

## MEANS OF PHYSICAL THERAPY IN NEUROMOTOR DISORDERS IN CHILDREN

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### **Abstract**

Concern for the child with infantile cerebral palsy is becoming more frequent from more and more perspectives and from very different fields. The attention paid to the child with neuro-psychomotor disabilities, his knowledge and the problems he imposes is felt today at the social level and is an always current medical-psycho-pedagogical and social problem. [1,3,7] In this study we started from several hypotheses, and through the steps we tried to recover the child with cerebral palsy in a short time. The study done in the child with infantile cerebral palsy was done for a period of 3 months, on a single child. After applying the kinetic program, we managed to maintain and even improve the degrees of mobility in the lower limbs. The main objectives set in the recovery program were to reduce spasticity in the lower limbs, fulfilling this goal I managed to improve mobility in the lower limbs. At the end of the study we drew conclusions

### **Introduction**

The definition of cerebral palsy represents “all neurological manifestations caused by congenital brain lesions (developmental abnormality in the first trimester of pregnancy) or acquired (produced by a difficult birth or by accidental trauma in the first months of life); it manifests itself as follows: forms of spastic paralysis with various locations, motor tension, slow and wavy involuntary movements, delays in mental development, sensory disorders, sometimes visual and hearing impairment.”[5,6]

The first references to this type of condition date back to the ninth century (1860), when William John Little, an orthopedic surgeon in London, described spastic diplegia, long known as Little's disease. [5] Later in the Anglo-Saxon literature the term "cerebral palsy" (CP) was attributed to it, which we also use nowadays. Little believes that the main cause of cerebral palsy is asphyxia at birth due to prolonged labor. The concern for the child with infantile cerebral palsy (ICP, cerebral palsy) is more and more frequent from many perspectives and from varied fields

also. The attention paid to the child with neuro-psychomotor disabilities, knowing him and the problems he imposes, has a social impact and represents a continuous medical-psycho-pedagogical and social problem

In the last 50 years there have been researches in neurophysiology, experimental studies that have brought new conceptions regarding the etiology of ICP, but also in the field of neuro-motor recovery.[4,8] The information is always insufficient to be able to understand and solve these diverse problems that form the notion of infantile cerebral palsy.[9,10]

### **Material-method**

Research hypothesis:

We began this study starting from the following hypotheses:

Is it possible to increase mobility in the lower limbs using kinetic means?  
Were the means and procedures selected and applied according to the methodological principles of physiotherapy effective?

To what extent will the applied kinetotherapeutic treatment help reduce spasticity?

Specific objectives:

They were established taking into account the multitude of studied parameters and in order to provide an overview of the etiological, clinical-functional, evolutionary and recovery aspects.

We selected the case of a child diagnosed with infantile cerebral palsy, the study was conducted over a period of 3 months, the subject of the study being diagnosed with spastic ICP.

Organizing and conducting the case study itself:

The study was conducted in two recovery centers in Suceava County, the purpose of the study being to highlight the etiological and functional aspects in order to design and evaluate complex therapy of children with psycho-neuro-motor disabilities, diagnosed with infantile cerebral palsy.

Evaluation sheet and initial kinetotherapeutic intervention – February

Name and surname: G. M.

Date of evaluation: 12.02.2018

Diagnosis: Infantile spastic paraparesis

My 4-year-old patient was diagnosed with infantile spastic paraparesis. At the initial assessment, it had spasticity in the lower limbs, predominantly in distality with the pelvis in a slight anteversion, with low amplitude and stiffness in the lower limbs.

Functional evaluation:

1. Evaluation of the musculo-skeletal system. It presents spasticity in the lower limbs, predominantly in distality; Slight pelvic anteversion.
2. Somatoscopic and anthropometric measurements  
Height: 114 cm  
Weight: 21 kg
3. Evaluation of neuro-psycho-motor function  
Osteotendinous reflexes: no disorders; Sensibility: no disorders; Sensory disorders: does not present; Syncinesis: does not present; Balance: presents disorders of dynamic and static balance; Coordination: normal;
4. Evaluation of the amplitude of movement  
Reduced range of motion in the lower limbs, with stiffness at passive mobilization of the joints of the lower limbs predominantly in the ankle joint;

**Table 1.** Initial and final evaluation of the motion range G.M

Initial measures	Initial grades		Final grades	
	Left	Right	Left	Right
Internal rotation of the foot	24 <sup>0</sup>	25 <sup>0</sup>	24 <sup>0</sup>	25 <sup>0</sup>
Dorsiflexion	22 <sup>0</sup>	21 <sup>0</sup>	24 <sup>0</sup>	23 <sup>0</sup>
Plantar flexion	38 <sup>0</sup>	37 <sup>0</sup>	39 <sup>0</sup>	38 <sup>0</sup>
Crossing the legs	89 <sup>0</sup>	89 <sup>0</sup>	90 <sup>0</sup>	90 <sup>0</sup>
Degree of flexion and extension of the knee	F. 110 <sup>0</sup> E. 8 <sup>0</sup>	F. 108 <sup>0</sup> E. 7 <sup>0</sup>	F. 112 <sup>0</sup> E. 8 <sup>0</sup>	F. 110 <sup>0</sup> E. 7 <sup>0</sup>

**Table 2.** Evaluation of initial and final muscle strength

	INITIAL before the kintetotherapeutic programe	FINAL after the kintetotherapeutic programe
Muscle strength 0		
Muscle strength 1		
Muscle strength 2		
Muscle strength 3	X	
Muscle strength 4		X
Muscle strength 5		

**Table 3.** Initial assesment of the muscular tonus in the lower limbs

		Initial February	Final April
Grading	Clinical manifestations of muscular tonus		
0	Normal tone: there is no pathological increase		
1	Very mild hypertonia: there is a discontinuation of passive movement followed by release or low resistance at its end		X
2	Mild hypertonia: there is a cessation of the passive movement in the middle area of the arc of motion being followed by a small resistance during the next segment of the arc of motion		
3	Medium hypertonia: there is little resistance throughout the entire range of motion, but the joint can be easily mobilized	X	
4	Accentuated hypertonia: passive movement is difficult to achieve, the joint can not be mobilized on the entire range of motion		
5	Severe hypertonia: passive movement is impossible, the joint cannot be mobilized		

#### Assessment of muscle strength G.M

- Decreased muscle strength in the lower limbs;

At the initial evaluation, the muscular force was 3 (muscle force can completely mobilize the segment against gravity), and after the end of the kinetic program the patient reached muscular force 4 (muscle force can completely mobilize the segment against gravity applying a lower resistance on the tested segments).

#### Walking evaluation

Slightly walking on tiptoes and with the foot oriented slightly outwards, predominantly on the lower left limb;

It becomes unbalanced when the patient steps on the whole sole;

#### II. Daily activities

1. Hygiene: independent

2. Nutrition: independent

III. Physiotherapeutic intervention: Program carried out during the first 3 months (February; March; April), three weekly sessions, one session lasting 50 minutes.

#### Objectives:

Combating and inhibiting spasticity

### Walking reeducation

#### Combating compensatory deficiencies

#### Kinetherapeutic means and techniques:

1. Passive, active-passive and active mobilizations in the lower limbs
2. Bobath's method of global relaxation
3. FNP (Rhythmic rotations)
4. Kabat diagonals applied to the lower limbs in order to reduce muscle spasm - global relaxation
5. Active exercises to promote and facilitate balance (static and dynamic) in orthostatism.

1. The Bobath method of global relaxation helps inhibit and decrease muscle tone by stretching.

Initial position of the patient: in a prone position on the Bobath ball, slight rocking back and forth assisted by the physiotherapist.

Initial patient position: sitting on the Bobath ball, the child will perform light jumps. With the feet resting on the ground.

Initial patient position: sitting on the gym bench, plants on the Bobath ball, light pushes to achieve simultaneous flexion and extension of the legs

2. Neuro-proprioceptive facilitation technique, alternative passive rotations of the lower limbs will be performed [2]

3. Kabat diagonals at the lower limbs:

#### Diagonal I - Bottom-up movement

The child is positioned in supine position, with the lower limb extended, in abduction, the hip slightly rotated internally, the foot is extended in pronation, passively performing flexion of the toes, extension of the foot, extension, abduction and internal rotation of the thigh.

Diagonal II- The child is positioned in supine position, with the lower limb adducted, slightly rotated outwards, the foot being positioned in extension and supination, with the toes bent. Finger extension, dorsiflexion and pronation of the foot, flexion of the thigh with abduction and internal rotation of the foot are performed. The movement is performed at its maximum amplitude.

2. Re-education of gait

#### Methods and means

Exercises of the lower limbs from the sitting position with the knees flexed and in extension - active dorsiflexion of the foot, from the sitting position the active extension of the leg alternately and simultaneously.

Active walking exercises on the devices in the physiotherapy room - corrective walking on the treadmill, walking on pillows, walking options on the soles

Corrective walking options with the help of portable objects - walking with a cane placed behind the grasped ends

Results:

A reduction in spasticity was observed in the lower limbs

Improved mobility in the lower limbs

Dynamic and static balance has been improved

3. Combating compensatory deficiencies

Sitting in postures with feet at 90 grade and right torso

The pelvis is tilted in retroversion stretching exercises from the knee position

In order to perform the final testing of the patient, we performed a motor route, which consisted of walking on the soles, insisting on the correct running on the foot, heel, sole, toe, diffraction walking exercises with the help of the walking reeducation ladder, and to develop and the dynamic balance the child went on a narrow plane.

In order to perform the final testing of the patient, we performed a motor route, which consisted of walking on the soles, insisting on the correct running of the foot, heel, sole, toe, diffraction walking exercises with the help of the walking reeducation ladder, and to develop and the dynamic balance the child went on a narrow plane.

**Table 4.** Examination of muscle tone according to the modified Aschworth Scale G.M.

		I	Int.	F
Grade	Clinical manifestation of muscular tonus			
0	Normal tone: there is no pathological increase			
1	Very mild hypertonia: there is a discontinuation of passive movement followed by release or low resistance at its end			X
2	Mild hypertonia: there is a cessation of the passive movement in the middle area of the arc of motion being followed by a small resistance during the next segment of the arc of motion		X	

3	Medium hypertonia: there is little resistance throughout the entire range of motion, but the joint can be easily mobilized	X		
4	Accentuated hypertonia: passive movement is difficult to achieve, the joint can not be mobilized on the entire range of motion			
5	Severe hypertonia: passive movement is impossible, the joint cannot be mobilized			

Muscular tonus is analyzed through passive motility that examines the amplitude and endurance of movement. The examination is performed from supine position, in complete rest, passive movements of the examined limbs being performed.

From the table presented we find a reduction in muscle tone (muscle spasticity), the child having minimal resistance to the passive mobilization of the lower limbs.

Final results G.M.

After the application of the kinetic program I managed to maintain and even improve the degrees of mobility in the lower limbs. The main objectives set in the recovery program were to reduce spasticity in the lower limbs, and I fulfilled this goal by managing to improve mobility in the lower limbs.

### Results and discussions

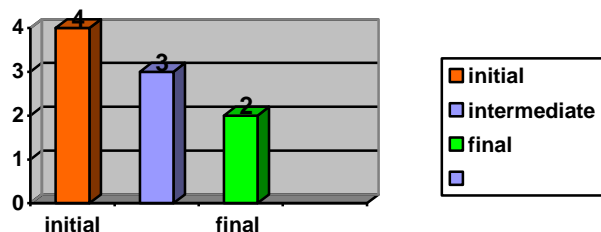
In order to highlight the progress made after the application of the kinetic program, we used the graphical method, presenting the initial and final results recorded in both patients. After the application of the kinetic program we registered progress in both cases, the mobility increased and the tonus decreased in all the limbs.

The results of G.M.

We presented the results obtained after the application of the kinetotherapeutic programs from the first session until the end of the program. We can see an increase in the child's mobility, but also the improvement of spasticity following the application of the physiotherapeutic program which consisted of gymnastic exercises, stretching, passive mobilizations, active-passive as well as active mobilizations.

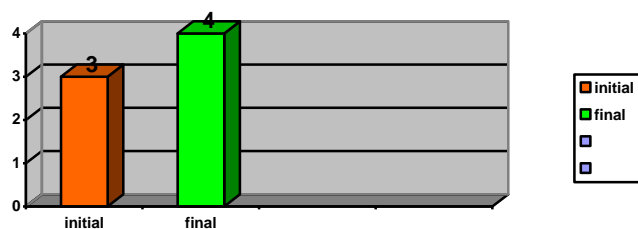
At the beginning of the treatment, the child (G.M) had spasticity in the lower limbs, with the characteristic gait on the foot pin, having internal rotation.

One of the objectives was to achieve the gross motor function specific to the child's age (age between 4 and 6 years). The child sits and gets up from the chair without the support of his hands, gets up from the floor or from sitting on the chair in orthostatism without support, walks and climbs the stairs, having running and jumping skills. Both balance and coordination have been improved by testing them through a motor path.



Graphic 1-Presentation of initial, intermediate and final muscle tone

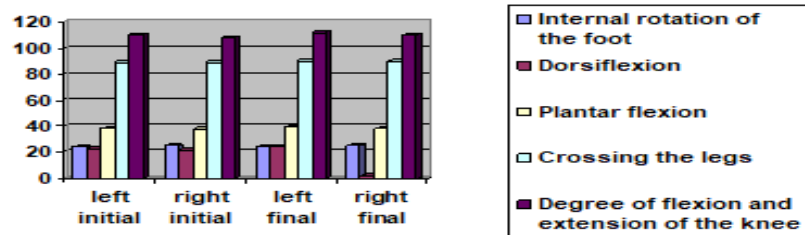
According to graphic 1 we can see a decrease in muscular tonus of the lower limbs, and if the muscular tonus decreases the range of motion increases. At the initial evaluation, the muscular tonus was 3 (medium hypertonia: there is a small resistance throughout the range of motion, but the joint is easily mobilized), and after applying the physiotherapy program I managed to reduce it to 1 (very mild hypertonia: there is a discontinuation of passive movement followed by release or low resistance at its end).



Graphic 2-Evaluation of initial and final muscle strength

According to graphic 2 after the application of the kinetic program we assessed an increase in the degree of muscle strength, at the initial evaluation, the muscular force was 3 (active movement against gravitational force), after the application of the kinetic program, I managed to reach the muscular force 4 gravitational force using moderate resistance).





Graphic 3-Evaluation of mobility degrees

According to Figure 3, there was an improvement in mobility in the lower limbs, mobility increased and due to decreasing in muscular tonus.

### Conclusions

The hypotheses initially established were met by managing to increase mobility in the lower limbs. Due to the means used by the correct application of the kinetotherapeutic program, the muscular spasticity was improved, and the selected methods and procedures proved to be effective due to the progress registered. This is the most important goal in the recovery of the child with cerebral palsy because by reducing spasticity, joint mobility increases and thus the patient can resume their activities and social life.

After the application of the kinetotherapeutic program I managed to maintain and even improve the degrees of mobility in the lower limbs. The main objectives set in the recovery program were to reduce spasticity in the lower limbs, and by fulfilling this goal I managed to improve mobility in the lower limbs.

Following the application of kinetotherapeutic treatment by specific means (FNPs, Bobath Method, Vojta Method, Castilio Morales Concept) we managed to reduce spasticity and improve joint mobility in both children. Recovery is long-lasting, and is done gradually, starting from easy to difficult, from simple to complex. The patient's approach influences the recovery, the child must understand the maneuvers and exercises performed in the recovery room, in order to perform the exercises at home, first with the help of parents, but then independently. Often the recovery sessions in the physiotherapy office are not enough, so in order not to lose the progress made and to be able to evolve, it is necessary to practice the exercises.

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