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Neuromotor rehabilitation of the child with infantile cerebral palsy - spastic paraparesis

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Abstract

Background. The development of the nervous system is a long-term and very complex process; at birth, the cerebral hemispheres are well outlined, and the maturation process continues at an accelerated rate. In cerebral palsy, there is damage or lack of development in one or more brain areas. The term "cerebral palsy" has been around for over a century.

Aims. Through this research, we wanted to highlight the importance and effectiveness of physical therapy in recovering children with cerebral palsy. An effective recovery program is adapted, specific and individualised to the needs of each child.

Methods. The research was conducted within the *Maria Beatrice Socio-Medical Complex* in Alba Iulia. It is a daycare center for recovering disabled children, especially those diagnosed with infantile cerebral palsy. This was comparative, prospective and interventional and took place over six months between 10.01.2022-10.06.2022. In the implemented study, 20 subjects participated; they were selected based on some inclusion criteria, namely: to be aged between 5 and 12 years, to be classified in GMFCS stage I or II, and not to present comorbidities such as hydrocephalus, epilepsy, hip dysplasia, or surgery that involved joint replacements in the lower limbs and spine surgery. The subjects in the experimental group benefited in addition to the control group from 16 minutes of exercises using the Galileo Board at each physical therapy session. The subjects were divided into two equal groups/groups, namely: group 1, the experimental group consisting of 5 girls and 5 boys aged between 6 and 11 years, classified as GMFCS stages I and II, and group 2, the control group, which also consists of 5 girls and 5 boys between the ages of 5 and 13 and placed in GMFCS stages I and II.

Results. The highlighted percentage results of this study confirm the importance and effectiveness of physical therapy in the recovery of a child with infantile cerebral palsy spastic paraparesis. After the final assessment, itwas observed that each child evidenced an increase in gross motor function.

Conclusions. This study again confirms the importance of physical therapy in recovering a child with a cerebral motor disability and spastic paraparesis. In collaboration with other supportive therapies, physical therapy contributes to independence and allows the child to enjoy a high quality of life.

Keywords: cerebral palsy, physical therapy, recovery programs, motor disability, quality of life.

Introduction

Pediatric neurorehabilitation aims to restore patients with the highest level of independence possible (Moll & Cott, 2013). Depending on the type and degree of their disability, therapies designed to increase children's independence require them to actively work on their restrictions and push their physical limits for weeks, months, or even years. Active participation, persistence, and attention to the treatment program are essential for the success of these therapies, which include many motor learning concepts (Maier et al., 2019). Unfortunately, it is tough for youngsters to preserve these characteristics throughout a long rehabilitation stay (Ammann-Reiffer et al., 2022).

The development of the nervous system is a long-term and very complex process; at birth, the cerebral hemispheres are well outlined, and the maturation process continues at an accelerated rate. Thus, specific to human ontogenesis, the maturation of neurological functions ends around the age of 10, and for mental functions around the age of 14-16. Stimuli from the external environment influence the entire maturation process. The brain controls everything

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we do and feel physically and emotionally (Rakic, 2002).

Cerebral palsy (CP) is a cluster of lifelong abnormalities of movement and posture development caused by non-progressive disruptions in the growing fetus or newborn brain (Rosenbaum et al., 2007). Current magnetic resonance imaging (MRI) research shows frequent abnormalities, including periventricular white matter lesions, localized ischemic/hemorrhagic lesions, widespread encephalopathy, basal ganglia damage, and brain deformities (Robinson et al., 2009). The prevalence of CP is between 2 and 3 per 1000 live births. Depending on the risk variables, these numbers change for specific patient groups (Van Naarden Braun et al., 2016; Europe SoCPi, 2000; Chen, 2022).

Cerebral Palsy (CP)/Cerebral Motor Palsy (CMP) has been defined as "a group of persistent developmental disorders of movement and posture, causing limitation of activity that is attributable to non-progressive disorders arising in the fetal brain or the brain in development course. The motor disorder of cerebral palsy is often accompanied by disturbances in sensation, perception, cognition, communication, and behavior, through epilepsy and secondary musculoskeletal problems" (Fowler, 2011). Before recent studies, it was believed that the lack of oxygen at birth is the cause of cerebral palsy; however, it is now clear that several additional reasons and risk factors contribute to the development of cerebral palsy. It is currently thought that cerebral palsy is caused by a sequence of developmental events that result in brain damage (Sadowska et al., 2020; Ruiz Brunner & Cuestas, 2019; Novak et al., 2017; Parikh et al., 2019; Paul et al., 2022).

In cerebral palsy, there is damage or lack of development in one or more brain areas. The term "cerebral palsy" has been around for over a century. Similar movement disorders continued to be referred to as "Little's disease" until 1889, when William Osler, a Canadian physician, suggested using the term "cerebral palsy". In his monograph, Cerebral Palsies in Children, Oshler noted the link between difficult labour and brain damage in children (Kozyavkin et al., 2009). Clinical manifestations of cerebral palsy can vary from negligible impairment to apparent impairment. The severity of the disease is related to the nature, level and location of the lesions in the brain. Early manifestations are often visible soon after the child is born, while unmistakable signs of cerebral palsy appear in childhood.

In special literature, we also find that cerebral palsy is a term that describes a group of permanent motor function disorders (of movement and posture) often accompanied by proprioceptive disorders, speech, and hearing, determined by non-progressive abnormalities of a developing or immature brain. Starting from the definition of cerebral palsy, we can realize that this disorder is very complex, and the impact it has on them varies widely. There may be cases with patients who cannot mobilize independently, cannot communicate verbally and emotionally, and may have so-called "co-occurring conditions", for example, epilepsy, autism spectrum disorders, and sialorrhea. There may be cases with patients who have only slight impairment of motor control (a neuro-motor delay) and a delay in cognitive development, which denotes the fact that each patient needs an individual Rehabilitation plan precisely because each individual is different and has different needs (Christine et al., 2007).

Cerebral palsy is classified topographically and neurologically as follows:

- from a topographical point of view: hemiplegia (spasticity of one part of the body), diplegia (the whole body is affected, but the lower limbs are more affected than the upper ones), tetraplegia (the whole body is involved, and the impairment is at the level of all four limbs) (Căciulan & Stanca, 2011).

- from a neurological point of view: cerebral palsy - spastic form, ataxic form, hypotonic (atonic) form, mixed form, dyskinetic/athetotic form.

Disability is a delicate situation globally and is increasingly common; for example, over 15% of the population in Europe is disabled, of which 150 million are children aged between 0 and 18 (Spinei, 2016).

Cerebral palsy is a neuromotor disorder that affects thousands of children each year; precisely 1 in 323 children are diagnosed with this condition, and it is known as the most common neuromotor disability of childhood (Fowler, 2011).

Infantile cerebral palsy is much higher in newborns with low birth weight, <1500g, especially those born prematurely, with gestational ages below 28 weeks (Oskoui et al., 2013).

In children with spastic paraparesis (some authors describe it as being synonymous with the mild form of spastic diplegia), there are signs of classic spasticity in the lower limbs by adduction of the thighs (with shear), leg in "varus-equine" with internal rotation, hyperreflectivity osteo-tendinosus, genu-flexed/genurecurvatum, lumbar kyphosis (caused by the shortening of the hamstrings), consecutive tilting of the pelvis, Babinski sign present, and the primitive reflexes disappear more difficult (3–5 years), clonus (Căciulan & Stanca, 2011).

The degree of independence of the child with cerebral palsy is classified using the Gross Motor Function Classification System—GMFCS (Gross Motor Function Classification System). This system assesses and observes active movements, maintaining specific postures (e.g., trunk and head control) and walking. It was developed in Canada, by the Children's Disability Research Centre, more precisely at the Institute of Applied Health Sciences, McMaster University, in 1997. It comprises 5 levels according to differences, and the degree of independence is aimed at the child's motor skills in daily activities (Căciulan & Stanca, 2011).

The diagnosis of cerebral palsy is similar to that of other neurological diseases; based on the clinical data, the diagnosis is established, what kind of neurological syndrome it is, then the topographical diagnosis follows, where the lesion is, and finally, the etiological diagnosis, the reason for the lesion (Oskoui et al., 2013).

The importance of the interdisciplinary team

The interdisciplinary team is prompted by the need to increase the quality of life, increase independence, and help affected children and their families. This multidisciplinary team is a group of people who work together with a common goal and, through collective effort, can achieve the proposed objectives. This interdisciplinary team includes a pediatrician, family doctor, neuro-psychiatrist, neurologist, physiotherapist, occupational therapist, psychologist, and speech therapist. Each has a role in the child's rehabilitation, and there must always be good collaboration and communication between all team members. This team must be as flexible as possible to adapt to the child's needs and be able to cope with the situation. Both therapists and parents contribute to the care program of the child with cerebral palsy; in other words, teamwork is the only way to achieve the most effective, complex, and correct rehabilitation of the child with neuro-motor disabilities (Bower, 2009; Căciulan & Stanca, 2011).

Through this research, we wanted *to highlight the importance and effectiveness of physical therapy in recovering children with cerebral palsy.* An effective rehabilitation program is adapted, specific, and individualized to the needs of each child. In this way, *it is possible to increase independence and improve the quality of his life. The family and an interdisciplinary team are essential factors that influence the motor and cognitive rehabilitation of the child.*

Hypothesis

In this research, we started from the premise that an individualized Rehabilitation program, consisting of kinetic exercises applied to children with infantile cerebral palsy, can significantly contribute to them obtaining new coordinative acquisitions and development, especially from a motor point of view. Therefore, the hypothesis that we propose for the study is the following: *the individual kinetic program will generate new acquisitions and improvements of motor skills, the correction of independent movement in orthostatic position, the increase of the degree of ADL type independence, against the background of personal evolution, generally optimized.*

Material and methods

Research protocol

This investigation was overseen according to the Declaration of Helsinki (2013) and approved by the Ethics Committee before the beginning of the study. It also met the ethical standards for Sport and Exercise Science Research. Because the General data protection regulation was enforced starting 25 May 2018 (Regulation (EU) 2016/679), which imposes a single set of rules on the protection of personal data, the tutors of the subjects investigated signed an agreement for recording and using personal data. This agreement was signed in two copies by all tutors. It made possible the use of records of some motor parameters, then using it with a confidentiality character without using the child's identity.

a) Period and place of the research

The research was conducted within the Maria Beatrice Socio-Medical Complex in Alba Iulia. It is a daycare center for recovering disabled children, especially those diagnosed with infantile cerebral palsy. This was a comparative, prospective and interventional study and took place over six months between 10 January 2022 - 10 June 2022.

b) Subjects and groups

The study was carried out in 20 subjects, selected based on some inclusion criteria, namely to be aged between 5 and 12 years, to be classified in GMFCS stage I or II, and not to present comorbidities such as hydrocephalus, epilepsy, hip dysplasia, or surgery that involved joint replacements in the lower limbs and spine surgery. A physical therapist evaluated and monitored all subjects under the guidance of the coordinating teacher.

The subjects were divided into two equal groups/groups, namely: group 1, the experimental group consisting of 5 girls and five boys aged between 6 and 11 years, classified as GMFCS stages I and II, and group 2, the control group, which it also consists of 5 girls and 5 boys between the ages of 5 and 13 and placed in GMFCS stages I and II.

The subjects in the experimental group benefited in addition to the control group from 16 minutes of exercises using the Galileo Board at each physical therapy session.

c) Applied tests

In the present study, we used the methods of observation and clinical investigation. With their help, we tried to demonstrate the indispensability of physical therapy in recovering a child with infantile cerebral palsy - spastic paraparesis.

We used the gross motor function measurement sheets (GMFM) as a basis, thus using the results obtained at the initial assessment, respectively, at the final evaluation, or we could observe the changes following the recuperative program.

The Gross Motor Function Measure (GMFM) is a standardised observational tool validated and designed to measure changes in the gross motor function of children with cerebral palsy. It includes 88 items divided from A to E (A: supine and prone exercises and rolling; B: sitting exercises; C: crawling and kneeling exercises; D: sitting practices - orthostatic; E: exercises walking, running or jumping).

GMFM is scored from 0 to 3 where 0 = does not initiate, 1 = initiates, 2 = partially performs, and 3 = complete.

Rehabilitation program

The objectives of the recuperative program were: reducing spasticity (muscle relaxation) of the lower limbs on hip flexors, thigh adductors and triceps sural (gastrocnemius); maintaining/increasing joint mobility (all three joints of the lower limbs are targeted, especially the talocrural joint); correction of postural alignment in orthostatic; improving balance in standing and walking, reducing the base of support in the bipedal position, improving balance, coordination and control while walking by strengthening muscle tone; gait correction.

The procedural methodology of the recuperative program: the exercises were explained calmly and patiently, using common words, easily understood by the child so that he understood the requirement and executed the condition as correctly as possible; the exercises were adapted according to the child's age, understanding and motor skills; the activities were periodically changed to avoid monotony and to stimulate the child to carry out the rehabilitation program; the exercises were performed from simple to complex; the Rehabilitation program was executed under the permanent supervision of the physical therapist; the standard Rehabilitation program had a particular order; the proposed exercises were performed in a series of 7–10 repetitions depending on the complexity of the training and the physical capacity of the child; each Rehabilitation session lasted 30 min.

The kinetic Rehabilitation program included the following exercises:

- Muscle relaxation/decontraction exercises (according to Metayer) – performed on: a table, ball, roll or mattress.
- Balance, coordination and control exercises: – performed on the balance board, bench, trellis, roll, bike and various applicative routes.
- The Bobath method was used to inhibit abnormal movements, sensory stimulation and muscle relaxation.
- Exercises for correcting gait and postural alignment in orthostatic: – performed between the parallel bars, on the walking lane and on the trellis.
- Applicative trials of varying complexity to improve balance, coordination and control.
- Elements of Feldenkrais therapy were used for proprioception, perceiving the child's body parts, and laterality.
- Elements of Masgutova therapy are helpful for spatial orientation (various objects of different colors are strategically placed, each time on the same side, and the child must go to them).
- Isometric exercises in various positions.
- Passive and global active stretching.
- Isometric and active exercises on the Galileo board for muscle toning and reducing spasticity.

Galileo board

In body components, muscles are integrated into a complex communication system consisting of the brain, spinal cord and peripheral nervous system; muscles, ligaments and tendons; bones and joints.

This internal communication system generates and manages all movements, postures, and reflexes. It is known that with adequate mechanical stimulation, a muscle can contract and relax several times per second. The so-called stretch reflex is a natural protective mechanism of the body. The rapid stretching of the muscles triggers the stretch reflex. If the muscle is stretched for a short time, it retracts; that is, it contracts on its own as an immediate reaction to the stretch. The contraction occurs automatically through the spinal cord and cannot be influenced.

The Galileo training platform works as a rocker. It is device-dependent, with an amplitude of +/- 6 mm, an adjustable frequency through which human movement is simulated, and muscle contraction information is activated up to the trunk level. At the same time, improved performance is achieved through intra- and intermuscular coordination. The rocking motion of the Galileo training platform generates the rapid muscle stretch required to trigger the stretch reflex. Galileo uses the natural process of the stretch reflex at a set frequency between 12 and 30 times per second, corresponding to frequencies from 5 to 30 Hz. This means, for example, that when you are standing, all the muscles that keep the body and eightpence the stretch reflex; therefore, they are trained. Repetitive frequencies between 5 and 30 Hz are most effective in exploiting the stretch reflex.

Example of training at the intensity of 5 Hz.: 2-minute training; 2-minute break; 2-minute exercise; 2-minute break; 2-minute workout.

After only a few minutes of training with Galileo, the affected muscles or the entire muscle chain receive hundreds of stimulating impulses to perform.

d) Statistical processing

Descriptive and inferential statistics (median, mean, and standard deviation) are included in statistical analysis. Anderson-Darling Normality Test was used to see how well our data follow a particular distribution. To compare means, the T-student test for unpaired data was applied. The Mann-Whitney test was used to correlate the medians for unpaired data. Minitab (Minitab 20.3, LLC, 2021 (available at: https://www.minitab.com) was used for statistical analysis.

Results

The first subject is six years old, male and classified as GMFCS stage I. There is a 12% increase in the proposed goal, an improvement in walking and an increase in balance in standing; he climbs and descends the stairs independently and performs the standing jump. The total score is 6% higher (total achievement) (Table I).

The second subject is 11 years old, female, and classified as GMFCS stage II. This subject presents the best evolution of the second batch of issues. The increase in percentages is higher by 11% at the proposed goal; there is a decrease in the base of support during walking; it stands up independently by knight-servant, climbs stairs alone, and sometimes uses unilateral support when going down. The percentage of what she can do per general is 9% higher (Table I).

The third subject is ten years old, female, and classified as GMFCS stage I. This subject had the most diminutive evolution of batch 2. At the proposed objective, it shows an increase of 6%. Balance in orthostatic has improved, and walking is safer. The percentage of what she can do per general is 4% higher.

Subject four is eight years old, male, and classified as GMFCS stage I. There is an 8% increase in the proposed goal, an improvement in gait, a reduction in the base of support and an increase in standing balance, and the total score is 4% higher (Table I).

The fifth subject is seven years old, male and classified as GMFCS stage II. In this subject, there is a 5% increase in the total score and a 10% increase in the score per the proposed objective. Features a narrowing of the base of support during walking, correcting posture while walking, and increasing control, coordination, and balance (Table I).

The sixth subject is an eight-year-old female, GMFCS stage I, with a 5% change in total score and a 9% change in the proposed goal score. This subject maintains unipodal support for longer, climbs and descends stairs independently, and has acquired better balance in standing (Table I).

The seventh subject is ten years old, male, and classified as GMFCS stage I. It shows a 9% increase in the proposed goal, an improvement in walking and an increase in balance in standing is observed, and the total score is 4% higher (Table I).

Subject eight is a 7-year-old female and is classified as

Table I
The results from the experimental group with the GMFM scale.

No. Crt.	Subjects	Initial test				Final test			
		Total individual score (max. score 264)		Score-objective proposal for individual (max score: 111)		Total individual score (max. score 264)		Score-objective recommendation for individual (max score: 111)	
		Points	%	Points	%	Points	%	Points	%
1	Subject 1	243	92%	91	82%	258	98%	104	94%
2	Subject 2	220	83%	54	49%	243	92%	67	60%
3	Subject 3	244	92%	92	83%	253	96%	99	89%
4	Subject 4	242	92%	92	83%	253	96%	101	91%
5	Subject 5	229	87%	87	78%	244	92%	98	88%
6	Subject 6	243	92%	91	82%	255	97%	101	91%
7	Subject 7	240	91%	90	81%	252	95%	100	90%
8	Subject 8	243	92%	91	82%	255	97%	101	91%
9	Subject 9	230	87%	87	78%	246	93%	100	90%
10	Subject 10	228	86%	85	77%	239	91%	94	85%

Table II
The results from the control group with the GMFM scale.

No. Crt.	Subjects	Initial test				Final test			
		Total individual score (max. score 264)		Score-objective proposal for individual (max score: 111)		Total individual score (max. score 264)		Score-objective recommendation for individual (max score: 111)	
		Points	%	Points	%	Points	%	Points	%
1	Subject 1	238	90%	90	81%	251	95%	97	87%
2	Subject 2	230	87%	83	75%	241	91%	92	83%
3	Subject 3	234	89%	85	77%	247	94%	94	85%
4	Subject 4	240	91%	91	82%	253	96%	99	89%
5	Subject 5	240	91%	90	81%	252	95%	97	87%
6	Subject 6	243	92%	93	84%	254	96%	102	92%
7	Subject 7	242	92%	92	83%	253	96%	101	91%
8	Subject 8	228	86%	86	77%	235	89%	91	82%
9	Subject 9	236	89%	87	78%	246	93%	93	84%
10	Subject 10	245	93%	96	86%	251	95%	100	90%

GMFCS stage I. An increase of 9% of the proposed objective is observed. This subject maintains unipodal support for longer, uprights more easily through knight-servant, jumps from a ladder, and shows an increase in balance in standing, and the total score is 4% higher (Table I).

The ninth subject is nine years old, male and classified as GMFCS stage II. This subject is noted to improve posture while walking, shrink the support base, and maintain unipodal support with greater ease. The proposed objective shows an increase of 12%, and the total score is 6% higher (Table I).

The last subject is ten years old, female, and is classified as GMFCS stage II. The proposed objective shows an increase of 8%, and the total score is 5% higher. There is an improvement in control, coordination and balance on the knees and standing. It makes walking more accessible and with fewer imbalances (Table I).

The first subject is seven years old, male and classified as GMFCS stage II. There is a 6% increase in the proposed goal, an improvement in walking and standing balance, and the total score is 5% higher (total achievement) (Table II).

The second subject is seven years old, female, and classified as GMFCS stage II. In this subject, the increase in percentages is higher, i.e., by 8% to the proposed objective, the reduction of the base of support during walking and jumping from the place is observed, and the percentage of what she can do in general is 4% higher (Table II).

The third subject is nine years old, female, and classified as GMFCS stage II. This subject had the best evolution of batch 1. At the proposed objective, it shows an increase of 8%. Balance in orthostatic has improved; jumping from a place and a ladder and walking is safer. The percentage of what she can do per general is 5% (Table II).

Subject four is a 13-year-old male with GMFCS stage I. There is a 7% increase in the proposed goal, an improvement in walking and standing balance, and the total score is 5% higher (Table II).

The fifth subject is 11 years old, female, and is classified as GMFCS stage II. In this subject, there is a 4% increase in the total score and a 6% increase in the score on the proposed objective. There is a decrease in the base of support during walking, an increase in balance on the knees and standing, and a correction of the posture during movement (Table II).

The sixth subject is a 6-year-old female, GMFCS stage I have a 4% change in total score and an 8% change in the proposed goal score. This subject has acquired better balance in orthostatic, maintains unipodal support for longer, climbs stairs independently and descends them rarely using unilateral support.

Subject seven is eight years old, male, and classified as GMFCS stage I. There is an 8% increase in the proposed goal, an improvement in walking and standing balance, and the total score is 4% higher.

Subject eight is five years old, male, and classified as GMFCS stage II. An increase of 5% of the proposed objective is observed. It is easier to stand upright through the knight servant, the gait improvement and an increase in balance in orthostatic are highlighted, and the total score is higher by 3%.

The ninth subject is nine years old, male, and classified as GMFCS stage II. This subject maintains unipodal support more efficiently and improves posture during walking. The proposed objective shows an increase of 6%, and the total score is 4% higher.

The last subject is eight years old female classified as GMFCS stage I. He scored the lowest in this batch due to needing to be present for all therapies. In this subject, an improvement in standing balance and walking is evident. The proposed objective shows an increase of 4%, and the total score is 2% higher.

Statistical results

Table III

Analysis from the point of view of gender and age.

	The experiment group - EG	The control group - CG
Female gender	5 (50%)	5 (50%)
Male gender	5 (50%)	5 (50%)
Mann-Whitney	*p* = 0.619 (Adjusted for ties)	

Mann-Whitney Test, p> 0.05, there is no statistically significant difference between the median age values in the two groups (Table III).

Table IV

Analysis of initial (IT) and final Test (FT) - Total individual score

	IT		FT	
	EG	CG	EG	CG
Mean	236.20	237.60	249.80	248.30
Std. Deviation	8.61	5.58	6.30	6.17
Unpaired t test	0,672		0,598	

T-Student test, p> 0.05, there was no statistically considerable variation among the means of the initial and final total individual score relevance in the two groups (Table IV).

Table V

Analysis of initial (IT) and final Test (FT) - Score-objective recommendation for individual.

	IT		FT	
	EG	CG	EG	CG
Mean	86.0	89.30	96.5	96.60
Std. Deviation	11.5	4.00	10.7	3.92
Unpaired t test	0,410		0,978	

T-Student test, p> 0.05, there was no statistically considerable variation among the means of the initial and final score-objective recommendation for individual score relevance in the two groups (Table V).

Discussion

The most common cause of physical disability in young children is cerebral palsy. The child with cerebral palsy encounters more significant obstacles and challenges in performing ADLs and everyday actions such as speaking, swallowing, and moving; therefore, it is a child with special needs. The specialized literature highlights that cerebral palsy is more common in less developed countries and is more common among boys. Most children diagnosed with this disease suffer from one or more conditions, known as "co-occurring conditions", for example, epilepsy; autism spectrum disorders; pathological sleep disorders; hearing, vision, and speech. Another, not to be neglected positive aspect is that more than 50% of children diagnosed with cerebral palsy can move in independent standing (Fowler, 2011).

The causes of infantile cerebral palsy are varied and result from problems during pregnancy (prenatal such as genetic ones, vascular accidents, intercerebral hemorrhages, incorrect brain development, infections in the first months of pregnancy, placenta previa or placental haemorrhages RH incompatibility between mother and fetus, intoxication of the mother with the consumption of alcohol, nicotine, drugs or medicines), during birth (perinatal such as prematurity, difficult labor, prolonged labor through the pelvic presentation, cardio-respiratory arrest, use of forceps, hyperflexion of the head) or in the period following birth (postnatal such as severe infections such as meningitis and encephalitis, head trauma, anoxia or hypoxia, hemorrhages), starting from days, weeks and extending up to the age of 5 years. It is considered that until age 5, the human brain has accelerated development.

The highlighted percentage results of this study confirm the importance and effectiveness of physical therapy in rehabilitating a child with infantile cerebral palsy spastic paraparesis. After the final assessment, it was observed that each child had a change in gross motor function. There is no equality in their evolution; in some, the shifts are minor and slower, while in others, they are more evident in a shorter period. This confirms that everyone is different in development, even with the same diagnosis.

Both the child's approach in therapy and the therapeutic Rehabilitation plan need to be individualized. Each child needs a particular system, and we as therapists have to find the most effective way to stimulate them to carry out the Rehabilitation program; for example, some children do exercises through play very well, while for others, play is a distraction by which they lose attention and concentration, some react well if they work with someone firmly in control. In contrast, others can no longer do anything if they are alerted (they get scared and tense up); some are stimulated if they see drawings, listen to music, or are verbally stimulated by the family, while others are distracted by these stimuli and lose focus.

The gross motor function classification system (GMFCS) indicates the child's level of independence. Thus, children classified in stage I and II GMFCS predominantly encounter problems with balance, control and coordination, and these children need the safety of the home environment, respectively, from school. Impairment of both upper and lower limbs caused by spasticity, hypotonia, or sensory perception disorders interferes with ADLs, which prevents these children from enjoying a good quality of life. The study shows that a lower degree of independence in a child does not mean that he can no longer progress or that he can no longer obtain acquisitions; on the contrary, any child can improve his motor skills, which is why the importance of the continuity of the program is understood rehabilitation regardless of the child's level of functioning.

In special literature, it is highlighted that the best results and the most remarkable evolution are more easily found in cases where the correct and early diagnosis together with the start of therapy as soon as possible and which is based on an interdisciplinary team (doctors, speech therapists, physiotherapists, family), and they collaborate very well.

We would also like to specify the importance of physical activity (Szabo, 2021a) through coordination (Szabo et al., 2021), balance (Szabo, 2021b) and general rehabilitation (Szabo, 2022; Szabo & Neagu, 2022) in the whole process of rehabilitation in the child with infantile cerebral palsy-spastic paraparesis.

The continuity of the kinetic program and the family plays a significant role in the child's neuromotor rehabilitation. Suppose the family, for various reasons, does not have the opportunity to work with therapists. In that case, it is essential to follow the therapists' recommendations and, under their guidance, implement a daily Rehabilitation program not to lose the acquisitions acquired during the therapies.

This study is helpful to all those who want to help these children achieve a better quality of life or those who encounter obstacles in their daily Rehabilitation program, both for the family of such a child and physical therapists.

From our point of view, it is necessary to carry out as many studies as possible aimed at the causes of cerebral palsy, the early diagnosis of this condition, the correct information of the family concerning the steps to follow in the rehabilitation of a child diagnosed with this condition, but also for the implementation of an individualized daily Rehabilitation program as quickly, correctly and efficiently as possible and at the level where access is allowed to all children with disabilities regardless of what kind of disability it is.

Conclusions

1. In conclusion, children with infantile cerebral palsy-spastic paraparesis who followed an individualized therapeutic program and benefited from a multidisciplinary team had noticeable improvements in acquiring and maintaining acquisitions, their overall evolution and quality of life.

2. This study confirms again the importance of physical therapy in rehabilitating a child with a cerebral motor disability, spastic paraparesis. In collaboration with other supportive therapies, physical therapy contributes to independence and allows the child to enjoy a high quality of life.

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