ORIGINAL ARTICLE

# Effects of 8 weeks functional training programme on posture control and functional mobility in spastic hemiplegic cerebral palsy

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## Abstract

**Objective:** To determine the impacts of functional training versus conventional training on posture control and functional mobility in spastic hemiplegic cerebral palsy children.

**Method:** The randomised clinical trial was conducted at the Rehab Cure physiotherapy centre, Lahore, Pakistan, from January to September 2020, and comprised children of either gender aged 4-14 years, diagnosed with cerebral palsy, gross motor functional classification system level II or III, and no mental retardation. The subjects were randomised into conventional therapy group A and functional training group B. Intensity of exercises was gradually increased each week, starting from 10 reps to 20 reps. The subjects received treatment 3 times a week for 8 weeks, and each session lasted 45-60 min. Paediatric Balance Scale, Trunk Control Measurement Scale, Five Times Sit to Stand Test and Timed-Up-and-Go test were used at baseline and post-intervention. Data was analysed using SPSS 21.

**Results:** Of the 14 subjects, there were 7(50%) in each of the two groups. Overall, there were 8(57.14%) males and 6(42.86%) females with a mean age of 7.57±1.86 years. Significant improvement was noted in both groups post-intervention ($p<0.05$), but intergroup differences were not significant ($p>0.05$).

**Conclusion:** Both functional training and conventional therapy significantly improved postural control and functional mobility in spastic cerebral palsy children, but intergroup differences were not significant.

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## Introduction

Cerebral palsy (CP) is a non-progressive neurological condition, which occurs due to disturbance in brain development in the foetus or the infant. It results in abnormal motor skills, muscle tones, movements and postures. Along with activity limitation, it can also affect perception, communication, sensation, cognition and behaviour. Types of CP include ataxic, spastic, athetoid and mixed. Another classification is done according to degree of disability, like quadriplegic, triplegic, hemiplegic, diplegic, monoplegic or paraplegic.[1]

Different studies showed that CP children may have some visual disorders,[2] auditory effects,[3] speech disorders,[4] behavioural and mental issues.[5]

There can be several causes of CP, from idiopathic to some known reasons.[6] CP risk factors include anaemia in mother, birth asphyxia and seizure.[7]

Early intervention includes multidisciplinary team services. Treatment has to be focussed to improve fine and gross motor functions.[8]

According to studies, functional-gait-training and intensive intervention for lower extremity had positive effects on gait improvement and balance control in CP children.[9,10]

The current study was planned to determine the impacts of functional training versus conventional training on posture control and functional mobility in spastic hemiplegic CP children.

## Patients and Methods

The single-blind randomised clinical trial (RCT) was conducted at the Rehab Cure physiotherapy centre, Lahore, Pakistan, from January to September 2020. After approval from the Riphah International University, Lahore, the sample size was calculated using Epi-Tool,[11] with mean 1=19.8, variance 1=11.32, mean 2=25.4, variance 2= 13.37, power 0.8, confidence level=0.95 and ratio of sample size n2/n1=1.[12]

The sample was raised using non-probability convenience sampling technique[13] from among spastic hemiplegic CP children. Those included were children diagnosed with CP, aged 4-14 years, having Gross Motor Functional Classification System (GMFCS)[14] level II or lll, having no mental retardation and with Modified-Ashworth-Scale (MAS)[15] spasticity level grade 1-III. Those excluded were children who had had orthopaedic surgery or had used botulinum toxin, had severe visual defect, auditory problems and vestibular issues. Informed consent was

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taken from all the participants and those who refused to volunteer were excluded.

The tools used for assessment were the Paediatric Balance Scale (PBS),[16] Trunk Control Measurement Scale (TCMS),[17] Five Times Sit-to-Stand Test (FTSST)[18] and the Timed Up and Go (TUG) test.[19]

First of all, the subjects were randomied using the lottery method[20] into conventional therapy group A and functional training group B.

Baseline treatment included transcutaneous electrical nerve stimulation (TENS), hot pack and stretching exercises. Group A received exercises, like bridging, diagonal pattern exercises, perturbation-based balance training in sitting and standing positions, supine-to-sit exercises, lateral walks, step-ups, gait training, stair climbing, weight-shifting and cat position. Group B additional received exercises, like gym ball exercises, exercise with resistance bands, unilateral pelvic bridging, trampoline jumping, resistance kneeling, Bosu ball exercises, treadmill walk, cycling, catwalk, back-walk, squats and stepper exercises. The intensity of exercises was gradually increased each week, staring from 10 reps to 20 reps. The subjects received the sessions 3 times a week for 8 weeks, with each session lasting 45-60min. Treadmill walk training gradually increased from 3min to 7min with 2min warm-up and 2min cool down. The groups received treatment on alternate days to maintain blindness to therapy. All measurements were taken at baseline and post-intervention.

Data was analysed using SPSS 21. Intragroup analysis was done using paired t test, while intergroup comparisons were done using independent sample-t-test. P<0.05 was considered statistically significant.

## Results

Of the 16 subjects enrolled, 14(87.5%) completed the study; 7(50%) in each of the two groups. Overall, there were 8(57.14%) males and 6(42.86%) females with a mean age of 7.57±1.86 years. GMFCS levels and MAS grades were noted (Table-1).

Intragroup analysis of group A (Table-2) and group B (Table-3) showed significant difference post-intervention compared to baseline values for PBS, TCMS, FTSTS and TUG.

**Table-1:** GMFCS level and MAS grades of the study subjects.

| GMFCS level | n (%) | MAS grades | n (%) |
|---|---|---|---|
| II | 2 (14.3) | grade-1 | 2 (14.3) |
| III | 12 (85.7) | grade-2 | 7 (50.0) |
| Total | 14 (100) | grade-3 | 5 (35.7) |
| | | Total | 14 (100) |

GMFCS: Gross motor function classification system, MAS: Modified Ashworth scale.

**Table-2:** Comparison between baseline and post-intervention values in the conventional therapy group.

| Pairs | Groups | Mean±SD | *p*-value |
|---|---|---|---|
| PBS pre | Conventional group | 31.4±3.2 | 0 |
| PBS post | Conventional group | 35.4±3.5 | |
| TCMS pre | Conventional group | 35.7±2.9 | 0 |
| TCMS post | Conventional group | 39.8±2.5 | |
| FTSTS pre | Conventional group | 31.7±3.0 | 0 |
| FTSTS post | Conventional group | 28.4±2.6 | |
| TUG pre | Conventional group | 19.7±3.0 | 0 |
| TUG post | Conventional group | 17.4±2.6 | |

PBS: Paediatric balance scale, TCMS: Trunk control measurement scale, FTSTS: Five time sit to stand test, TUG: Time up and go test, SD: Standard deviation

**Table-3:** Comparison between baseline and post-intervention values in the functional therapy group.

| Pairs | Groups | Mean±SD | *p*-value |
|---|---|---|---|
| PBS pre | Functional group | 30.5±2.9 | 0 |
| PBS post | Functional group | 36.0±3.0 | |
| TCMS pre | Functional group | 35.7±2.9 | 0 |
| TCMS post | Functional group | 42.0±2.7 | |
| FTSTS pre | Functional group | 33.4±2.6 | 0 |
| FTSTS post | Functional group | 28.8±2.2 | |
| TUG pre | Functional group | 20.1±2.4 | 0 |
| TUG post | Functional group | 16.7±1.9 | |

PBS: Paediatric balance scale, TCMS: Trunk control measurement scale, FTSTS: Five time sit to stand test, TUG: Time up and go test, SD: Standard deviation

**Table-4:** Inter-group comparison between baseline and post-intervention values.

| Pairs | Groups | Mean±SD | *p*-value |
|---|---|---|---|
| PBS pre | Functional group | 30.5±2.9 | 0.737 |
| | Conventional group | 31.4±3.2 | |
| PBS post | Functional group | 36.0±3.0 | 0.486 |
| | Conventional group | 35.4±3.5 | |
| TCMS pre | Functional group | 35.7±2.9 | 0.927 |
| | Conventional group | 35.7±2.9 | |
| TCMS post | Functional group | 42.0±2.7 | 0.926 |
| | Conventional group | 39.8±2.5 | |
| FTSTS pre | Functional group | 33.4±2.6 | 0.630 |
| | Conventional group | 31.7±3.0 | |
| FTSTS post | Functional group | 28.8±2.2 | 0.581 |
| | Conventional group | 28.4±2.6 | |
| TUG pre | Functional group | 20.1±2.4 | 0.371 |
| | Conventional group | 19.7±3.0 | |
| TUG post | Functional group | 16.7±1.9 | 0.257 |
| | Conventional group | 17.4±2.6 | |

PBS: Paediatric balance scale, TCMS: Trunk control measurement scale, FTSTS: Five time sit to stand test, TUG: Time up and go test, SD: Standard deviation.

Intergroup comparison showed no significant difference between the two therapies (Table-4).

## Discussion

The findings of the current study were in line with literature,[21] showing significant improvement in postural stability and functional mobility in CP children. The current

study showed there was noteworthy difference between baseline and post-treatment values in both the groups ($p$=0.001).

A study[22] on the effect of lower limb strength training in CP children showed significant effect on physical ability and strength for gross motor function measure (GMFM).

Another study[23] showed that treadmill gait training with eyes close and open helped in improving functional balance, mobility and knee joint position sense.

Improvement in functional mobility noted in the current study is also in line with systematic-review and meta-analysis[9] conducted to find out the effectiveness of functional-gait-training on mobility of adults and children with CP.

A study[24] on the effects of trunk exercises on mobility function, balance and trunk control on children with hemiparetic CP used Trunk-Impairment Scale (TIS), Berg Balance Scale (BBS) and Dyanamic Gait Index (DGI) as measurement tools. Both groups exhibited significant progress in baseline post-intervention values, but the experimental group showed greater improvement on trunk control, mobility function and balance of spastic hemiparetic CP children. The current study showed significant improvement in both groups, but intragroup comparisons showed no significant difference ($p$>0.05).

In terms of limitations, the current study was done at a single centre and comprised subjects having just one CP type. Multi-centre studies comprising subjects of multiple CP types are recommended.

## Conclusion

Both functional training and conventional therapy significantly improved postural control and functional mobility in spastic CP children, but intergroup differences were not significant.

**Disclaimer:** None.

**Conflict of Interest:** None.

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