

CONTRIBUTION OF NEURO-MOTOR REHABILITATION PROGRAMS IN THE EVOLUTION OF CHILDREN WITH CP/HEMIPARESIS (STUDY N°3)

CONTRIBUTIA PROGRAMELOR DE RECUPERARE NEUROMOTORIE, IN EVOLUTIA COPIILOR CU PC/ HEMIPAREZĂ (STUDIUL III)

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Cuvinte cheie: copil cu paralizie cerebrală, calitatea vieții, funcția stato/kinetică, hemipareză

Abstract: Emphasizing the importance of neuromotoric recovery programs in motric acquiring for regaining the major human function – the gait, and the functional independence of first and second level (according to *Gross Motor Function Classification System – Expanded and Revised GMFCS*)(5)

We preferred to present the data in three separate studies (in extenso) because of the large number of parameters studied and because we wanted to offer a generic picture over the etiologic, clinical-functional, developmental and recovery aspects.

We evaluated the motric and functional acquisitions of the children with CP hemiparesis, using the *Gross Motor Function Classification System – Expanded and Revised GMFCS – E & R* (8,9,10,11) taking into consideration various ages.

We obtained an optimum functional tonus of attitude, balance within the agonist-antagonist muscular chains and we increased the muscular force almost adequate to the particular age – necessary in basic daily activities (BADL), and we also obtained the instrumental ones (IADL) with functional amplitudes in joints.

The applied methodology was efficient in all circumstances and for every experimental groups of the 3rd study, so that the experimental

Rezumat: Punerea în evidență a programelor de recuperare neuromotorie, în achiziționarea motrică, pentru recâștigarea funcției majore umane, mersul biped și a independenței funcționale la nivele de I și II după (*Gross Motor Function Classification System – Expanded and Revised GMFCS*)(5)

Data fiind multitudinea parametrilor studiați și pentru a putea oferi o imagine de ansamblu asupra aspectelor etiologice, clinico-funcționale, evolutive și de recuperare, am preferat prezentarea datelor noastre în trei studii distincte cu următoarele apariții și prezentări (lucrare in extenso).

În cadrul studiului am evaluat achizițiile motorii și funcționale a copilului diagnosticat cu PCI hemipareză, prin Sistemul de Clasificare a Funcției Motorii Grosiere Extinsă și Revizuită (*Gross Motor Function Classification System – Expanded and Revised GMFCS – E & R*)(8,9,10,11) în funcție de diferite vârste din evidențele înregistrate și prelucrate.

S-a obținut un tonus funcțional optim de atitudine, echilibru în cadrul lanțurilor musculare agonist-antagonist și am reușit să dezvoltăm o forță musculară qvaziadecvată vârstei, necesare vieții în activitățile zilnice de bază (BADL) și cele instrumentale (IADL) obținând și amplitudini funcționale în articulații.

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investigation had significant results for the studied parameters.

The implemented and used methodology was accepted by the physical therapist and children.

The most significant results are in children of 4 - 12 years, because the progress and motric acquisitions after this age are slow and scarce.

Metodologia aplicată și-a dovedit eficacitatea în toate situațiile și la toate eșantioanele studiului III astfel încât demersul experimental s-a soldat cu rezultate semnificative la parametrii studiat.

Metodologia de lucru implementată, parcursă și executată, a fost acceptată de copii și kinetoterapeut.

Purpose of research

The purpose is to emphasize the neuro-motor rehabilitation programs, in motor acquisition, in order to regain the major human function, two legged gait, and functional independence at levels I and II after (Gross Motor Function Classification System – Expanded and Revised GMFCS)(5)

Theoretical fundament, through metastudies regarding ischemic hemiparesis in children and motor behavior maturing.

Congenital hemiplegia is one of the best known forms of cerebral palsy in infants born at time and it takes the first place among the causes of cerebral attacks (strokes):

The ischemic neonatal attack includes the ischemic arterial perinatal attack; the assumed pre- or perinatal attack and sinovenous cerebral thrombosis are important factors which determine cerebral palsy. The attack induced by traumatism is focused and keeping the normal areas of the brain provides unique opportunities of plastic adjustment. The implications of this essential difference can also be emphasized from the discussion regarding the way in which epidemiology, pathophysiology, diagnosis and the therapeutic neuro-motor programs after the perinatal attack connect with cerebral palsy.

The days before and after birth represent a period of special risk, for mother and child, probably connected to the activation of coagulation mechanisms form this critical period. The ischemic arterial attack around birth occurs in one out of 4000 children born in time, presenting neurological and systemic signs in new-born children. (6) The neonatal crises are most often encountered in clinical analyses. In other children, the attack is recognized only retrospectively, after the onset of hemiparesis or of crises after the first months of life.

The risk factors for perinatal attack include hereditary or gained thrombophilia and environment factors. The perinatal attack is at the basis of congenital hemiplegia, cerebral palsy, spastic tetraparesis and epileptic disorders. There is much to learn about the history of perinatal attack, as currently there are no prevention or treatment strategies based on concrete evidence. (The fetal attack occurs in the 14th week of gestation and at the onset of labor. This article presents a few cases of fetal attacks diagnosed in-utero and the review of 47 cases of fetal attacks from the specialty literature, March, 2004. California 0(6.7)

Chemical traumatism, the new-born' brain can be deprived of oxygen through two mechanisms: Hypoxemia (decrease of oxygen quantity in the cerebral blood flow); Ischemia (decrease of blood entering the C.N.S.); Hypoxia generates the suffering of nervous cell which, under these prolonged circumstances, dies and becomes necrotic. Consequently, acidosis occurs, determined by the increase of CO₂ concentration, fact which, in its turn, increases the venous stasis, dilatation of the capillary, rupture possibility and, implicitly, the intoxication of the nervous cell. Oxygen does not reach anymore in the injured area where the ischemic condition sets in. Thrombosis of capillary vessels occurs, up to infarct, affecting a smaller or wider area, usually with diffuse character with confluent tendinitis. During prolonged labor, hypoxemia can occur under two aspects: total acute asphyxia, sudden and total interruption of O₂ and CO₂ exchanges between mother and fetus. When the duration of total asphyxia is reduced, most of the new-born children

survive, but they will later present permanent cerebral lesions. Occurring rarely and only if the mother suffers a sudden heart arrest, partial asphyxia determines, first of all, lesions at the level of the cerebral trunk (reversed as in the case of total asphyxia). The cerebral lesion determining spastic paralysis is often the result of an obstetrical traumatism or of a neuro-vascular syndrome produced during or after the head goes through the cervix uteri, therefore intrapartum. Given the fact that anoxia and its effects appear after expulsion, other authors consider these lesions as being postnatal. However, most often it is demonstrated the idea that cerebral lesion is not an effect mainly of obstetrical traumatism, but an anatomo-pathologic fact based on certain preexistent pathological phenomena.

The postnatal (postpartum) phenomenon represents 15% of the C.P. cases, either immediately after birth, or later in infant and child, before the N.S. reaches maturity. (6, 7, 8, 9).

During the acquisition of neuro-motor functions and behaviors, the evolution occurs towards progressive corticalization, which implies joining the old structures with the new ones, in a new unit. Concomitantly the functional hierarchy occurs in a subordination relation of the inferior structures compared to the new ones, but also the dependency of the new structures on the old ones.

Thus the child will not walk before it manages to hold its head up or assume the sitting position and it will not acquire these behaviors until the pyramidal fascicle has been sufficiently myelinated. Maturing happens only under the influence of stimuli from the external environment. This stimulation must happen during a period well determined for each structure, named the “critical period”. The mere presence of stimuli from environment is yet not enough, a response is also necessary. Action is needed in order to acquire a motor behavior. There is an inborn maturing potential which is not validated unless in the presence of stimuli and actions (3, 4, - Pasztai Z. 2004, 2009). The motor behavior becomes mature slowly and sequentially. Action generates the feed-back mechanism which leads to the acquisition of functional autonomy. The first phase of psycho-genesis is achieved during the period of 0-2 years old being constituted by the “sensorial-motor intelligence”. The acquisitions during one phase do not disappear, but they are integrated into the new functional model acquired, serving as basis for interaction with environment. Generally, we use five systems to determine the place where our body is in relation with the environment and the relationship between all body components.

II. Material and methods

II.1. Theoretical methods: theoretical research of sources, concepts and conceptions, theoretical and practical approaches of existing results. Gathering and processing of epidemiological, demographic data, evaluation of risk factors, of maximum neuro-motor function, all these have been accomplished transversally for each case.

II.2. Specific objectives: Given the multitude of studied parameters and in order to be able to provide a general image of etiologic, clinical-functional, evolutionary and rehabilitation aspects, we preferred the presentation of our data in three distinct studies with the following appearances and presentations:

Study n° 1 – title: “Characteristics and stadiality of neuro-psycho-motor evolution of children aged 0-1 according to the specialty literature in Romania”, table 3 (1).

The study – theoretical research of sources, concepts and conceptions, of theoretical clinical-functional and etiologic approaches, descriptive and of transversal type, was carried on in the Clinical Hospital of Medical Rehabilitation-Felix Spa, children’s ward-1st of May Spa, during the period October 2008 – March 2009 and it initially included a group of n=921 cases, out of which it was later selected a representative lot of n=674 children diagnosed with CPI/ESI and other locomotor disorders, aged between 1 and 18.

Study n° 2 – contains the evaluation and statistic processing of existing data about the children who benefited of neuro-motor rehabilitation. It was carried on in the Clinical Hospital of Medical Rehabilitation-Felix Spa, children’s ward-1st of May Spa, during the period January 2009 –

February 2010; it is a study of longitudinal observational type, prospective, non-experimental (descriptive) and it included n=409 children aged between 1 and 12, diagnosed with ESI/CPI, spastic form, selected from the anterior lot of n=921 children (1-18 years old), for which the following parametric data from the data base were processed and it was presented at the 3rd Balkan Physical Therapy Congress (2)

Study n° 3 – contains the period February 1st-April 30th 2010, a number of 359 patients (February 2010 –April 2010) and it is the next step of a new selection and making up of 6 lots of children according to the age/diagnosis criterion: 0-2, 2-4, 4-6, 6-8, 8-10 and 10-12 in implementing study n° 3. Out of 359 subjects admitted in hospital, a number of 203 children aged between 0-12 are selected for the study.

Hypothesis Which is the contribution of the neuro-motor rehabilitation program to motor acquisition according to GMFCS classification, in children with CP hemiparesis diagnosis?

Evaluation – Within the study, we have evaluated the motor and functional acquisitions of the child diagnosed with CPI hemiparesis through the Gross Motor Function Classification System – Expanded and Revised GMFCS – E & R (8, 9, 10, 11) according to the different ages from the recorded and processed data.

Implementation of the neuro-motor rehabilitation program

The functional neuro-motor rehabilitation and treatment took place during the school semesters in the physical therapy and gym halls and at the children's homes during holidays when hydrotherapy was mainly applied. Some exercises were made under the form of a game; the principle applied was team-work with the physical therapists and 3rd year students and master students in physical therapy, 1st and 2nd year, from the University of Oradea.

Results and discussion

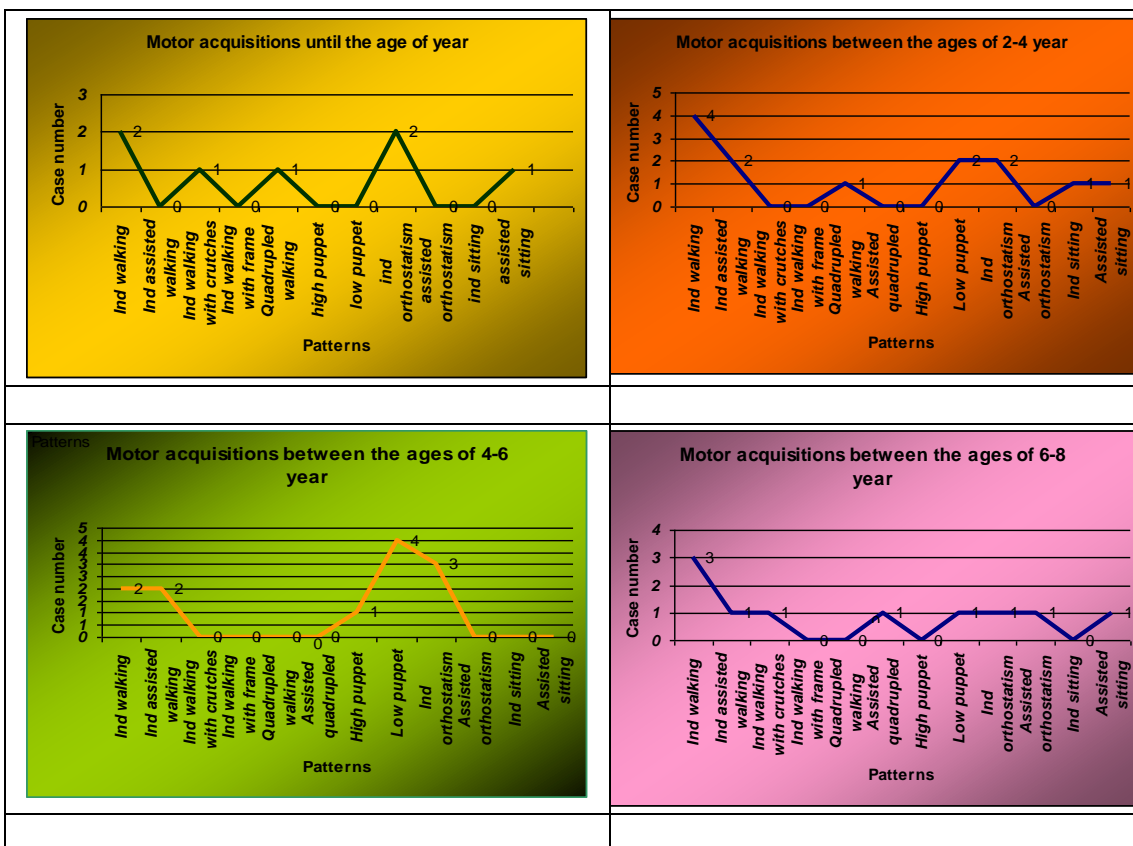
Interpretation of study n° 3 results

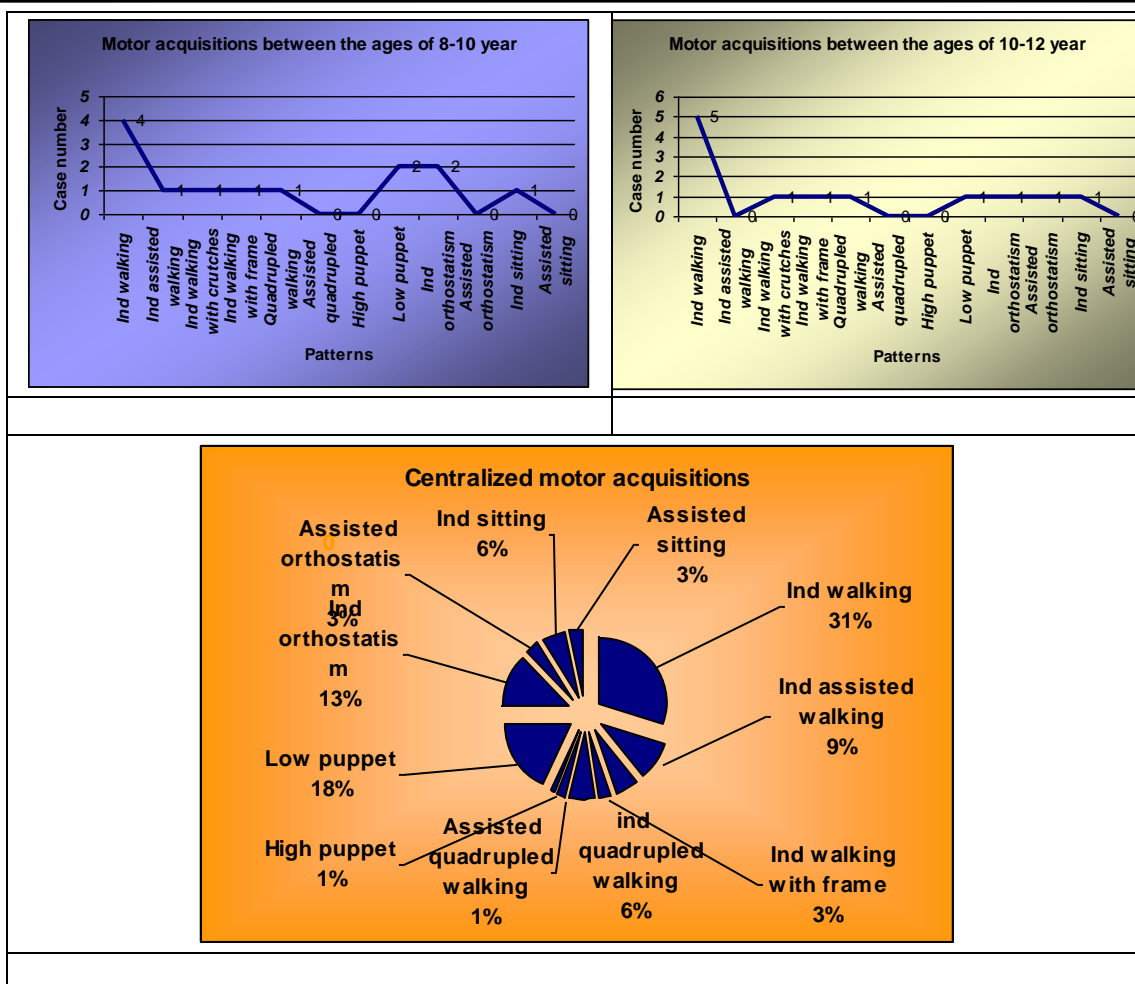
Table n° 1. Studied subjects from the Clinical Hospital of Rehabilitation-Felix Spa, children's ward-1st of May Spa

Hemiparesis	67	patients	33,6%
Paraparesis	63	patients	31,2%
Tetraparesis	39	patients	18,7%
Ataxic-cerebellar sy	20	patients	9,8%
Other disorders	14	patients	6,7%
TOTAL=	203	patients	
Research period 01.February - 30April 2010 from a number of 359 patients			

Table N° 2 Dg. Hemiparesis

	Motor engrams/ age subjects	2 years old	4 years old	6 years old	8 years old	10 years old	12 years old	Total =N
Walking	Independent walking..	2	4	2	3	4	5	20
	Assisted walking laterally.	0	2	2	1	1	0	6
	Walking with crutches	1	0	0	1	1	1	4
	Walking with frame	0	0	0	0	1	1	2
Quadrupedal walking	Independent.	1	1	0	0	1	1	4
	Assisted	0	0	0	1	0	0	1
"Puppet" posture	High	0	0	1	0	0	0	1
	Low	2	2	4	1	2	1	12
Orthostatism	Independent	0	2	3	1	2	1	9
	Assisted	0	0	0	1	0	1	2
Sitting	Independent.	1	1	0	0	1	1	4
	Assisted	0	1	0	1	0	0	2
								67





Final conclusions

1. The approach of this **topic** was imposed by the necessity to bring in discussion a reality presented only vaguely by the specialty literature;
2. In order to achieve the purpose and to confirm our hypothesis, that is to obtain growth, normal development and normalization of static-kinetic function, it was necessary for us to emphasize the perseverant work in the field of education for movement, using physical therapy;
3. Thus we have contributed to the increase of these individuals' quality of life. The physical therapist used the means which are most specific to this age, easily accepted and used by the subjects in any location (in classroom, at home, in the bathtub – hydro-stretching).
4. Optimum functional tonus of attitude has been obtained, balance within the agonist-antagonist muscle chain and we have managed to develop muscle strength quasi-adequate to the age, necessary in basic daily activities (BADL) and in instrumental daily activities (IADL), also obtaining functional amplitudes in joints.
5. The applied **methodology** proved its **efficiency** in all situations and at all study samples, so the experimental work had significant results in the parameters from studies 1, 2 and 3.
6. The implemented work methodology, followed and applied, was accepted by children and physical therapists;
7. Amelioration and decrease of symptoms regarding the tension, hyper tonicity-spasticity condition;

8. Obtaining **efficient muscular control on the dysfunctional muscles** and even the disappearance of dysfunctional condition in several children from the lot with hemiparesis;
9. Increase of neuro-motor performances regarding motor and muscular control of ability and finesse in the lot with hemiparesis;
10. the increase rhythm of all parameters is slower in the subjects aged 8, 10, 12, because of the already onset pathologic muscular hyper tonicity and of more reduced mobility in space, less motor acquisitions;
11. **Stability of trunk-pelvis-lower limbs** is obtained by all those who manage orthostatism and alternative quadrupedal walking variants;
12. **Independent walking**, quite coordinated, is obtained by a number of 20 subjects out of 67. We suggest induction as a successful therapeutic means for the future > *the technique of muscle stretch – stretching and techniques on the big Bobath ball* in the prophylaxis and treatment of static-kinetic dysfunction, from the age of 4-12, as a future method which will allow the elimination or fast recovery of dysfunction, that is the normalization of the static-kinetic function at the age of 6-12;
 - There are still uncertain **the issues of fitness** for these children for **the increase of quality of life in the future**. Therefore, these issues must be studied, researched, requiring a separate experimental study.
 - Through **an adapted physical activity program** (APA) this can also be achieved in well adjusted and expensive locations.

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