

# Research Journal of Pharmaceutical, Biological and Chemical Sciences

## The Effectiveness Of Regular Adaptive Physical Education Classes With Adolescents Suffering From Cerebral Palsy.

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### ABSTRACT

Cerebral palsy is a condition that is accompanied by a variety of motor disorders caused by brain damage of various origins in the early stages of development. To assess the effectiveness of the exercises used in the study applied the method of stabilometry. The choice of this method is due to the fact that with cerebral palsy, ataxia often develops, which violates the stability of the vertical position of the body and controls the movement of the center of gravity. In this regard, it is necessary to control the imbalance in the direction of one of the muscle groups and destabilization of the joints, which violate the ability to verticalize the body. In the exodus of adolescents with cerebral palsy, there was a "mobile equilibrium": a constant alternation of the muscle tone of the groups of anti-gravity muscles. They also had poor posture, were uncoordinated in the movement of the limb with a predominance of the flexing, adductor and penetrating muscles, indicating the imbalance of the striated muscles of the body and the pathology of the spinal column. As a result of the application of tried and tested variants of adaptation of physical exercises in the process of group recreational activities for adolescents suffering from cerebral palsy, their physical condition improved due to the achievement of overall recovery.

**Keywords:** cerebral palsy, recovery, exercise, stabilometry, myofasciography, inclusive physical education.

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**INTRODUCTION**

The problem of pathology correction in humans has long attracted the attention of various researchers [1, 2]. In this regard, certain successes have been made - various approaches and options for the recovery of persons of different ages and having different pathologies have been developed [3, 4, 5]. It has long been recognized that regular exercise [6, 7] has a huge health potential. They have become especially active now in children with various pathologies, getting very good results [8].

The problem of organizing motor activity for children with disabilities is still relevant not only in physical culture and health clubs for disabled people and rehabilitation centers, but also in the framework of inclusive physical culture classes [9, 10]. This creates the need to use the available improvised means and adapt the physical exercises used in their conduct in order to increase the efficiency of the performed motor actions [11, 12].

Children with lesions of the nervous system, a large proportion of which is infantile cerebral paralysis, require greater adaptation of physical exercises for independent performance in the process of practicing adaptive, as well as inclusive physical culture [13]. When constructing a rational motor activity of such participants, it is necessary, in most cases, special material and technical equipment, as well as assistance in the process of performing passive-active exercises by either specialists in the sphere of adaptive physical culture or parents [14].

Currently, it is recognized that cerebral palsy is a complex pathology, covering a group of various motor disorders caused by injuries of the brain of various origins in the early stages of its development [16, 17]. The clinical picture of the effects of cerebral palsy is extensive and is directly related to the scale of brain damage [18], but all forms of cerebral palsy are characterized by movement disorders and posture maintenance [19,20]. To assess the effectiveness of the exercises used and the process of adaptive physical training in general, the method of stabilometry is used, which allows to evaluate the effectiveness of therapeutic effects on the muscles [21-25]. However, the possibilities of this method for cerebral palsy have not yet been fully clarified.

The goal was set in the work: to adapt the exercises for group and independent classes for children suffering from cerebral palsy, assessing their effectiveness.

**MATERIALS AND METHODS**

The study was approved by the local ethics committee of the Russian State Social University on September 15, 2016 (protocol №9). The study was conducted on the basis of physical culture and sports club of disabled people “Korsar-Sport” (Podolsk). The study involved 7 adolescents (age 13 - 17 years) with a diagnosis of cerebral palsy (spastic diplegia, left-sided hemiparesis, spastic tetraparesis, dystonic tetraparesis with atactic syndrome, hyperkinetic form of cerebral palsy).

**Table 1. Values of stabilometric parameters of the norm**

Parameter	The value of the position of the point of projection of the common center of mass in the frontal plane, mm		The value of the position of the point of projection of the common center of mass of the sagittal plane, mm		The speed of movement of the total center of mass, mm / s		Statokinesiogram area, mm <sup>2</sup>	
	Men	Women	Men	Women	Men	Women	Men	Women
Average value	1.3	0.8	-33.2	-25.2	11.4	9.7	96.1	102.9
Standard deviation	5.5	5.4	13.6	13.7	3.8	3.3	39.7	44.7
+95%	12.1	11.4	-6.6	1.6	19.0	16.1	174.0	190.5
-95%	-9.5	-9.8	-59.8	-52.1	4.0	3.3	18.3	15.3

To assess the diagnosis of examinations, the method of stabilometry was used, which allows to determine the level of functional activity and the stability of the skeletal muscles.

In the ongoing recreational classes with adolescents with cerebral palsy, general strengthening gymnastic exercises adapted to the functional state of the musculoskeletal system of the student were applied. The following describes the applied adaptation options for the exercises using various materials at hand:



Figure 1. Variants of using the belt to adapt exercise

1. **Using a belt (regular belt, sports bag straps, yoga belt, etc.).** The various options for using the belt to adapt the exercises are presented in Figure 1. The use of the belt provided a significant relief to the exercises related to bringing the lower limbs to the abdomen from a supine position; bending the legs at the knee joints, etc.
2. **The use of special blocks (wooden bars, books, etc.).** This aligns the shoulder girdle due to the special eliminating the difference in length of the upper limbs. In the course of the exercises, the block was used to perform flexions of the arms in the support, exercises in the position on all fours (Figure 2). In exercises based on the feet, an individual wooden block was laid under the sole of the shortened limb, leveling the level of the pelvic bones.



Figure 2. The use of blocks during exercise.

### 3. Use of additional support (Figure 3).

To overcome the incorrect setting of the feet, non-physiological knee flexion, flexion and internal rotation of the hips when performing squats or exercises related to standing up, additional support was used in persons with cerebral palsy.



Figure 3. Options for using the wall as a means of adapting exercise

### 4. Ensuring the proper setting of the stop

With the varus feet, it was recommended to hold the block between the thighs, pushing it back with muscle tension (adduction and pronation in the hip joint). In this case, an additional pressing of the internal surfaces of the feet to the support was provided. When valgus statement of the feet - the student was asked to strain the muscles of the lateral surface of the thigh, trying to break the belt fixed at the level of the tibia (abduction in the hip joint). This movement provides additional force for pressing the external surfaces of the feet to the support (Figure 4).

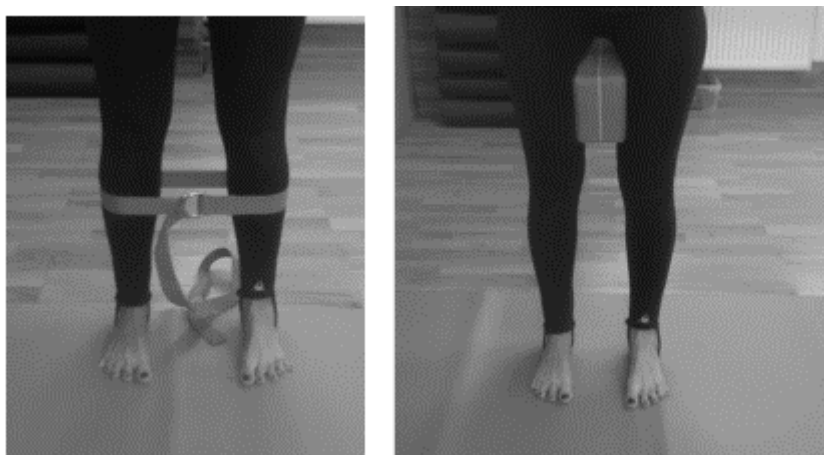


Figure 4. Overcoming valgus / varus stop

**5. Use of special postures for recreation.** To ensure muscle relaxation and relaxation in the intervals between the main exercises of the complex of adaptive physical culture and after the completion of the training process, relaxation exercises were used (Figure 5).



**Figure 5. The option of using additional support in the exercise of muscle relaxation.**

This can help reduce the level of functional activity of skeletal muscles and improve blood circulation throughout the body.

The results were processed with a standard statistical software package.

### RESULTS OF THE RESEARCH AND DISCUSSION

The results of the measurement of stabilometric indicators obtained as a result of research work are presented in table 2.

**Table 2. The values of stabilometric parameters before and after applying the course of exercises of adaptive physical culture**

№	The value of the position of the projection point in the frontal plane, mm		The value of the position of the projection point of the sagittal plane, mm		The speed of movement of the total center of mass, mm/s		Statokinesiogram area, mm <sup>2</sup>	
	before	after	before	after	before	after	before	after
1	1.07	11.24	-31.19	-31.60	11.03	9.37	82.96	54.44
2	4.35	10.73	-47.23	<b>-56.39</b>	7.04	6.70	32.80	28.55
3	9.64	7.85	-28.87	-31.18	<b>21.00</b>	<b>20.36</b>	<b>333.82</b>	137.62
4	<b>19.18</b>	<b>13.98</b>	<b>-53.98</b>	-25.28	10.35	9.65	45.79	41.60
5	2.45	<b>18.25</b>	<b>-59.40</b>	<b>-53.24</b>	9.65	8.07	<b>434.89</b>	<b>307.05</b>
6	3.94	1.95	<b>-54.91</b>	-46.58	7.80	7.16	<b>213.35</b>	139.92
7	<b>12.86</b>	3.61	<b>-54.09</b>	<b>-60.80</b>	<b>17.46</b>	12.33	139.63	119.57
m	7.64	9.65	-47.09	-43.58	10.52	10.80	183.32	118.39
±σ	6.70	6.03	11.30	13.15	5.05	5.05	148.92	103.14
±m	2.73	2.46	4.61	5.36	2.06	2.06	60.79	42.11

The presented samples are related and have a normal distribution. When analyzing by the methods of mathematical statistics, a nonparametric Z - sign criterion was used. The reduction in the speed of movement of the total center of body mass and the area of the statokinesiogram was taken as a positive result of the training process, an increase in the indicators was taken as a negative result. According to the results of the statistical analysis, we can conclude about a reliable (0.05) decrease in the rate of movement of the total center of body mass and the statokinesiogram area ( $t_{empirical} = t_{control} = 7$ , with  $n = 7$ ), that is, the complex of adapted exercises of adaptive physical culture used improved the postural balance of those engaged in.

The achieved results show a pronounced healing effect from the exercises applied. The basis of the effect achieved seems to be the activation of the nervous system [26-29] and its interaction with the muscular system [30-33].

As a result of the application of these adaptation options, physical exercises are applicable in the process of group recreational activities with adolescents. suffering from cerebral palsy [34,35], it was easier to perform similar complexes with their independent use. This is the key to their faster recovery and socialization [36,37].

Due to the persistence of positive results, it is recommended to conduct a course of recreational and recreational activities in children with cerebral palsy 3-4 times a week for a long time [38,39,40].

### CONCLUSION

As a result of the use of an adaptive physical culture with auxiliary means, it was possible to achieve a positive result in the form of a decrease in the rate of movement of the total center of body mass and the area of the statokinesiogram in adolescents with cerebral palsy. According to the results of the statistical analysis, we can conclude about a significant decrease in the rate of movement of the total center of mass of the body and the statokinesiogram area. In this regard, it can be said that the used complex of adapted exercises of adaptive physical culture significantly improves the postural balance of those engaged with cerebral palsy. Developed variants of adaptive physical exercises are applicable in the process of group recreational activities with adolescents suffering from cerebral palsy. Their success is associated with simplifying the implementation of complexes of physical exercises.

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