International Journal of Orthopaedics and Physiotherapy
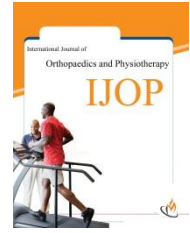
TASK ORIENTED MOTOR SKILL TRAINING PROGRAM WITH SEGMENTAL TRUNK STABILISATION ON ACQUISITION OF MOTOR STABILITY IN CHILDREN WITH CEREBRAL PALSY

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ABSTRACT

There is a lack of evidence about the efficacy of rehabilitation interventions to improve UL function in children with CP. The aim of this study is to investigate the effect of task oriented motor skill training with segmental spinal stabilization on acquisition of motor skills in young children with cerebral palsy. A matched pairs randomised trial was carried out using a goal directed functional training program to evaluate the efficacy of the training with trunk stabilization at different level in children with cerebral palsy aged 5 to 12 years. Primary outcome measures were Gross Motor Function Measure (GMFM 66) and Qualities of Upper Extremity Skills Test. A Mixed Linear Model with unstructured means of GMFM-66 was calculated, where time, GMFCS and age-group were used as factors in the final model. Four, of in total 154 assessments, were missing, they were intermittent and there was no suspicion of drop-outs. Significant improvements were demonstrated in GMFM-66 during the intervention (assessment 1–2 mean difference: 2.92, p<.001; assessment 2–3 mean difference: 2.19, p<0.001; assessment 3–4 mean difference: 5.07, CI: 3.8–6.4, p<0.001). There are several factors that could have influenced the results, making comparisons with other studies difficult. The average change in the outcome measures is likely to be dependent on the composition of GMFCS levels and ages in the sample. As seen in our study and also found by others. Children classified to level I-II showed the greatest change, as was expected in line with motor development curves for CP.Task Oriented Motor Skill Training Program for children with Cerebral palsy resulted in improved basic motor abilities, improved self-care in home environments, and reduced need for caregiver's assistance in self-care and mobility.

INTRODUCTION

Cerebral palsy is not a term for a single disorder, but a term that describes multiple neurological damage that causes developmental abnormality in motor function and postural control. It is defined as a general term for a syndrome of non-progressive impaired motor function caused by brain damage or a defect whose clinical presentation frequently changes. This definition has gained a broad consensus [1]. Most recent definition describe it as "a group of permanent disorders of the development of movement and posture, causing activity limitations that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often

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accompanied by disturbances of sensation, perception, cognition, communication, and behaviour, by epilepsy and by secondary musculoskeletal problems [2].

There is a lack of evidence about the efficacy of rehabilitation interventions to improve UL function in children with CP. This may be partly attributed to the small number of randomized clinical trials (RCTs) of good methodological quality, and to the use of inadequate outcome measurements. Studies evaluating treatment interventions have not focused on the objective measurement of movement quality during task performance so are unable to determine if post intervention improvements were due to an increase in the use of motor compensations or to improvements in movement quality [3].

A third explanation for the lack of high level evidence of UL therapeutic effectiveness in children with CP is that previous studies addressed impairments instead of function and activity. The concepts established by the International Classification of Functioning, Disability and Health (ICF) state that body functions, activity, environment and personal factors are inter-related. The task-oriented treatment approach in rehabilitation is based on the ICF model [4].

By developing efficient task-specific strategies and adapting goal-oriented movement to different tasks and environments, the therapist can provide a variety of conditions to practice motor ability that will be activity dependent and related to the main underlying impairments in tasks specifically designed for the individual.

The aim of this study is to investigate the effect of task oriented motor skill training with segmental spinal stabilization on acquisition of motor skills in young children with cerebral palsy & also to determine whether acquisition of motor ability may be better improved in young children with cerebral palsy by task oriented motor skill training program.

MATERIAL & METHOD

A matched pairs randomized trial was carried out using a goal directed functional training program to evaluate the efficacy of the training with trunk stabilization at different level in children with cerebral palsy aged 5 to 12 years. In our study, the baseline assessment consisted performed one week before the intervention. The post intervention assessment was performed twice after weeks and three months of intervention was completed. For the follow-up assessment, the evaluation was scheduled one month after the post intervention assessment. Potential participants were identified according to the criteria, listed below, then suitable children and their parents were invited to participate in the randomized trial and informed consent to participate were obtained from the child and or by her/his parents prior to enrolment in the randomized control trial.

Only those children who had a confirmed diagnosis of cerebral palsy according to 2005 definition (MRI and clinical history); were aged between 5 to 12 years at time of recruitment; had predominant spasticity with Modified Ashworth scale (MAS) grade $\leq$ 2 were included in the study [5]. The children with moderate or severe muscle spasticity and/or contracture (MAS > 2); having uncontrolled epilepsy; or with some cognitive deficits were excluded. All parents signed the consent form approved by the ethics committee and the Institutional Review Boards of Singhania University.

After enrolment, children were block randomized into pairs according to their activity level at GMFM using a computer generated set of random numbers [6].

The treating therapists and study personnel, committed to help during the treatment, will be blinded of group allocation.

Primary outcome measure were Gross Motor Function Measure (GMFM 66) which is a standardized assessment that was designed to measure change in gross motor function over time in children with CP [7] and Qualities of Upper Extremity Skills Test (QUEST) [8] to evaluate quality of fine motor movements. Spasticity was measured using the Modified Ashworth Scale.

All children participated in training intervention consisting of a 1 hour treatment session, 3 times per week for 8 weeks. The intervention was delivered by Physiotherapist in the respective centre. Fifteen sets of daily life upper extremity exercises were planned for this study. Each set is composed by three sequential upper limb goal actions of increasing complexity.

A special fiberglass support device was fabricated for use during Goal Direct Therapy session for segmental stabilization of spine. Pelvic strapping and a rigid posterior support that circles the spine and trunk provided upright stability of the spine below the level of interest. The posterior support was adjusted to allow evaluation of 4 different spinal segments (cervical-upper thoracic (under arms), mid-thoracic (midribs), thoracic-lumbar (waist) and pelvis (hips), with segments evaluated in a pseudo-random order. GMFM-66 was performed three times; one baseline assessments, one assessment after 12 weeks of intervention and one follow-up, one month after the intervention (16th Week). GAS was performed three times (goal-setting and two evaluations) and body functions (PROM, spasticity and SMC) were assessed before and after the intervention.

RESULTS

Seventy one children with cerebral palsy participated in this study, 37 boys' and 34 girls. The mean age at start of the intervention was 74 months (SD 27 months). Children were classified according to GMFCS.

Clinical and demographic characteristics at baseline for each child are presented in the Table 5.1. All children completed all the study assessments and fully complied with the intervention sessions. Four children were dropout from the study due to various reasons.

25 children with CP had subjects had unilateral left side involvement; 27 of them were having unilateral right side involvement; & 19 with bilateral involvement. A Mixed Linear Model with unstructured means of GMFM-66 was calculated, where time, GMFCS and age-group were used as factors in the final model. Four, of in total 154 assessments, were missing, they were intermittent and there was no suspicion of drop-outs. Significant improvements were demonstrated in GMFM-66 during the intervention (assessment 1–2 mean difference: 2.92, p<.001; assessment 2–3 mean difference: 2.19, p<0.001; assessment 3–4 mean difference: 5.07, CI: 3.8–6.4, p<0.001).

The improvements gained during the intervention remained, even though there was a tendency for children in level III and IV to decrease their scores at the last follow-up, but the findings were not significant. The interactions between time and the children's age-group, GMFCS level or distribution of CP were not found to influence the degree of improvement significantly. No significant difference between the extents of improvement was observed between the levels of GMFCS.

The effect size was calculated for the change score during the intervention (assessment 1– 4) for each GMFCS level and the effect sizes were; I: 1.27, II: 3.36, III: 2.38 and IV: 2.02. A mean improvement of 18 reference percentiles during the intervention was observed (GMFM-66 assessment 1 and 4, 95% CI: 12–25, p<0.001).

Five goals were assigned to each child, for a total of 110 goals. At the baseline all goals started at -2. After 6 weeks of therapy, the goal attainment to the expected level or higher was achieved in 63/110 goals and at the end of the intervention in 93/110 goals.

The not fully attained goals were evenly distributed within the group of children. Six weeks after the end of therapy, goal attainment to the expected level or higher was reached in 98/110. At the last follow-up, goal attainment to the expected level or higher was achieved in 103/110 goals.

The median value of the total t-score for all goals in the group at the last follow-up was 68.09 (percentile 25th–75th: 64.33–74.12). No significant differences in t-scores were observed with respect to group, GMFCS levels or MACS levels.

Table 1. Pair wise comparison between the four assessments; mean differences, and significance levels, n= 71

Time	95% CI	Pair wise comparisons	p
BL (1)	51.81–57.66	1–2	0.799
PTW3 (2)	52.95–58.79	2–3	0.024
PTW12 (3)	55.86–61.71	1–3	0.000

Keys: BL-Baseline reading, PTW6&12-Post-test reading oweek 6 & 12.

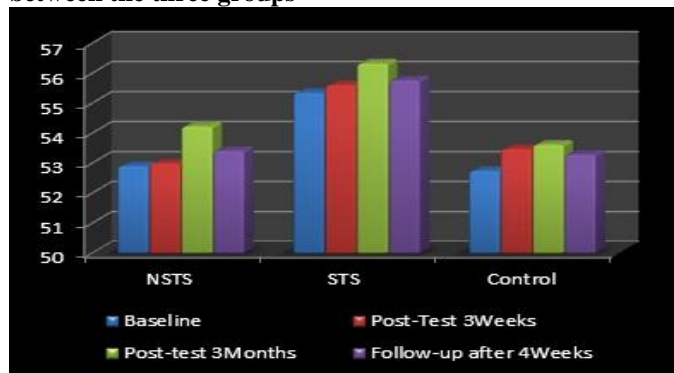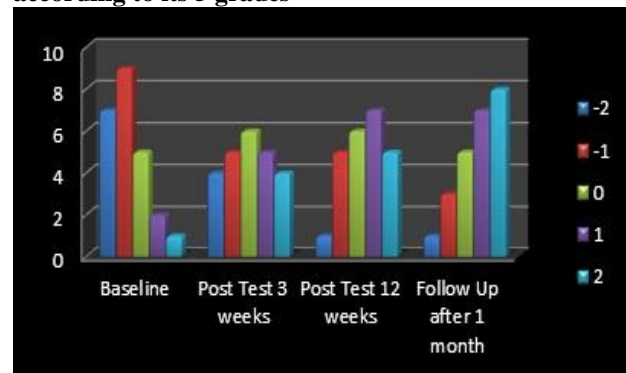**Fig 1: Effect of training on Gross Motor Function Measure between the three groups**

Fig 2. Evaluation of Goal Attainment scaling (GAS) according to its 5 grades

DISCUSSION

The purpose of this study was to investigate the preliminary effect of Task Oriented Motor Skill Training Program on acquisition motor abilities in children with cerebral palsy. In the present study change in function was examined in a heterogeneous sample of children with CP who participated in a three-month period of Task Oriented Motor Skill Training Program. The children's basic motor abilities improved, and predetermined individual goals were the least met in 35 (66%) of the 53 goals. Group training seemed to have a positive impact on the children's and family's daily life since the parents reported that the children's functional skills in self-care at home had increased and their need for caregiver's

assistance in self-care and mobility had decreased.

Wang et al [9] have proposed a change of 3.71 on the GMFM-66 as a cut-off point between clinical "great improvement" and "not great improvement ". In two studies of intensive physiotherapy where GMFM-66 was used and all GMFCS levels were presented in the samples, the intervention periods lasted for respectively 4 and 8 weeks, with a total amount of 12 and 36 hours of training. When comparing results, our outcomes were quite similar or even better; although the intervention period was shorter, but the duration of daily treatment was longer.

There are several factors that could have influenced the results, making comparisons with other studies difficult. The average change in the outcome measures is likely to be dependent on the composition of GMFCS levels and ages in the sample. As seen in our study and also found by others. Children classified to level I-II showed the greatest change, as was expected in line with motor development curves for CP. Contrary to the findings of [13], but in line with Ahl [14], age groups did not have an impact on change in our study. This could be interpreted as the participating children, regardless of age, had not optimised their basic gross motor development before participating in the intensive training. Whether the change in motor abilities in the present study would even out over time as shown in other models of intensive training, or whether participation in repeated periods of training would result in similar improvement, is a subject of further investigation.

The individual goal setting for the children was accomplished as a process during the baseline period between parents, child and professionals. In this period the child was repeatedly tested with the GMFM and QUEST, possibly influencing the choice of goals. However, the contents of the goals changed minimally from the first to the last assessment in the baseline period, although the precision increased, implying that parents/child and professionals very early in the baseline period agreed upon goals for the training. Goals explicitly related to e.g. play and social function were less common even if the attainment of many of the goals might contribute in these areas. The potential relationship between movements, activities and participation could possibly be better elucidated to the parents.

Further prospective studies over an extended period of time with careful registration of the children's age, functional level and habilitation services would give accumulated knowledge of the outcomes of different approaches regarding the child and the family in a long time perspective.

CONCLUSION

Task Oriented Motor Skill Training Program for children with Cerebral palsy resulted in improved basic motor abilities, improved self-care in home environments, and reduced need for caregiver's assistance in self-care and mobility. Intensive training focusing on selected, individual activities in a group setting in the children's local environment over a restricted time frame, may seem to be a cost effective and motivating way of optimising function in young children with cerebral palsy.

ACKNOWLEDGMENT

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