

Effect of Enriched Environment on Gross Motor Control in Cerebral Palsy

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ABSTRACT

Objective of study: To evaluate the usefulness of Enriched environment (EE) and Neuro Developmental Technique (NDT) in the perspective of gross motor function in cerebral palsy (CP).

Methodology: This Randomized control trial (RCT) was conducted from March 2016 to November 2016 in Armed Forces Institute of Rehabilitation Medicine Rawalpindi, Pakistan. Sample size was 40 CP children. The data was gathered from 1 to 6 years of spastic CP children through a standard Gross motor function measure (GMFM) tool. This statistical analysis was done on SPSS 21. To evaluate the inferential statistics, independent sample and paired t-test was applied.

Results: Participants' average ages in groups A and B were respectively 4.01.7 and 3.81.8. According to our findings, both the treatment group and the control group had significant change ($p=0.00$). This shows that EE therapy had a significant impact on the children with CP who are spastic; $p < 0.05$.

Practical implication: This research will help to incorporate appropriate treatment in the rehabilitation settings to gain effective results.

Conclusion: EE plays an effective role in improvement of gross motor function of spastic CP children. But NDT treatment approach was also effective, although less than EE.

Key words: Cerebral palsy, Enriched Environment, Neuro-developmental treatment, GMFM

INTRODUCTION

CP is a non-progressive disorder of central nervous system which damages brain development(1). Delay in achievement of gross motor milestones in CP children is main characteristic of central nervous system injury(2) that affects both activity level and the quality of movement(3). The spastic CP children are on higher risk of learning disabilities due to cognitive impairment(4). Prevalence of cerebral palsy is approximately 2 to 2.5 per 1000 live births.(1, 5)

Physical therapy treatment plays a vital role to improve the gross motor activities and their daily life activities. CP children have been reported to gain 90% motor function ability by age of 5 years(2). Physiotherapy treatment helps to break abnormal patterns and facilitates improved function. NDT, Sensory integration therapy and CIMT are common types of treatment approaches. NDT is most commonly used to promote quality of life and motor function of CP children. GMFM is a reliable tool which is reasonably sensitive to measure and assess the change in motor activity (6, 7). It includes 88 items rated on a scale from '0' to '3'. '0' means 'does not initiate movement' and '3' means 'complete movement'.

Enriched environment is very unique and new approach which is based on multi-sensory, tactile stimulation. It includes high level of complexity and variability with arrangement of toys, platforms, tunnels, LED and LASER lights. This environment enhances cerebral plasticity, hence, improves gross motor function. Effectiveness of EE is understood much on cognitive level but less on gross motor control(8). This is an effort to find out suitable treatment procedure during rehabilitation.

There is very limited work done on use of Enriched environment, and the area of cerebral palsy lacks the work and evidence of use of EE therapy. This study will also provide evidence of using physical therapy EE techniques to improve gross motor functions.

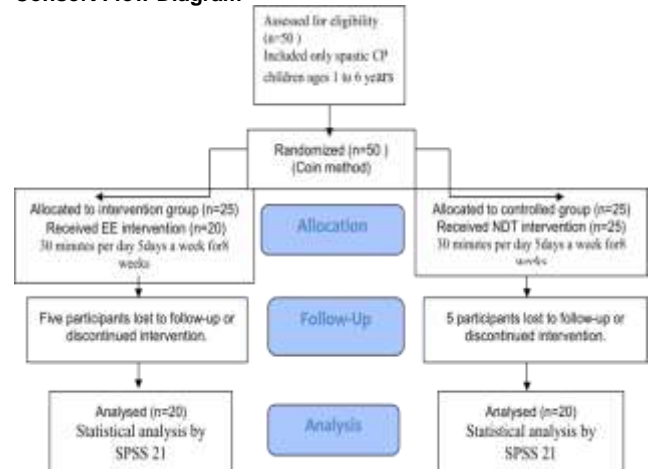
Significance: Cerebral palsy patients are commonly seen daily in the clinics. Suitable therapy causes direct impact on improving the management of CP. This study helps in proposing the best treatment methodology for CP children's.

MATERIAL AND METHODS

This was a RCT conducted from March 2016 to November 2016 in Armed Forces Institute for Rehabilitation Medicine, Rawalpindi. Open Epi tool was used to calculate the sample size. A pilot study was conducted on 10 participants in each group to calculate the

sample size. Post intervention GMFM scores for treatment and control group were (44.9 ± 15.8) and (33.15 ± 13.7) respectively. Calculated sample size was 50 CP children. It included only spastic CP children ages 1 to 6 years. Spastic CP children with epileptic seizure, hearing or visual impairment were excluded from the study. 50 participants were equally distributed through Randomization by coin method into two groups. Group A was 'control' and group B was 'treatment group'. As a baseline, demographics and gross motor activity were noted through standardized GMFM tool. At the end of intervention period, only change in gross motor activity was measured. GMFM-88 tool evaluates six gross motor activities; lying, rolling, crawling, sitting, standing and walking. All subjects received a treatment of 30 minutes per day, consecutive 5 days a week for 8 weeks. 5 participants from each group didn't follow-up. Conventional therapy i.e. NDT and EE therapy was given to 'control' and 'treatment' groups respectively. EE therapy comprised of multi-sensory, multi tactile stimulation was given to the children. Both treatment approaches were guided and performed by skilled therapists. The statistical analysis was done on SPSS 21. To evaluate the inferential statistics, independent sample and paired t-test was applied.

Consort Flow Diagram



RESULTS

There were 40 participants in this study out of which were 30 males and 10 females. Control group had 12 males and 8 females, treatment group had 18 males and 2 females. Mean age of participants in control group was 4.0 ± 1.7 and in treatment group was 3.8 ± 1.8 .

Normality test of data was done through Shapiro-Wilk test for GMFM scores before and after treatment for both EE and NDT groups. Data was normally distributed ($P > 0.05$). To evaluate the impact of treatment within the group we used Parametric Paired T. Noteworthy changes were evaluated within treatment group ($P < 0.05$) and control group ($P < 0.05$). But percentage change pre versus post within the treatment group was 10.3% which was greater than control group.

Parametric independent-t- test was applied to check the difference between the groups. Results showed a statistically significant difference between the two groups, $P < 0.05$. Mean value of GMFM score was greater in treatment group as compared to control group.

Table 1 Baseline characteristics of participants

Variables	Group A (control)	Group B (treatment)
Gender	Male= 12(60%) Female= 8(40%)	Male= 18(90%) Female=2(10%)
Age (years)	Mean= 4.0 ± 1.7	Mean= 3.8 ± 1.8

Table 2 Change in GMFM scores Pre versus Post within the groups

Groups	Pre GMFM mean \pm std	Post-GMFM mean \pm std	P-value
Pre/post Treatment (EE)	29.0 ± 14.5	44.9 ± 15.8	0.00
Pre/post Control (NDT)	27.4 ± 12.3	33.1 ± 13.7	0.00

Table 3 Post interventional scores of GMFM between the groups

Group	Total	Mean \pm std	P value
Treatment	20	44.9 ± 15.8	0.02
Control	20	33.1 ± 13.7	

DISCUSSION

This study was conducted to determine the effect of EE intervention on gross motor function of CP compared with standard treatment NDT. This study showed that EE and NDT both techniques were equally effective. The findings indicate that a trained therapist, using either EE or NDT technique achieved desired results in gross motor function. Additionally, at the end of 8 weeks intervention period, the pre and post statistical results showed that the GMFM scores are improving in EE treatment group, than the NDT control group. However, this study provides new ways of improvement in motor outcome and measure the change of motor activity with help of GMFM tool (9).

It is reported in a systematic review conducted by Catherine Morgaine et al that EE has been a promising technique which has shown little promising effect on the gross motor activity. (8)

Law et al compared two different EE interventions and found both approaches were equally effective. The participants were from all level of GMFCS. They measured the effect of EE (sensorimotor training, stimulation and specific task) on motor, sensory and cognitive levels. The result of this study showed ($P < 0.05$) EE is effective for gross motor and cognitive improvement that represent the same as for this study results ($P < 0.05$) (10). Heidi Janssen Jan, Z. Davis and colleagues also assessed the effect of EE on gross motor function. They reported EE seemingly effective on stroke patients. (11, 12)

A pilot study was conducted by Morgan C et al. in which they measured the effect of EE on motor behavior of high risk CP children. They reported improvement in gross motor function. The results were statistically significant ($p < 0.05$) as concluded by this study too. (13)

Nikos Tsorlakis et al. conducted a study to evaluate the effect of intensive NDT application on CP children. The results of the study showed that NDT is effective. (14)

CONCLUSION

This is concluded from this study that EE plays an effective role in improvement of gross motor function in spastic CP children. NDT treatment approach was also found effective, although less than EE. There is need to determine the effect of more specific types of EE on six dimensions of GMFM in spastic CP children.

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