KINEMATIC POSSIBILITIES OF PEDAGOGICAL CONTROL OF ATHLETES PREPARATION SYSTEM FOR PARALYMPIC COMPETITIONS

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Abstract: *In this article that the possibility of preparing athletes for Paralympic competitions is studied on the basis of kinematic studiesand many years of preparation.At the current stage, the effectiveness of changing the volume of general training training loads, speed-strength and special training exercises in qualified athletes has been studied. One of the main goals of field scientists is to introduce tools and methods into the training process that will give great results in a short period of time. The results of this study reveal the results of the kinematic analysis of the selected method of carrying out these loads, the size and intensity of the loads that are selected for each stage of the training of para-athletes.*

Keywords:*Many years of preparation,kinematic capabilities,volume and intensity of loads, nosological condition of athletes, cyclical and acyclic sports, changes in body condition, dynamic support reaction, possibility of acceleration, phase continuity.*

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Relevance and necessity of the topic

The system of preparing athletes for the largest Paralympic Games in the world is improving year by year, and the sports in the program and the legal rules for participating in them are also improving year by year. The importance of comprehensive control in the effective organization of the training process to increase the competitiveness of athletes in international sports fields, to train highly qualified athletes is increasing day by day . First of all, this is related to the nosological condition of the athletes, and on the other hand, it indicates that the competition is increasing day by day, and the sports results are increasing. At each stage of the multi-year training system, there is a need to develop a methodology for timely and quality management of the training process.

The purpose of the research is to test the effectiveness of the kinematic analysis of the pedagogical control of the system of training athletes for the Paralympic competitions in practice and theoretically base it.

Tasks of the research

Pedagogical control of special movement training of paralympians with severe nosology (persons with various injuries in cerebral palsy) based on the specific characteristics of paralympic sports;

kinematic control to obtain reliable information about the level of training of para-athletes in cyclic and acyclic sports;

determination of spatio-temporal characteristics of the degree of impact of training loads of paralympians in various sports on daily movement activities .

An object of the research, the process of training with paralympians studying in the Adaptive physical education and sports specialty of the State University of Physical Education and Sports of Uzbekistan was taken.

subjectof the research was the control of the training structure and load content of paralympians in cyclic and acyclic types based on kinematic analysis.

RESEARCH METHODS

In researchstudy and analysis of scientific and methodical literature, pedagogical observation, pedagogical control, pedagogical testing, functional diagnostics, laboratory, kinematic analysis, pedagogical experience, mathematical and statistical methods were used.

The scientific novelty of the research is as follows :

for paralympians with severe nosologies (individuals with various injuries in cerebral palsy), the ability to get accurate and quick information about movement possibilities due to pedagogical control of the dynamic base reaction direction and the acceleration possibilities convenient for the conditions of this direction with the change of the body position during movement has been expanded;

The method of eliminating deficiencies in the organization of the training process based on the determination of kinematic possibilities that provide reliable information through many functions on the level of preparation of paralympians engaged in cyclic and acyclic sports has been improved.

Scientific and practical significance of research results

Scientific significance of research resultsThe information obtained during the research enriches the content of the theory and practice of adaptive physical education related to the problems of organizing and conducting educational and training processes in various training cycles of para sports, increasing special movement readiness, and is explained by its scientific justification .

The practical significance of the results of the research is determined by the fact that they serve to ensure the continuity of training, develop their physical qualities, manage the growth trends of training loads, form periodic and continuous competence, and improve sports results.

Research organization methodology

How a person can realize the ability to move, organize it in different forms, and achieve certain results depends on his physical qualities and abilities. Conducting adaptive physical education training without fully studying the individual's movement capabilities will not only have a negative effect on the sports result, but also lead to deterioration of the daily movement activity of the athlete. In this regard, it is important to take into account the mobility, age, physical fitness and biological characteristics of the participants. Pedagogical control based on regularly conducted laboratory conditions envisages strict regulation of these features in a complex manner. It should not be forgotten that the pedagogue, who trained many champions, and the trainees themselves may not be able to fully and timely determine the changes that occur under the influence of physical exercises.

One of the most important aspects of adaptive physical education is not the result achieved in various competitions, but the improvement of a person's indicators of movement activity. The possibilities of performing these actions require changing the form and content for people of different nosologies. When performing certain actions, the amplitude of movements of certain links of the human body depends on the structure of the neck, the speed of work, and the flexibility of the connective apparatus and muscles.

Joint mobility is divided into active mobility, which is achieved due to the active contraction of muscles, and passive mobility, which is achieved by external forces. In many cases, active mobility is used less than passive mobility. The maximum anatomically possible range of motion is usually not used in everyday activities and sports activities. This is explained first by the fact that additional muscle power is required to reach the full amplitude, and secondly by the difficulty of smoothly changing the direction of movement while taking the movement to its last limit. Striving to increase the range of motion excessively is the cause of injury in most cases.

We tested para-athletes' kinematic movement capabilities and active and slow movement capabilities in laboratory conditions.

PATIENT: Akmirzayev Farrux

DATE OF BIRTH: 16/04/1998 **WEIGHT:** 63 Kg **HEIGHT:** 174 cm **GENDER:** M

Analysis Report - Timed Up and Go

Parameters	Value	Units
Analysis Duration	10.94	s
Functional mobility skill	Independent	

Parameters	Sit to Stand	Stand to Sit	Units
Phase Duration	1.10	1.30	s
Antero-Posterior Acceleration	4.1	3.4	m/s²
Lateral Acceleration	2.7	4.7	m/s²
Vertical Acceleration	7.9	12.2	m/s²
Parameters	**Mid Turning**	**End Turning**	**Units**
Phase Duration	8.33	0.00	s
Maximum Rotation Speed	269.2	0.0	°/s
Average Rotation Speed	41.7	0.0	°/s

Test Phases

Figure 1: is a description of kinematic movement after spinal cord injury

We have analyzed some problems in the phases of sitting down and standing up from a chair and walking, which are often used by a person in everyday life .

In these para-athletes, despite the restoration of functional mobility after a spinal cord injury, deep lameness and the use of external support forces are required for movement. The duration of the phase for standing while sitting on a chair was 1.10 seconds, while the duration of the phase for sitting on a chair was 1.40 seconds.

The ability to accelerate forward and backward was 1.9 m/s2 for standing and 8.2 m/s2 for sitting.

The possibility of lateral acceleration was 2.0 m/s2 when standing from a chair, and 5.6 m/s2 when sitting on a chair.

The optimal acceleration was 6.7 m/s2 when standing up, and 6.4 m/s2 when sitting down.

Phase continuity in standing up, the average turning speed was 1.50 seconds, the maximum turning speed was 144.6 ^{0}/s, and the average turning

speed was 99.1 ^{0}/s.

When sitting on a chair, these indicators made the rotation phase duration 0.84 seconds, the maximum turning speed was 294.1 ^{0}/s, the average turning speed was 140.7 ^{0}/s.

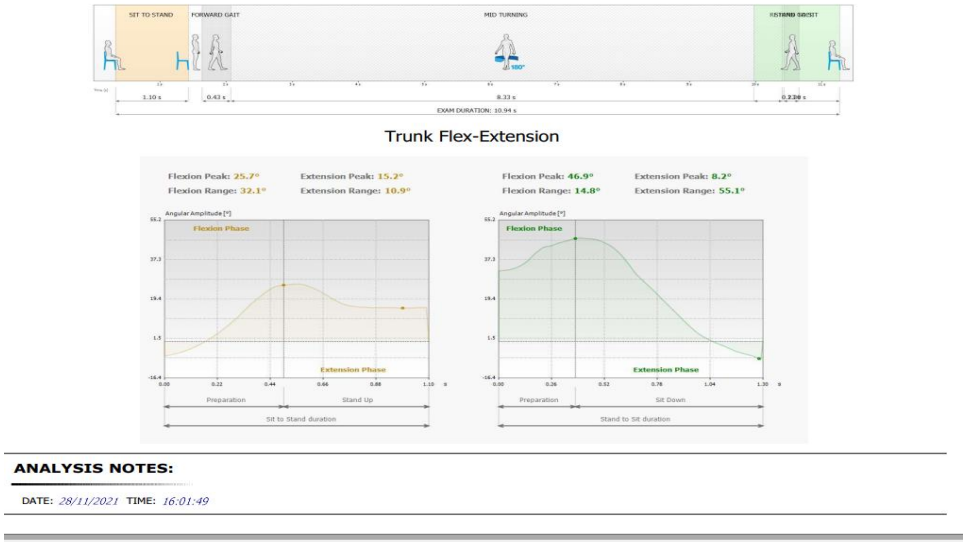

Figure 2: is a diagram of kinematic movement after spinal cord injury

It can be seen from this histogram that it takes 1.10 seconds to get up from the chair, and 1.50 seconds to turn 180^{0}. It takes 1.37 seconds to return to the seat. These results show that getting back to the chair is more difficult than getting up from the chair.

In adaptive physical education and sports practice, the mobility of the joints is used either by pre-stretching the muscles, due to rapid and multiple contractions of the muscles during the movement, or by stretching the shortened muscles to increase flexibility and correct height defects.

The speed of movement of some parts of the body is different from the speed of movement of the whole body. The speed of movement of the whole body depends not only on the speed of movement of some parts of the body, but also on a number of other factors, the length of the arms and legs, and the proportional performance and other resistances of the external environment .

Along with the sports results of the athletes, we have analyzed the rotational movement possibilities that occur many times during the movement.

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Turn Test

Spatio-Temporal parameters	Forward Gait	Turning	Return Gait	Normal Range	Units
Analysis duration	6.8	2.5	6.2		s
Speed	1.15	1.01	1.14	1.12 - 1.34	m/s
Cadence	106.1	86.0	106.2	111.0 - 126.6	steps/min
% Stride length	74.7	71.3	74.8	78.6 - 90.8	%
Stride length	1.30	1.24	1.30	1.16 - 1.30	m
Gait cycle duration	1.13	1.27	1.13	0.97 - 1.27	s

Figure 3: opportunities for rotational movement that occur multiple times during movement along with athletes' athletic performance

Analysis time for spatio-temporal characteristics was 4.4 seconds for walking forward and 4.9 seconds for turning back, and an average of 4.1 seconds for turning 180^{0}.

The athlete's ability to perform a movement at speed averaged 3.05 m/s when moving forward in a straight line, and 2.27 m/s when turning back after a 180^{0} rotation. It took an average of 2.78 m/s to turn 180^{0}. It should be noted that these indicators are very high compared to the standard results.

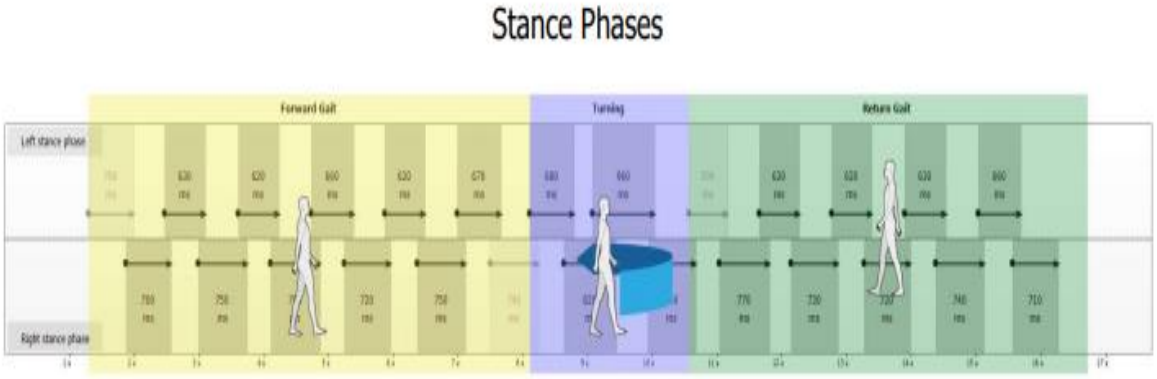

Figure 4: The ability of an athlete to perform a movement at speed

In forward motion, the cadence was 131.1 steps per minute, while 180 ^{0} revolutions recorded 131.6. According to the regulatory requirements, these indicators should have been 111.0-126.6 minutes of step. 102.1 steps per minute were taken in the return after the rotation, but this indicator was of high amplitude compared to the angle of deviation in walking. Constantly moving in this way creates a higher sway compared to normal walking, causing the musculoskeletal system to tilt one-way.

The step percentage was 162.4% in forward movement, 152.3% in 180 ^{0} rotation, and 165.3% in backward movement after rotation. According to standard results, this indicator should not exceed 78.6-90.8%.

The length of a simple step was 620 m/s to 700 m/s when walking forward, 820-960 m/s when turning, and 590-770 m/s when going back.

The duration of the rotation was 0.95 seconds. It should be noted that this indicator is a little closer to the standard requirements (0.97-1.27).

The athlete under study is a running type of athletics and has seven years of sports experience. Through this study, the acyclic movement capabilities of cyclic sports participants were studied. In each acyclic movement, it is important to clearly define three phases in accordance with their functions in the whole act: preparation for the execution of the movement, execution of the main movement at the required amplitude, and final phases. All three phases are interrelated, run together, and always require each other.

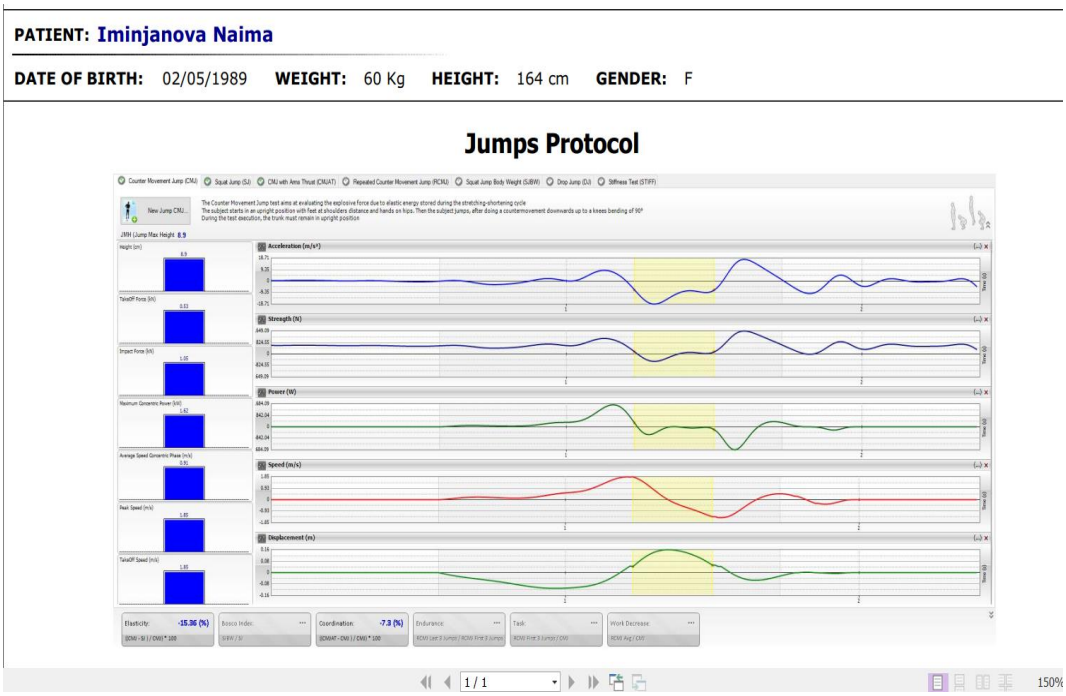

Figure 5: Knematic movement activity in the nosology of one arm and one leg engaged in parasport (athletics)

In individuals with various injuries in cerebral palsyalong with the possibility of developing explosive power abilities is complicated, the level of development of this ability is of particular importance in cyclical sports. Leg reactive power was determined in the squat jump test. Reactive forces are the forces reflected during the interaction of body parts during accelerated movement. That's why determining the mutual balance of body parts when performing a certain movement serves as a basis for improving the athlete's results. In this test, the kinematics of the optimal height of the leg muscle tone, which allows for the best vertical jump, was studied. A test of jumping as high as possible while sitting at 90 ^{0} was applied. In cycling sports, these indicators were recorded from 8.9 cm to 11.3 cm in an athlete whose ability to move one leg and one arm was checked. It should be noted that this result in the 3 months of the preparatory

stage shows the presence of growth dynamics, but at the same time, it does not show a high growth rate.
The direction of the dynamic base reaction with the change of the body position during movement and the possibilities of acceleration favorable for the conditions of this direction were checked at different times of training. These indicators, on the one hand, allow people with various injuries in cerebral palsy to get accurate and quick information about their movement possibilities, and on the other hand, they make it possible to make appropriate changes in the direction and content of training during the training period.
One of the main characteristics of movement kinematics is determined by the possibilities of acceleration and tension relative to the performance of the activity. The indicators of acceleration of this athlete ranged from 18.7 m/s ^{2} to 19.8 m/s ^{2}.
Through this card, we showed the level of training of our athletes based on accurate information on many functions as a guide to coaches on training deficiencies and their elimination.
Leg muscle tension on the second coordinate axis was equal to 0.53 (kN) in this athlete during training. According to the one-arm and one-leg nasology of the cerebral hemispheres, this indicated result is slightly lower than the average indicators. In the course of research, high results were recorded in this nosology of leg muscle strength in cyclic sports, mainly in long jump of paracycling and para-athletics. One of the most important aspects is that the highest results in many athletes mainly correspond to the 4th-6th mesocycles of training. During the main competition, these indicators are 12-14% less than the results shown in the training period. Of course, these indicators will not affect the outcome of the competition.
For this particular exercise, the impact stress in terms of strength was 1.05(kN). The worst results according to this indicator also mainly correspond to the competition period. These indicators are caused by the strong tension of the leg muscles close to the main competitions. These results are the basis for our conclusion that in the nosology of one arm and one leg, on the one hand, different changes should be made to the individual training program for the athlete.
The maximum concentrated power indicator was equal to 1.73 (kW) from 1.62 (kW). This indicator is very important in all types of sports, especially in cyclical sports, the results in the main competitions in many cases require a very short time, and the possibility of winning in athletes with high sports technique is directly related to the level of development of this indicator. Depending on how high the maximum concentric strength index is, the athlete's prospects can be determined. The forces affecting the movement of the human body are divided into internal and external forces. If the passive forces of the musculoskeletal system are determined by the elasticity and extensibility of the muscles, the active forces of the musculoskeletal system are determined by the pulling force of the muscles. In nosologies related to cerebral palsy of the musculoskeletal system, muscle tension is one of the most important links.
Concentric force index at average speed in high jump is 0.91 to 0.98 (m/s). This indicates that with this athlete, the trainers show that the monthly training cycle should be more focused on fast-strength training.
High jump speed also showed a result of 1.85 to 1.96 (m/s). When analyzing these indicators, it will be correct to approach based on the athlete's weekly microcycle tasks. Because jumping speed showed a relatively lower result after exercises designed mainly for leg muscle strength. When analyzing the kinematic capabilities of an athlete, it is necessary to take into account the direction of the load performed during training and the mode of work performance. Also, in the analysis of the dynamic characteristics of the athlete, reactive forces are important. Reactive forces are understood as the forces during the interaction of body parts during accelerated movement.
showed a result of 1.85 to 1.92 (m/s) in terms of kinematic capabilities . For force descriptions of actual motion, the generalized concept of motion forces is used. The qualitative characteristics of human movements are so diverse that they can be conditionally divided into spring-like, explosive, semi-forced and relaxed movements. Explosive power capabilities that require quick-fire power have been analyzed by us.
It is in this nosology that the kinematic capabilities of boys engaged in cyclical sports were studied. Often, when performing physical exercises technically correctly, the coherence of the movement is visible. When performing a certain movement, one group of muscles should be performed in a sequence in which the work of another muscle group begins before the end. At the same time, further actions

require an increasing speed. If each force acts from the point where the movement resulting from the action of the previous force reaches the maximum speed, the speed of the next movement will be increased.

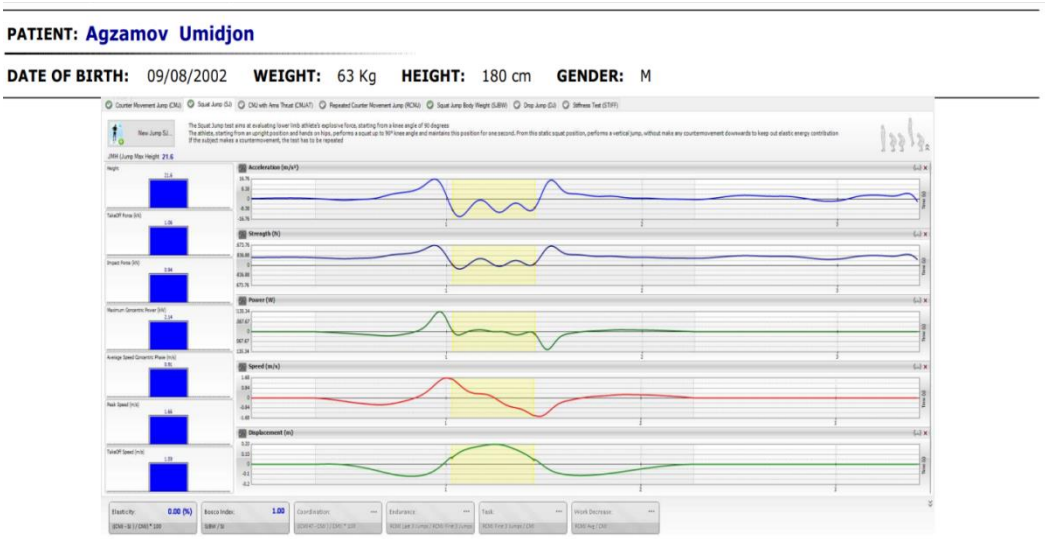

Figure 6: Kinematic activity of Agzamov Umidjon, who is engaged in parasport (athletics).

In practice, in most cases, the way to increase the speed during exercise in persons with various injuries in cerebral palsy is more or less related to the morphological characteristics of the body joints. Therefore, when the way to increase speed is limited , it is necessary to try to reduce the time of action of muscle power . In the squat high jump test, along with the athlete's reactive power, the ratio of the working system of the body links is also important. The shorter the time of action of the force in relation to the movement performed on this path, the higher the speed of movement.

In cyclical sports, the height of one leg and one hand vertical jump of the tested athlete was 21.6 cm on average, his best result was in the pre-competition stage (23.9 cm), and the worst result was in the first stage of training (18.7 cm.) coincided with the stage. It should be noted that the results from the 2nd month of the preparatory stage showed the presence of growth dynamics, but at the same time did not show a high growth rate.

Acceleration capabilities of this athlete ranged from 16.8 m/s2 to 21.2 m/s2. Mainly, the growth rate corresponded to the mesocycles of flexibility and agility development.

Leg muscle tension on the second coordinate axis was equal to 1.06 (kN) to 1.12 (kN) in this athlete during the training period. According to one-arm and one-leg nasology of the cerebral hemispheres, this indicated result is closer to the indicators of secondary development.

It was found that the impact tension increased from 0.94 (kN) to 1.16 (kN) in terms of strength compared to this particular exercise.

The maximum concentric power index was initially 1.48(kW) at the beginning of the study, but during the studies these indicators were equal to 2.14(kW) to 2.23(kW). This indicator directly affects the results of the main competitions in cyclical sports. Changing the direction of dynamic support reactions by changing the position of the body in the process of movement, thanks to which it is possible to give the body an acceleration favorable for the conditions of this direction. Examples of these situations include short- and long-distance running from cyclical sports, different body postures in standing position and long jump in acyclical sports.

The concentric force index at the average speed of jumping up is 0.91 to 0.99 (m/s). This indicates that the athlete's concentric strength index at average speed does not give a positive result even at different stages of training .

High jump speed also showed a result of 1.66 to 1.93 (m/s). When analyzing these indicators, it is certainly correct to approach based on the severe nosological condition of the athlete. Also, in some types of physical exercises, it imposes special requirements on the general condition and the condition of some parts of the body. These requirements are assessed not only by the biomechanical expediency of physical exercises, but also by taking into account the accuracy of body position, consistency of movements, and beautiful performance.

The vertical flight speed of this athlete also showed a result of 1.59 to 1.83 (m/s) according to kinematic capabilities. These indicators also show that high growth rates were not observed in the results of the research conducted at the beginning and various stages of the athlete's training.

In sports practice, most of the errors in body position or movements, which meet the requirements of anatomic-physiological and technical efficiency, are related to insufficient consideration of the effect of neck-strengthening reflexes caused by the change of head position in relation to the body.

CONCLUSIONS

The results of the research conducted with Paralympians at different stages and periods provided the opportunity to get accurate and quick information about the movement possibilities of individuals with cerebral palsy, and on the other hand, it was the basis for making appropriate changes in the direction and content of training during the preparation period.

Another widely spread nosology, the results of the study on the one-arm and one-leg nosology, on the one hand, required the introduction of various changes to the individual training program for the athlete, and on the other hand, it is the basis for our conclusion that there are some problems in the preparation of recovery and muscle relaxation exercises after the exercises given for the development of strength quality. it happened. The kinematic capabilities of boys engaged in cyclical para sports are often confirmed by the results of the research carried out in laboratory conditions at various stages.

In the squatting high jump test in persons with various injuries of cerebral palsy, the balance of the working system of the body joints together with the athlete's reactive power is of great importance. It was found that the shorter the time of impact of the force in relation to the movement performed on this road, the higher the movement speed.

From our side, through these exercises, it was the basis for developing fundamental conclusions not only about the kinematic capabilities of the para-athletes, but also about general conclusions about the movement preparation during the competition and transition period.

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