

PHYSICAL THERAPY BASED INTERVENTION ON MOTOR FUNCTIONS PERFORMANCE IN INFANTILE CEREBRAL PALSY

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Abstract

After cognitive and reasoning abilities, one of the most basic function which defines an individual as human being is the ability to control and move the body in space. Some of us, focus most of their attention on cognitive activity and on the other hand, some individuals focus most of their activity on motor skills. Probably the more significant aspect is that, even if we are engaged in cognitive activity we still depend on motor functions to relate and transmit our cognitive achievements. So how does this work for a child suffering from cerebral palsy? Their childhood is characterized by lost motor function which is a major part of the disability with a large variety of motor impairments (all of which are secondary to the encephalopathy), including lower extremity function, upper extremity function, mobility, swallowing or speech. However, even with this anatomical problems, children with cerebral palsy, may succeed as contributing members of society. The goal for these children is not “to find someone to blame”, is to grow up and develop to their maximum capabilities with their own resources.

The study examined effectiveness of therapeutic physical exercises in achieving motor control in five dimensions of motor ability (lying and rolling, sitting, crawling and kneeling, standing, walking, running and jumping). The assessment tool was a specific indicator designed to measure changes in gross motor function over time in children with cerebral palsy, GMFM (Gross Motor Function Measure).

Introductions

Cerebral palsy is considered one of the leading cause of motor impairments in children, with prevalence estimates of approximately 2 per 1000 live births or up to 3 to 4 per 1000 school-age children [1].

Cerebral palsy, by definition, requires that the pathological lesion be in the brain. Cerebral palsy „describes a group of permanent disorders of the development of movement and posture, causing activity limitation,

that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication, and behaviour, by epilepsy, and by secondary musculoskeletal problems'' [2].

The complexity of cause has been extensively discussed in the medical literature. With cerebral palsy, the structural and functional maturation of the Central Nervous Systems (CNS) gets compromised. This can happen due to prenatal conditions (prematurity, less than 36 weeks, low birth weight, less than 2500 g, bleeding in the third trimester, severe toxemia, trauma or placental insufficiency) perinatal conditions (premature rupture of membranes, presentation anomalies, bradycardia or hypoxia) or postnatal conditions (0-2 years-CNS infection, encephalitis, meningitis, hypoxia neonatal hyperbilirubinemia or head trauma) [3].

The consequences of a lesion for the developing brain depend on development stage of the infant at the time of insult, place and size of the lesion that may compromising the process of skill acquisition.

The topographical classification of the cerebral palsies are: [4]:

Tetraplegia (quadriplegia). Involvement of all limbs and body. Arm are equally or more affected than the legs (many are asymmetrical).

Diplegia. Involvement of limbs, with arm much less affected than legs (again, asymmetry may be present).

Hemiplegia. Limbs and body on one side are affected.

By type, the classification of the cerebral palsies is: [3,4,5]:

Spastic cerebral palsy (lesion site-cortex with main motor characteristics: hypertonus, abnormal postures, changes in spasticity and postures, voluntary movement).

Ataxic cerebral palsy (lesion site-cerebellum with motor characteristics: disturbance of balance, voluntary movement, hypotonia, nystagmus).

Athetoid (dyskinetic, dystonic) cerebral palsy (lesion site-basal ganglia - extrapyramidal system with main motor characteristics: involuntary movements – athetosis, postural control, voluntary movements, hypertonia or hypotonia, the athetoid dance, paralysis of gaze movements). The dyskinetic type changes with time.

Mixed cerebral palsy (lesion site-diffuse with main motor characteristics: mix of two or more of the above).

Physical therapy plays a large role in the development of a child with cerebral palsy. The therapist has to develop a treatment plan (always individualized) to allow the child to function as independently

and efficiently as possible delivering with time, maximum independence of the individual child.

Material and method

Hypotheses of the research: we hypothesized that an individualized and specific set of exercises will work towards two important goals: first, to improve motor functions, for example, sitting, standing, using a form of locomotion or using hands, increase muscle ROM, flexibility and strength, improve balance, stability and posture/alignment, improve gait, and second, *to prevent* impairments that may affect performance such as limited range of motion, weakness, postural malalignments, pain and fatigue wherever possible.

The purpose of the research: to design and implement special exercise programs for improving movement and strength in all dimensions of motor functions.

Subjects of research: Name and surname: U.I.E, 13-year old, feminine, diagnosed with bilateral spastic cerebral palsy, asymmetric spastic diplegia, predominantly left side, perinatal injury. The duration of the physical therapy – based intervention was approximately 3 years, November 2017- June 2021 with a frequency of 3-4 sessions per week, predominantly at the patient's home.

The research methods: method of study of specialized literature, observation method, experiment method, graphical and tabular method.

Tests used in research

-Modified Ashworth Scale

-Gross Motor Function Measure (GMFM)

The means used in research: The techniques used in the treatment of CP are conventional approaches like:

Active/Passive mobilizations;

Strengthening Exercises;

Proprioceptive neuromuscular facilitation (PNF-rhythmic stabilization, repeated contractions, reversals, relaxation technique such as contract-relax and hold relax);

Neurodevelopmental treatment (Bobath approach);

Le Metayer techniques;

Balance training;

Hydrotherapy;

Stretching;

Occupational Therapy.

Results

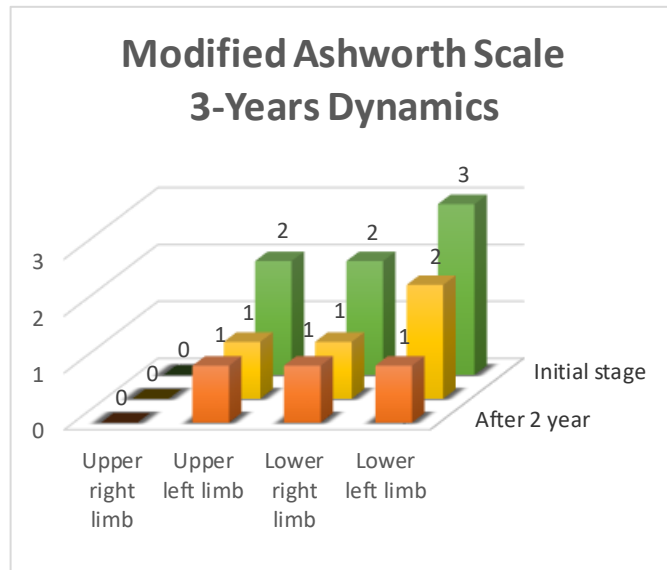


Figure 1. Modified Ashworth Scale-3-Years Dynamics

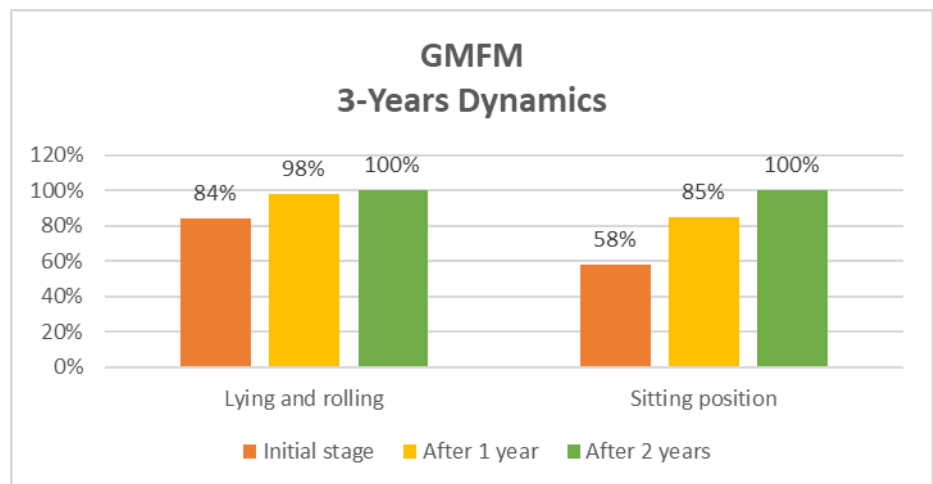


Figure 2. Lying and rolling, sitting (GMFM)- 3-Years Dynamics

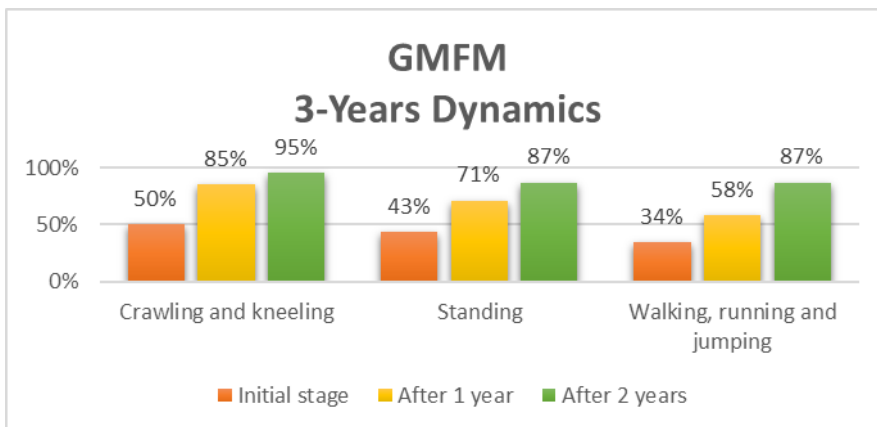


Figure 3. Crawling and kneeling, standing, walking, running and jumping (GMFM)- 3-Years Dynamics

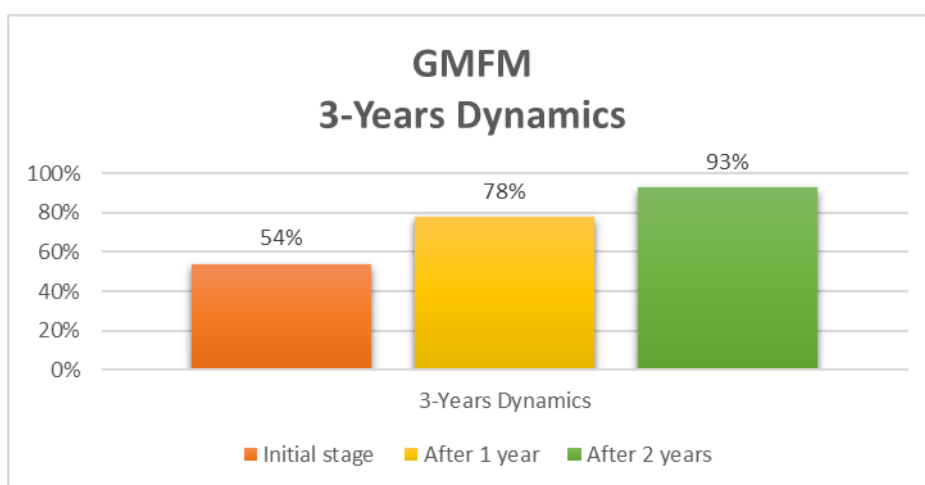


Figure 4. Gross Motor Function Measure- 3- Years Dynamics

Conclusions and discussions

The framework for all assessments is outlined to synthesis in previously graphics. The framework consists of the following assessments:

The motor functions, for example sitting, standing or using a form of locomotion were increasing with contribution of physical therapy treatment. Physical therapy has a positive attributes in the development of a child with cerebral palsy. Although the brain damage is not progressive, the motor and musculoskeletal problems may increase. Physical therapy is needed to prevent or minimise these impairments.

The main roles for therapists for „grow-up” a child with cerebral palsy to his maximum independence may be the following:

- minimising hypertonicity and involuntary movements;
- improving postural alignments and patterns of gait;
- minimising impairments within the functions;
- improving ROM of muscles, joints, and soft tissues;
- improving postural mechanism of stability and balance;
- prevent deformities;
- strengthening for weakness of various kinds;
- promoting positive motor experiences as key for motivating the child with cerebral palsy and of their family.

Physical therapy has a significant role in promoting the neurological development of the child and teaching the child to use his existing potential in the best possible way.

References

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