elements of training and general development, as well as

¹⁰ Cerebral Palsy: Hope Through Research. National Institute of Neurological Disorders and Stroke. 2018. URL: <https://www.ninds.nih.gov/Disorders/Patient-Caregiver-Education/Hope-Through-Research/Cerebral-Palsy-Hope-Through-Research>

correction, compensation, and, of course, prevention of violations at various levels¹¹.

In a case of spastic diplegia acrobatic exercises, power exercises on training apparatus, general developmental gymnastic exercises, exercises on a trampoline are recommended¹². This list of areas of personal development includes:

1. Providing a fund of motor skills.
2. Formation of applied skills.
3. Development of motor-coordination abilities.
4. Improving the functional capabilities of the body.
5. Social adaptation to real living conditions and integration into society.

In this case, any technique is based on the following principles: a gradual increase in load and the principle of «from simple to complex»; alternation of different types of exercises, application of the principle of scattered load; exercises should correspond to the existing level of wards and be individual-oriented; rational dosing of load, fatigue is not allowed; ensuring injury prevention¹³.

It is traditional to build a program based on three parts – warming-up, main and final parts¹⁴.

The complex of warm-ups includes exercises with a consistent effect on the main muscle groups starting from the distal parts of the body and a gradual increase in load. As a rule, the exercises are performed at the expense of a preliminary demonstration and explanation. At the same time, the help in performance of exercises is allowed. When conducting general developmental exercises to activate attention and increase emotional state, it is recommended to perform exercises with static fixation of individual positions.

The section of general developmental exercises includes corrective exercises for correction the reactions, muscle relaxation, formation of correct posture, calving ability and formation of balance, development of spatial orientation and accuracy of movements.

¹¹ Евсеев С. П. Адаптивная физическая культура в практике работы с инвалидами и другими маломобильными группами населения : учебное пособие. М. : Советский спорт, 2014. 298 с.

¹² Круцевич Т.Ю. Теорія і методика фізичного виховання. Том 1. Київ : Олімпійська література, 2012. 392 с.

¹³ Плахтій П. Д. Фізіологія фізичних вправ / П. Д. Плахтій, А. І. Босенко, А. В. Макаренко. Кам'янець-Подільський : ТОВ «Друкарня Рута», 2015. 268 с.

¹⁴ Евсеев С. П. Адаптивная физическая культура в практике работы с инвалидами и другими маломобильными группами населения : учебное пособие. М. : Советский спорт, 2014. 298 с.

The main means of warm-up are the basic acrobatic exercises for coordination: standing and lying rotations, rolling, spinning, jumping, different options for walking in a straight line, maintaining balance in the leg rack together, apart, on one leg and more.

It is recommended to start the exercises from different starting positions. These are different racks, sitting, lying down, stops, etc. They may have different orientation and impact on different muscle groups, orientation, have different amplitude, pace and nature of performance. They are simultaneous movements of the arms forward, backward, sideways, up, down; flexion and extension of the forearms and hands; head movements in different directions. Also alternating and simultaneous bending of the fingers into a fist and extension with a change in pace, in the initial position lying on his back, abdomen, side alternately lifting and withdrawing straight or bent legs, bending, unbending, as well as circular movements with them. Moreover it may be squats on the whole foot, standing at the support; tilts the torso forward, backward, sideways; exercises for the development of physical abilities; the simplest combinations of studied movements¹⁵.

Warm-up includes grouping sitting, lying on one's back, squatting; racks on the shoulders and head; various rolls.

During the main part of the lesson, exercises in acrobatics, on the gymnastic wall, on the gymnastic bench, on technical devices, on fitball are performed. Namely, there are following groups of exercises:

1) Rotational exercises (rolls, overturns) aimed at developing the functions of the vestibular analyzer;

2) Static exercises (stand on the shoulders, focusing at an angle in light conditions), which promote the development of certain muscle groups;

3) Flexibility exercises (bridges, leaning forward in a sitting position, «fish», «basket», etc.), used to relax spastic muscle groups;

4) Exercises for balance (different options for walking in a straight line, maintaining balance in the leg rack together, apart right (left)), used to develop vestibular stability;

5) Exercises for forming the correct posture (sitting, standing near the gymnastic wall);

6) Exercises aimed at orientation in space (jumping on a trampoline in a stand on his knees, in gray, lying on his back, abdomen);

¹⁵ Евсеев С. П. Адаптивная физическая культура в практике работы с инвалидами и другими маломобильными группами населения : учебное пособие. М. : Советский спорт, 2014. 298 с.

7) Exercises for developing the strength of the muscles of the back, abdomen, arms, legs;

8) Exercises with objects (gymnastic sticks, rubber, tennis and stuffed balls) that promote the development of hand motility, as well as the development of physical qualities;

9) Exercises in pairs aimed at improving proprioceptive sensitivity;

10) Moving games that improve speed reaction, attention and increase the functionality of the cardiovascular and respiratory systems, as well as the emotional background of the training¹⁶.

All the used exercises are aimed at the formation of locomotor-static functions, which have practical application and involve, in addition to the full use of physiological functions of the body, interaction with various objects and surfaces.

Trampoline exercises are universal means of improving the functions of the vestibular, motor analyzers, the ability to accurately control movements, maintain dynamic balance. They help to strengthen the muscles of the legs, back and spine and are recognized as one of the most effective in the cerebral palsy¹⁷.

Safety training in trampoline jumping is necessary. It is also important to be aware of the possibility of landing not only on the legs, but also on the back and abdomen, the possibility of rotation and the properties of the throwing net.

Recommended exercises on a trampoline include walking on a net, jumping on two legs, in the center of the net, jumping from one leg to the other in the center of the net, jumps with a safety lounge, with the help of a coach. Moreover jumping for two holding a stick, jumping in the standing position on his knees, lying on one's abdomen, in the standing position on one's knees with a mat. Also jumping on two legs with the transition to the knees and get back on your feet, the same in a sitting position; falling on one's back, the same with getting back on the feet, the same after jumping on two legs.

Vibration stimulation is a vibrational effect on muscles and tendons that causes a persistent discharge of muscle affect the so-called tonic vibration reflex. This action mimics the physimotor activation of muscle endings, which usually occurs with isometric random contractions.

¹⁶ Круцевич Т.Ю. Теорія і методика фізичного виховання. Том 1. Київ : Олімпійська література, 2012. 392 с.

¹⁷ Плахтій П. Д. Фізіологія фізичних вправ / П. Д. Плахтій, А. І. Босенко, А. В. Макаренко. Кам'янець-Подільський : ТОВ «Друкарня Рута», 2015. 268 с.

Vibration exposure is characterized by aftereffects and potentiating effect, which is repeated for months, and sometimes years, with repeated sessions¹⁸.

3. The suggested methodology for solving the problem

Taking into account the experience of foreign and domestic scientists, trainers and rehabilitators, as well as based on our own experience of teaching aikido, we concluded that not all the existing recommended methods for vestibular development for individuals with cerebral palsy can and should be used in adulthood, the vast majority of them are designed and suitable for children. In addition, even considering the fact that our ward has spastic diplegia of the first level according to GMFCS, and is regularly engaged in maintaining general physical training, some exercises still are too difficult and even dangerous for him, such as jumping on a trampoline or acrobatics.

However, there are similar recommended, but less intense and more individual-oriented exercises and trainings for both the vestibular system and coordination of movements and the whole body in Taizo (so-called Japanese yoga), which originated and developed long before aikido, and is used in martial arts as a warming-up, and rightly earned the recognition of masters of various martial arts. After all, Taizo teaches not only to use one's body correctly and expediently, constantly developing it, it is based on the close connection between man and Nature, which is in constant harmonious motion¹⁹.

Thus, we replaced the overturns and gullies with various ukemis, the study of which began with the sitting position – suwari waza, gradually increasing the level to the standing position (tachi waza) and amplitude. Unlike the classic gymnastic rollover, ukemi is a very practical skill that allows you to insure the body falling in any direction on any surface without harm to health. While performing a rollover, the head very often touches the floor, which in a real combat situation means an injury. The gradual increase in the level of performing the ukemi, i.e. the height of insurance, allowed the ward to get used to the load on the vestibular apparatus. As a result, after a month of regular training (2–3 times a week, each workout for 1–1.5 hours), we observed significant

¹⁸ Евсеев С. П. Адаптивная физическая культура в практике работы с инвалидами и другими маломобильными группами населения: Учебное пособие. Москва : Советский спорт, 2014. 298 с.

¹⁹ Ueshiba, K. The spirit of aikido. 1st ed. Kodansha International. 1984; 128 p.

improvement in spatial orientation and the absence of dizziness and nausea that constantly accompanied him before²⁰.

In addition, an important element was the introduction into the curriculum of respiratory affairs in Taizo, the principles of which are also followed when performing aikido techniques. Such exercises are aimed at relieving tension and simultaneous coordination of different parts of the body, with an emphasis on deep and rhythmic breathing, which forces the athlete to calm down, focus on breathing and more effectively continue to perform exercises. In our method, taizo breathing exercises have become both a way of relaxation between the exercises of the nage waza section, which involves multiple falls and getting up, and preparatory to aikido techniques²¹.

As already mentioned, the ward, against the background of cerebral palsy, from childhood cannot be independently in a sitting position on a horizontal surface. This fact prevented a number of preparatory exercises, such as rolling “roly-poly”, “butterfly”, leaned in a sitting position, and so on. However, after a month and a half of training in a group of Aikido, the ward was able to sit on the tatami alone, helped by his hands behind him, and a month later – in an adapted form to perform the above exercises²².

It is known that the vast majority of both preparatory and technical-tactical exercises in aikido are performed in the position of seidza, i.e. sitting position, with bent legs, or with the transition from seidza to kneeling, on one knee, or standing on two feet. Given the specifics of the physiological characteristics of our ward, a long stay in the position of the seat was very difficult for him, because his legs were constantly swollen; it was accompanied by pain in the knees, feet and thighs. It was also very difficult to make transitions between seidza and standing position, caused by incomplete functionality of the feet and leg muscles, including limited flexibility of the feet and toes, so the ward could not interact with the tatami surface to get up without hands and maintaining the right pace and timing. The underdevelopment of the vestibular

²⁰ Saotome, M. Aikido and the Harmony of Nature. Boston & London: Shambhala Publications Inc., 1993. 251 p.

²¹ Ueshiba, K. The spirit of aikido. 1st ed. Kodansha International. 1984; 128 p.

²² Евсеев С. П. Адаптивная физическая культура в практике работы с инвалидами и другими маломобильными группами населения: Учебное пособие. М. : Советский спорт, 2014. 298 с.

apparatus was also noted, which did not allow him to perform the necessary movements and rises in a certain plane for effective interaction with a partner²³.

During the three months of our study, we analyzed the difficulties faced by our ward, if the proposed exercises were comfortable for him and whether there is progress in their implementation. At the same time, we used both the method of observation and questionnaires, conversations, constantly monitoring the level of workload. Each week, the ward made progress in performing certain exercises and techniques, an important aspect was that the exercises were already familiar to him, each time returning to them, the performance was better and more natural. The friendly atmosphere in the dojo on the tatami also played an important role, all partners were constantly changing, including roles that allowed everyone to focus and the technique of their own performance, which, of course, had to adapt to the manner of each new partner.

Thanks to the diligence of our ward, there has never been a situation when someone, or he himself, would not want to work with someone from the group, which allows us to talk about achieving effective inclusiveness. Which is certainly not possible without good treatment and openness for people with special needs and all the other participants of the training process.

Currently, after three months from the beginning of our study, we can talk about significant changes in the general physical condition of the ward and, in particular, in the state of development his vestibular apparatus and orientation in space. During this time he learned to sit on a horizontal surface, posture improved markedly (pelvic load forward became less), movements became smoother, less sharp and jerky as before. Among the practical skills, we can mention his performing rolling and body insurance, both from a sitting position and standing. Fall-ukemi became much more confident, the ward learned to relax certain parts of the body, which allowed him to reduce the pain aspect when interacting with the tatami²⁴. Moreover, this trend applies not only to the upper body, which is fully functional, but also to the lower. Although the work of the legs is still not complete, he is not always able to react quickly and confidently, stand up, step accurately and in the right direction, but it is safe to say that the appliance of aikido techniques is

²³ Saotome, M. *Aikido and the Harmony of Nature*. Boston & London: Shambhala Publications Inc., 1993. 251 p.

²⁴ Ueshiba, K. *The spirit of aikido*. 1st ed. Kodansha International. 1984; 128 p.

performed at a sufficient and high level. That allows recommending this person to participate in the certification of aikido for the degree of *qui* (student degrees, which provide a distinction in the form of colored belts, are available to persons over 14 years).

Regarding the performance of acrobatic elements, in addition to various *ukemi*, during the training process, the ward learned to perform a headstand with different positions of the arms, and even managed to make a variant with legs apart. Although any exercises involving a wide leg position were given very difficult due to pelvic congestion caused by constant muscle tone of the lower extremities. In addition, after two months of training, it became possible to perform a handstand with the help of an instructor and provided support on the wall. Now the ward can stand in the rack on his hands for 5–7 seconds, which is a significant gain in such a short time, and given that at first, it was impossible due to constant dizziness²⁵.

Speaking of exercises of general physical orientation, the question of swing exercises and exercises for movement, which involve the simultaneous work of two or all limbs in different directions is important. Such exercises require the coordination of both hemispheres of the brain and the use of gray matter, the pathology of which leads to cerebral palsy. These exercises are especially difficult for the ward, but progress is obvious and is an impetus to continue the research.

A separate section in the study of aikido is the work with weapons, which in our case of rehabilitation of the cerebral palsy and prevention of problems with the development of the vestibular apparatus, is considered as work and interaction with ward – a skill that is extremely important for daily life, one's social and physical assets²⁶.

About one-sixth of the training time during the period of research was devoted to working with weapons. These are the traditional Japanese training weapons used in aikido: *tanto*, a wooden knife, an analogue of the real thing, a *bokken* – a wooden sword, an analogue of a *katana*, and a *jo* – a wooden stick. It is worth noting that the basis of any manual technique in Aikido is working with weapons, i.e. these two sections complement each other and the study of working with weapons helps to make manual work more concise, clear and accurate. These are the tasks

²⁵ Плахтій П. Д. Фізіологія фізичних вправ / П. Д. Плахтій, А. І. Босенко, А. В. Макаренко. Кам'янець-Подільський : ТОВ «Друкарня Рута», 2015. 268 с.

²⁶ Saotome, M. Aikido and the Harmony of Nature. Boston & London : Shambhala Publications Inc., 1993. 251 p.

we set for ourselves in the research work – through training of general physical condition and vestibular apparatus to make the movements of the ward clearer and more natural, comfortable for his daily life, and generally improve the quality of his physical condition and interaction with society²⁷.

The possession of a weapon requires a certain readiness and tone of the whole body; in addition, weapon has weight and requires loading the lower body for more comfortable movement, which means additional load and impact on the lower body that is the most vulnerable in our case. The study of this section was a difficult stage of our research. Moreover, although the ward has just begun to be acquainted with the art of using weapons in aikido, we can already talk about its high efficiency. After all, if mistakes are made in manual technique, and other parts of the body or habitual movements, loyalty of the partner can compensate them, then in techniques using weapons such moments are obvious immediately and require special concentration from practitioners. Of course, the introduction of weapons should not occur from the first lessons, but a month or two after mastering the base, due to high fatigue, which was observed with our ward. However, there is a high efficiency, which allows recommending working with weapons during aikido training in appropriate combination with general physical exercises and manual techniques, to prevent disorders of the vestibular apparatus, as well as maintaining and developing sufficient and high level of physical development in adolescents with cerebral palsy in adults²⁸.

CONCLUSIONS

Cerebral palsy is a disease that manifests itself in early childhood and accompanies a person throughout life. At the same time, regardless of the degree of manifestation and form, in Ukraine the prevention of cerebral palsy is carried out mostly only for children, while adults are not paid attention at all. At the same time, the experience of foreign experts proves that prevention and active exercise in cerebral palsy of the first and second degree are not only useful but also able to improve significantly the physical and intellectual performance of people with disabilities. Thereby improving their living conditions and, consequently, overall state of physical and moral health of the whole society.

²⁷ Ueshiba, K. The spirit of aikido. 1st ed. Kodansha International. 1984; 128 p.

²⁸ Saotome, M. Aikido and the Harmony of Nature. Boston & London: Shambhala Publications Inc., 1993. 251 p.

In this research, we focused on the development of the vestibular apparatus in adult athletes with cerebral palsy in aikido training, but the study found that the proposed exercises and methods are effective not only for the development of the vestibular apparatus, but also for other organ systems.

Thus, the peculiarities of vestibular training in adult athletes with cerebral palsy in the inclusive group of Aikido class is that, despite the level of physical condition and high motivation, such training is not only possible, completely safe for athletes with disabilities. It also allows not only maintaining the skills of independent movement and self-care in everyday life, but also with forming and developing new ones. In addition, it is a real opportunity for an adult with cerebral palsy to be engaged in sports that involve communication and active interaction with others to become more confident, morally and physically resilient. As well, aikido training significantly increases the development of vestibular apparatus, orientation in space, to overcome the problem of dizziness and nausea in transport and more. Based on the leading methods of developing the vestibular apparatus for people with cerebral palsy, we adapted them to the realities of training in aikido and Japanese Taizo gymnastics, as well as taking into account the individual characteristics of our ward.

Studies have shown that the new technique is effective, efficient, because it allowed not only to improve the physical performance of the ward, but also indicative of his socialization and full participation in aikido certification at the level of *qui*, which makes him an equal member of the group, organization and improves his daily life and communication. The disadvantage is the individuality of this methodology, because it may not suit everyone, as it was crucial personal contact between the instructor and the ward, as well as between him and the group, but this aspect can be adjusted to achieve maximum results.

SUMMARY

Any physical activity in cerebral palsy provokes signals from muscles, tendons, ligaments, joints and analyzers to the central nervous system that provides the act of movement. All this leads to the emergence of new foci of excitation, which replace pathological reflexes and promote the development of new compensatory mechanisms. There is no exercise or other treatment for repairing damaged areas of the brain, but individually selected methods and sets of exercises, combined with

a positive psychological mood, can significantly improve and correct the physical condition of the athlete.

The method proposed in the presented research is based on the performance of exercises in general physical and special training in aikido, in the general inclusive group for adult athletes. The purpose of this methodology was to improve the vestibular system of athletes with cerebral palsy. However, it also proved effective for the development of spatial orientation, coordination of movements of different parts of the body, improving the physical and emotional state of the ward, making him a full member of the group, who can take part in certifications and training seminars with other athletes. That allows us to recommend it for practical use during both aikido training and therapeutic preventive physical training, specializing in working with persons with cerebral palsy. However, this methodology requires further study and the analysis, as well as research on the examples of different individuals with different degrees of manifestation of spastic diplegia.

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