

## THE IMPORTANCE OF AQUATIC THERAPY IN THE TREATMENT OF THE CEREBRAL PALSY IN PRESCHOOL AGE CHILDREN

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**KEYWORDS:** floating on water, hydrostatic pressure, viscosity, immersion, water temperature.

### ABSTRACT

Cerebral palsy (CP) it is known as a condition that occurs in infants or in fetal development of encephalon.

**The main purpose** in this study was to highlight the importance of aquatic therapy used as an alternative method or in parallel with neurological recovery programs at the gym. This alternative method of aquatic therapy has major benefits and may become a priority of all exercises, in very many cases, after a complex evaluation of children diagnosed with CP.

**The study** was done on a group of six children diagnosed with CP and no surgery till the beginning of aquatic therapy, aged between 3 and 7 years, the period from October 2016 and until May 2018. It was observed an important improvement of the quality life and daily activities and the visible increase of the general symptoms of the children diagnosed with infantile CP. The aquatic therapy used methods of neuro-motor recovery treatments, individually and in groups and various interactive exercises of breathing, spinning of the body in water, flips underwater, all these improving balance, gait, stability, improve the awareness and abilities of the body, facilitating breathing, decrease of spasticity, and last but not least, the joy of immersion in the warm water have immediate effects in relaxation.

**The major objective** of the study was to approach new methods of treatment in CP, accessible, which may contribute to improve the quality

of life in daily activities, general relaxation and decreasing of spasticity that affect and limit so much the motricity of those children.

**Cerebral palsy (CP)** defines a group of dysfunctions that result from prenatal or early life, and are non-progressive dysfunctions due to damage of motor areas in the brain that do not develop normally during fetal development or due to brain trauma either before, during or immediately after birth with irreparable damage and permanent sequelae. (1)

The most affected are the boys, percentage being 1.5% comparing with girls, 1%. The type of spastic in CP is the most common, percentage being overwhelming, 70-80% of all cases (Ontario Federation for Cerebral Palsy, N.d.a).

**The aim** in this study is to highlight the importance of aquatic therapy used as an alternative or especially in parallel with neuro-motor recovery programs at the remedial gymnastics place. This alternative method of aquatic therapy has major benefits and may even become a priority in many cases, after a complex assessment of children diagnosed with CP.

The main goal pursued by using this type of therapy is the relaxation of spastic muscles. Those contractures contribute to limiting the joint ROM (RANGE OF MOTION). The most commonly affected are hip flexors, external rotators and Achilles tendons in the lower limbs, and in the upper limbs the elbow extensors. The decrease of spasticity will contribute to joints health by warm water therapy followed by prolonged passive stretch and then more pressure can be applied at the end of the exercise in the ROM limit.

#### **Material and method**

The study was conducted between October 2016 and May 2018, consisting of three 50-60 minutes, weekly sessions for the kinetotherapy program, two weekly sessions with a duration of 50-60 minutes of aquatic therapy for the experimental group and three weekly sessions of the kinetotherapy program for 50-60 minutes for the control group.

The study was conducted on 6 children diagnosed with spastic CP, aged 3 to 7 years at the beginning of the study, selected from a large group of 11 children with various forms of CP without surgery during the study.

The clinical presentation of CP of the subjects of the two groups was similar, a subject with spastic tetraplegia, a subject with spastic hemiplegia and a subject with spastic paraplegia.

Experimental group:

No crt.	Name surname	Diagnosis	Age	Sex
1	C.M.	Cerebral palsy, Spastic tetraplegia Predominantly paraplegia	3 years & 3 months	M
2	A.S.	Cerebral palsy, Spastic left side- hemiplegia, Prematurity grade II	3 years	F
3	MG	Cerebral palsy, Spastic paraplegia	5 years	F

The control group consisted of three children with spastic CP, whose parents did not want to do aquatic therapy.

No Crt.	Name and surname	Diagnosis	Age	Sex
1	G.D.	Spastic tetraplegia, Predominantly paraplegia, Convergence strabismus	3 years & 3 months	M
2	L.M.	Predominantly paraplegia LL - right side, Prematurity grade.II	3 years	F
3	S.M.	Cerebral palsy, Spastic right side- hemiplegia, Prematurity grade II-III.	3 years	F

The objectives pursued in the recovery of children were:

- Relaxation of spastic muscles and increasing the range of motion (ROM);
- Increasing stability in different positions;
- Increased joint mobility in UL and LL ;
- Increasing self-confidence;
- Awareness of own body;

The most important objective in fact using this modality of therapy is decreasing the spastic muscles, contractures of those muscles that contribute to limit the joint ROM. The most affected are the hip flexors, external rotators and Achilles tendons at the LL level, and in the UL the elbow extensors. The decrease of the spasticity will contribute to joint health through warm aquatic therapy, followed by

passive prolonged stretching, and then a bigger pressure may be applied at the end of the exercise in the ROM limits.

The aquatic therapy aims to achieve the child's general relaxation, this fact contributing to the optimal development in applying progressive exercises. Most children love water, so with patience and tact they will be accustomed to introduction and adaptation to the aquatic environment as first step of this therapy. Not even the social aspect is neglected, these children interact better with other children and with other adults outside of parents, an optimal communication is created between the child and the therapist.

Thus, the hands pallets, floating and inflated devices for arms and forearms and the floating plates for swimming are used to increase water resistance in the recovery program and overall strength, program with progressive steps. The water ball games, ball throws, the joy to play in water, rotations and twists and turns in the water, with or without the therapist help may help the vestibular system. The strength, the balance, the energy consumption and the functional mobility are all improved by aquatic therapy. Last but not least, the patient-therapist relationship will be a big bonus such the posture, the flexibility and self-confidence, are the stones that will feed the development of those children.

Methods and means used in the gym:

- The Bobath method by inhibiting reflex posture for global relaxation, of the UL and the LL, the use of Kabat diagonals combined with PF (RR, IR), Stretch reflex, Le Metayer method for reducing muscles spasticity the UL, combined with active-passive exercises, variants of walking, motric designated areas, will integrate progressive programs strictly individualized on the patient, according to the pursued objective.

**M.C. Cerebral palsy. Spastic tetraplegia, Predominantly paraplegia:** it presents an extensive motor deficiency specific, hypertonicity of the flexors at the UL level, characterized by the phenomenon of the "knife blade", predominantly on the left side; hypertonicity of the extensors of the LL level, high deficiency of plantar dorsiflexion. position;

**S.A. Cerebral palsy, Spastic hemiplegia, Prematurity gr.II, Motric retardation:** it presents spasticity in predominantly left limbs; left UL is in flexion, adducted and the fist is tight; predominantly contractures on flexor muscles; the LL, in maximum extension, varus equine attitude,

diminished joint mobility, gentle walking on the tips of the toes, knees in hyperextension, more pronounced at left LL.

**G.M.Cerebral palsy. Spastic paraplegia. Kinetotherapeutic assessment** : decreased joint mobility at the ankle joint level, equine foot, shortened Achilles tendon, more on the left LL.



Children in the control group who benefited only from interventional kinetotherapy had the same objectives as those in the experimental group, the methods and techniques used being the same as in the experimental group. So:



**G.D.A.Spastic tetraplegia. Convulsive syndrome, Hydrocephalia.**

Initial evaluation shows spastic muscles, UL are adducted, very tight fists, predominant contractures of the flexor muscles of UL; at LL level, the thigh adductors presents contractures, accentuated equin foot; the joint mobility is low, it shows the phenomenon of the "knife blade"; it presents muscles retractions that has led to poor postures; shows rigidity of passive ROM of the joints;

**L.M.Cerebral palsy, Paraplegia, predominantly monoplegia LL, right side, Prematurity grade II. Functional evaluation:** it presents muscles spasticity at LL level, contractures of thigh adductors,

predominantly right side, reduced muscles strength, severe disturbances of dynamic balance..

### **S.M.Cerebral palsy. Spastic hemiplegia.**

**Functional Assessment:** Maintains the seated position, “four-paw position” on the knees. It does not maintain orthostatic position. The right side of UL presents spasticity in the flexors, the right fist with flexed fingers, pollicis finger in adduction and opposition. The right LL shows spasticity on the extensor muscles and slightly diminished at the ankle level.

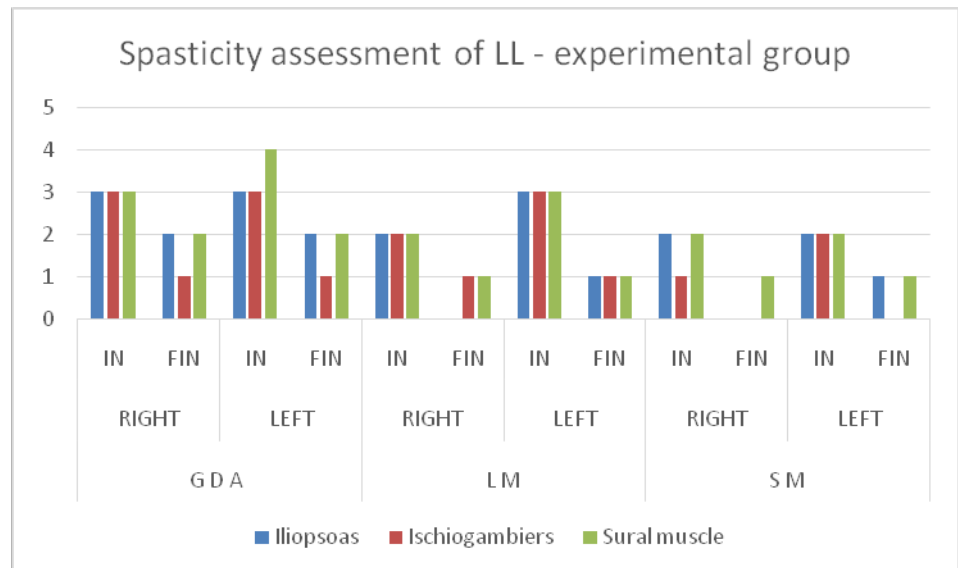
### **Results and discussions**

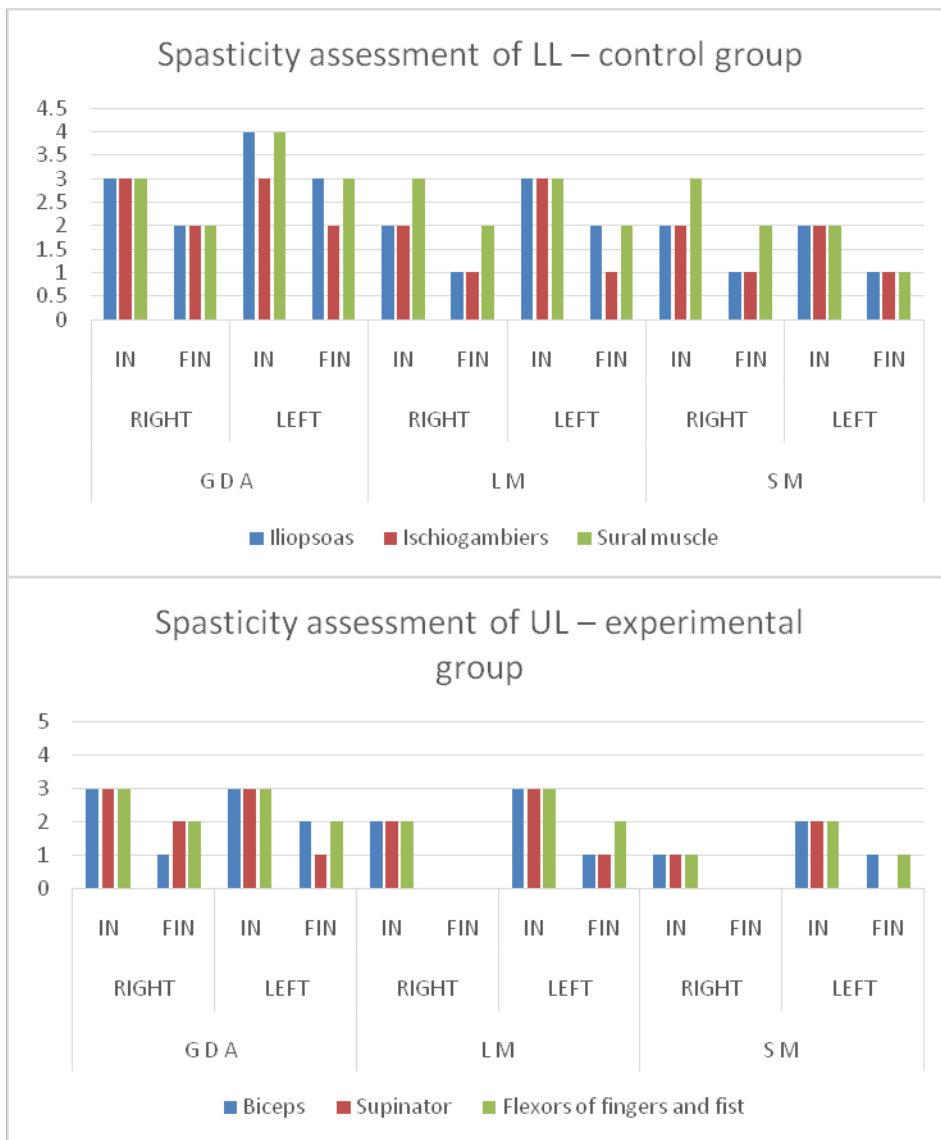
Following the evaluation of hypertonia through the modified ASWORTH scale in the two comparative groups, it was found: in the experimental group: initially the spasticity of the **iliopsoas muscle** varies between **2-3**, with an average  $2.3 (\pm 0.768)$  right,  $2.6 (\pm 0.258)$  left and in the final assessment between **0-2** with an average of  $0.6 (\pm 0.945)$  right,  $1.3 (\pm 0.472)$  left, and in the control group: the initial value of the spasticity varies between **2-4**, with a average **2.3 ( $\pm 0.768$ )** right, **3 ( $\pm 0.816$ )** left, and the final value is between **1-2**, with an average **1.3 ( $\pm 0.472$ )** right,, **2 ( $\pm 0.816$ )** left. **Ischiogambiers** : initially the spasticity group varied between **1-3** with an average of  $2 (\pm 0.816)$  right,  $2.6 (\pm 0.258)$  left, and final **0-1** with a mean of  $0.6 (\pm 0.476)$  right,  $0.6 \pm (0.476)$ left, and at the control group: initial spasticity varies between **2-3** with an average of  $2.3 (\pm 0.768)$  right,  $2.6 (\pm 0.258)$  left, the values between **1-2** with an average of  $1.3 (\pm 0,472)$  right,  $1.3 (\pm 0.472)$  left. **The triceps sural** recorded in the initial experimental group values between **2-4** with an average of  $2.3 (\pm 0,768)$ right,  $3 (\pm 0,816)$  left, and final **1-2**, with an average of  $1.3 (\pm 0.472)$  right,  $1.3 (\pm 0.472)$  left..

At **UL**, the spasticity was assessed on the brachial biceps, supinators and fist flexors. The results obtained in the initial assessment on **brachial biceps** in the experimental group recorded values between **1-3** with an average of 2 right,  $2.6 (\pm 0.472)$  left; in the control group recorded values between 2-4 with an average of  $2.6 (\pm 0.472)$  right,  $2.6 (\pm 0.472)$  left. The final score was **0-2** with an average of  $0.3 (\pm 0.472)$  right, $1.3 (\pm 0.472)$  left, and in the control group varied between **1-3** with an average of  $1.6 (\pm 0.541)$  right,  $1.6 (\pm 0.541)$  left. On the initial experimental group, the **supinator** muscle vary between **1-3** with an average of  $2 (\pm$

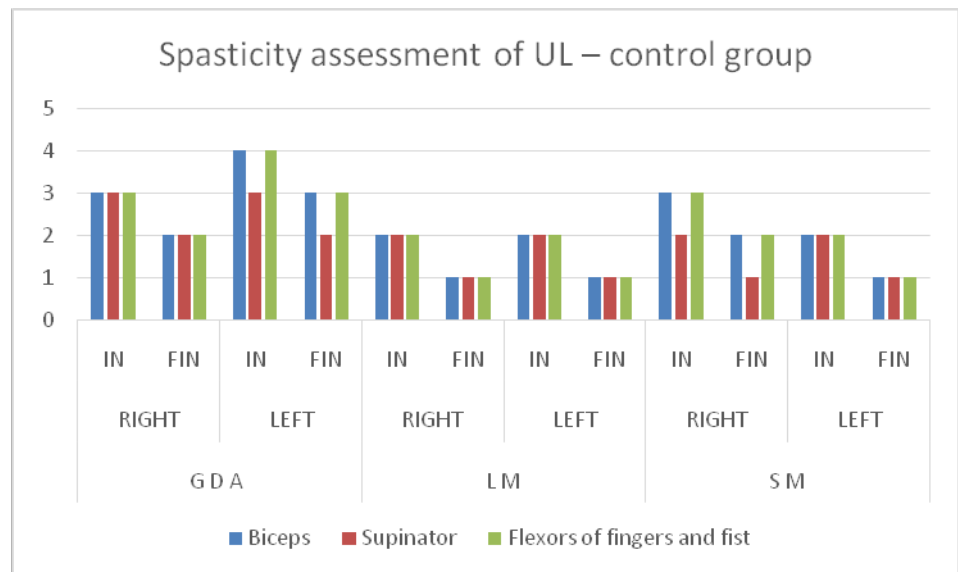
0.816) right, 2.6 ( $\pm$  0.472) left, and the group of control register values between **2 -3** with an average of 2.3 ( $\pm$  0.768) right, 2.3 ( $\pm$  0.768) left.. The final score is registered at the experimental group, values between **0-2** with an average of 0.6 ( $\pm$  0.476) right, 0.6 ( $\pm$  0.476) left, and in control group 1-2 with an average of 1.3 ( $\pm$  0.472) right, 1.3 ( $\pm$  0.472) left. In the experimental group the flexors of the fist, initially, varied between **1-3** with an average of 2 ( $\pm$  0.816) right, 2.6 ( $\pm$  0.472) left, and in the control group between **2 -4** with an average of 2.6 ( $\pm$  0.472) right, 2.6 ( $\pm$  0.472) left. At the final assessment, in the experimental group the values varied between **0-2** with an average of 0.6 ( $\pm$  0.476)right, 1.6 ( $\pm$  0.541) left, and in the control group ranging between **1-3** with an average of 1.6 ( $\pm$  0.541) right, 1.6 ( $\pm$  0.541) left.

Analyzing comparatively the data obtained in the initial and final evaluation, in the experimental group and the control group, there was found that the spasticity decreased in all muscle groups, tested in both LL and UL. The decreasing of the hypertonicity results in an improvement of the tone that leads to further decrease the mobilization resistance on all muscle groups. Comparing the results between the experimental group and the control group, a more pronounced improvement of the tonus in the experimental group was observed in both LL and UL, which confirms the hypothesis, that aquatic therapy has added much more value to general recovery therapy.









Regarding the other results, after the application of parallel therapies, the children from the experimental group present those results:

**C.M.** Able to walk in orthostatic position independently; the walking is apart, with the adduction of the left hip and without flexion at the knee level. He can move on his knees with minimum help.

**S.A.** He can walk in orthostatic position independently; much better, the walking is specifically hemiplegic walking. He presents compensatory hyperlordosis to walking on the tips of the toes. The abdominal muscles are hypotonic; the child maintains the position on his knees, four paws-position, can move independently with slight imbalance. The walking is specifically the hemiplegic walking and it is observed an improvement of the dynamic balance.

**G.M.** The joint mobility is light increased, he can perform the exercises independently with an increased range of motion (ROM).It cannot be performed neither passive or active the triple flexion of the LL. The walking is continuing to be on the tips of the toes; the static balance is improved. The child maintains the orthostatic position with help on both legs, with slight imbalance. It is observed a significant improvement of the balance. At the control group, after the interventional therapy in the gym it was observed the next results:

**G.D.A.** The general relaxation was the main objective and there were added exercises and methods for promotion and facilitation of the four paw position, stretching and postural exercises that led to a slight increase of active ROM at the UL and LL, slight diminished rigidity at passive ROM of the ankle.

**L.M.** The mobilizations are performed actively and passively, can perform exercises at spalier without help, performs stand ups from sitting position with help, climb and descend the stairs independently, does not passes over obstacles only with help.

**S.M.** It is present a significant improvement of active mobilizations at the UL and LL and slight diminished rigidity at passive mobilizations of the ankle. Comparing with control group at the experimental group it is observed a pronounced improvement of the static and dynamic balance and of the move in the orthostatic position. Thus the stretching exercises, the methods of neurologic motor recovery and the aquatic therapy increase the grade of functional independence, the body awareness and self-confidence.

## **Conclusions**

For the children diagnosed with CP, the aquatic therapy and the recovery methods applied in the gym facilities, in alternative programs constantly and individualized, demonstrated their attention and efficiency, visible through the daily activities of those children. The improvement of the daily life quality and to make possible the independence of those children, are the primary objectives. The aquatic therapy decreases the spasticity, major fact for continuing and application of the other methods and programs of exercises such as: Bobath method, Kabat, Vojta, etc. The parallel and alternative use of those methods and methods, next to the aquatic therapy show the remarkable results visible and mentioned in statistics. The general relaxation, the communication before applying any methods and techniques is essential. If a child is stressed and does not collaborate with the therapist it is difficult to apply any treatment or exercises program. Aquatic therapy demonstrates the efficiency in general relaxation and the joy and the interest of those children, the possibility of continuing the application of the other methods, adapted through individualized exercises in complex programs. The active movements in the water are much easier to be performed, due to the support of the water on the body, generating confidence and safety to a

child with CP. A pleasant water temperature and the viscosity of the water relaxes the child with CP, the water is the native medium of the human body, and in a natural way it is possible to perform active moves that improve the balance, stability, the posture, the movement generally and self-control. The blood circulation and the respiratory system are activated stimulating positively the interest of the child in being attentive, an advantage for improving hearing and speech. The walking exercises through the water stimulate and improve the walking on the ground. The water resistance increases the general muscles strength and especially of the lower limbs. The interactive practical stimulating games of the prehension and gripping, of the conducted directional movements through the use of the floating devices for swimming pools such as: floating plates, floating inflatable rings, different sizes of water balls are attractive and increase the resistance to fight the fatigue. The society, the family and the specialists' teams of the recovery group in CP, are bound to collaborate, communicate interactive and to elaborate the most efficient treatments plans to help them become independent in the daily activities, instead of being depended of multiple factors. Any method which is efficient and give positive results must be accepted and applied to recover the children with CP. The human society evolves, and the same and the methods of the treatment must be experimented to focus obtaining the desired results.

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