

Impact of intensive physical therapy on gross motor functions in children with cerebral palsy

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Background: The evidence of intensive intervention is not well defined while it is used by many therapists for children with cerebral palsy. As they expect some effect of intensive therapy.

The aim of the study is to evaluate the short term effect of intensive physical therapy on gross motor functions in children with spastic diplegic cerebral palsy. **Methods:** 20 spastic diplegic children of 2-4 years old were randomly assigned into two equal groups (control and study). intensive therapy program was applied to study group for four hours per day for 5 days per week. The motor functions of all children were evaluated using Gross Motor Function Measure-88 (GMFM-88) scale before and after three weeks of the intervention. **Results:** The scores of GMFM-88 increased in both groups when comparing between before and after intervention with significant difference between study and control groups after intervention ($P < 0.001$). **Conclusion:** The intensive therapy might be effective on gross motor functions of children with spastic diplegic cerebral palsy.

Keywords: Cerebral Palsy, Spastic diplegia, intensive therapy, Children

Introduction

Cerebral palsy (CP) is a term to describe a set of permanent disorders of the development of movement and posture, causing activity limitation, that is attributed to nonprogressive disturbances in the developing fetal or infant brain.” [1-2]. CP is a common neuropediatric disorder with a prevalence at a rate of 0.1% to 0.2% of live births in high-income countries [3] and presumably higher rates in lower income countries [4-5]. The genetic factors as, maternal disease, preterm birth, low birthweight and birth asphyxia are associated with an increased risk of CP.[6-7].

Spastic diplegia is the most prevalent type of cerebral palsy. It is characterized by pyramidal motor syndrome predominating in the lower limbs [8]. Children with spastic diplegia had insufficient postural control ability [9] and altered motor functions, which are evident during various tasks, such as posture and walking [1].

The therapeutic intervention includes therapeutic exercise and strengthening, neurodevelopmental treatment (NDT), therapeutic handling, sensory integration (SI) and sensory processing disorder (SPD), Modified Constraint-induced Movement Therapy (mCIMT), electrical stimulation (ES), hand splinting and task-specific training and community programs [10,11]. Several factors help determine the desired treatment approach or treatment technique when working with children with CP. The severity of the child's impairments, their functional limitations, as well as the child and

family's goals all influence the design of an effective treatment plan.[11]

The programs that providing a higher intensity of therapy (a mixture of different types of therapy) yielded better results. Conversely, there were other findings did not support that. Further, more intensive daily treatment produced only a limited and temporary improvement.[12] Intensive therapy for a long period seemed to be very demanding and was considered tiring and stressful by the children, who showed low compliance. Recently, that an intermittent intensive programs was less tiring and led to improvements in motor function[13]. The purpose of the present study was to evaluate the effectiveness of short term intensive therapy on gross motor functions of children with CP. The hypothesis was that the children in the intensive therapy group would improve more for short time in the children with spastic diplegia

Subject, materials and methods

Subjects:

Twenty children were selected from out patient clinic, faculty of physical therapy, Cairo University. They were selected according to the following criteria; 1) aging 2-4 years old, 2) a medical diagnosis of spastic diplegia, 3) level III on the GMFCS, 4) degree of spasticity by The modified Ashworth scale was 1 and 1+, 5) could follow instructions, and 6) no oral medication for spasticity. Exclusion criteria were as follows: hip subluxation, severe scoliosis, intrathecal baclofen injection, associated disorders as any psychiatric or behavior disorders,

uncontrolled seizures and or obesity . Each child was evaluated by a physician before participation in the intervention. The signed consent form from ethical committee was obtained from each caregiver before the initiation of the study. The selected 20 children fulfilling inclusion criteria were assigned randomly into two equal groups (control and study) by lottery method. Control group received only physical therapy, while study group received the same physical therapy but intensively.

Procedures

For evaluation

-Evaluation of gross motor function:

The (GMFM) was used to evaluate the gross motor skill level of children participating in this study in each sitting, kneeling and standing dimension, before starting treatment and after 3 weeks of treatment.

For treatment

physical therapy:

Warming up with hot packs and massage, Reeducation of muscle tone and deep proprioceptive stimulation techniques, controlling pathological movement patterns, Increasing the activation of proper movement patterns, Strengthening of specific muscle groups responsible for functional movement, Progressive

resistance exercises, Balance, coordination and endurance training, Transfers (lying to sitting, sitting to lying), functional activities and gait training. children in study group received intensive therapy, for four hours \5 days \week.. While control group receive the same program but for one hour \three times \week.the duration of treatment was successive three weeks

Statistical Analysis

Descriptive statistics and t-test were conducted for comparison of mean age between control and study groups. Chi squared test was conducted for comparison of sex distribution between control and study groups. T test was conducted for comparison of data obtained from both groups pre and post treatment regarding scores of GMFM . All statistical tests were performed through the statistical package for social studies (SPSS) version 19 for windows. (IBM SPSS, Chicago, IL,USA)

Results

General characteristics:

Comparing age, height, weight of the children of both groups revealed that there was no significance difference between both groups in the mean age, weight and height ($p > 0.05$) table 2.

table 2: general characteristics of children in control and study groups

| | Control group $\bar{X} \pm SD$ | Study group $\bar{X} \pm SD$ | p-value |
|--------------------|--|--|----------------|
| Age (years) | 3.24 ± 0.73 | 3.33 ± 0.71 | 0.74 |
| Weight (kg) | 18.93 ± 2.73 | 18 ± 5.16 | 0.54 |
| Height (cm) | 77.86 ± 5.24 | 75.26 ± 7.86 | 0.29 |
| Boys/ Girls | 2/8 | 3/7 | 0.71 |

Comparison of Gross Motor Function measures (GMFM)

GMFM of the control group were changed 3.17% between pre treatment and post treatment with mean difference of -3.4 and p-value ≤ 0.05 . The mean difference between pre and post treatment in the GMFCS of the study of -13.4 with the percent of change was 12.18% and (p = 0.0001) (table 3)

Table 3: *Comparison of mean values of gross motor function measures of control and study groups.*

| Groups & time of measure | $\bar{X} \pm SD$ | MD | p-value |
|--------------------------|----------------------------------|--------|----------------|
| Pre control / pre study | 107.06 ± 16/ 109.93 ± 16.29 | -2.87 | 0.63 |
| Control (pre/post) | 107.06±16/ 110.46 ± 16.53 | -3.4 | 0.003* |
| Study(pre/post) | 109.93± 16.29/ 123.33 ± 13.95 | -13.4 | 0.0001* |
| Post control /post study | 110.46±16.53/ 123.33 ± 13.95 | -12.87 | 0.02* |

Discussion

This study was administer to evaluate the effect of intensive therapy on gross

motor function. Children with mild to moderate spastic diplegia improved their gross motor function as measured with the GMFM as GMFM88 is better scale to evaluate the progress of children with CP. This improvement was significant for both groups. Furthermore, intensive intervention had a greater effect on children's motor function than reference non-intensive intervention. This conclusion justifies the notion for more intensive therapy in CP. To our knowledge, there have been only a few studies

Only one of two further studies the use of the GMFM is cited as a measure for the effectiveness of NDT which is provided either normally or intensively [13]. Knox and Evans 2002 [14] used the improved scaling of GMFM-66. Because our study used GMFM-88 for the intensive provision of NDT. The results support the efficacy of intensive therapy. It must be highlighted that even a lack of change in motor function has clinical importance for children with CP. Often there is a levelling-off or regression in motor development, especially in older children with severe spasticity, in whom the movement patterns are fixed and no more improvement is expected.[15] Improvement in

function, comfort and the independence of children with disabling neurological conditions could lead to better health and quality of life as well as important cost savings in the long term

Conclusion this study concludes intensive therapy along with conventional physiotherapy is effective in improving the motor functions in children with spastic diplegic cerebral palsy.

Limitations of the Study

- Treatment was given for a short duration (3 weeks) and long term effects were not intended.
- The study was conducted on a small population. It is important to examine the statistical power of this study. Although the calculated total sample size of children was not achieved

Conclusion

This study concludes that the intensive therapy is effective in improving the gross motor function in children with spastic diplegic cerebral palsy

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