

Original Article

Effects of Task-oriented Approach on Affected Arm Function in Children with Spastic Hemiplegia Due to Cerebral Palsy

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Abstract. [Purpose] The purpose of the present study was to examine the effects of task-oriented approach on motor function of the affected arm in children with spastic hemiplegia due to cerebral palsy. [Subjects] Twelve children were recruited by convenience sampling from 2 local rehabilitation centers. The present study utilized a one-group pretest-posttest design. All of children received task-oriented training for 6 weeks (40 min/day, 5 days/week) and also underwent regular occupational therapy. Three clinical tests, Box and Block Test (BBT), Manual Ability Measure (MAM-16), and Wee Functional Independence Measure (WeeFIM) were performed 1 day before and after training to evaluate the effects of the training. [Results] Compared with the pretest scores, there was a significant increase in the BBT, MAM-16, and WeeFIM scores of the children after the 6-week practice period. [Conclusion] The results of this study suggest that a task-oriented approach to treatment of the affected arm improves functional activities, such as manual dexterity and fine motor performance, as well as basic daily activities of patients with spastic hemiplegia due to cerebral palsy.

Key words: Cerebral palsy, Hemiplegia, Task-oriented approach

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INTRODUCTION

Cerebral palsy (CP) is a chronic motor disorder resulting from a nonprogressive brain lesion acquired at a time of rapid brain development and is characterized by muscle fibrillations or paralysis. Spastic hemiplegia is the most common type of CP among full-term infants and is the second most common type of CP next to diplegia among pre-term infants¹⁾. Children with spastic hemiplegia generally experience various motor and sensory impairments such as muscle weakness, spasticity, abnormal movements, and sensory dysfunctions, and approximately 50% of these children show more disabilities of the upper extremities than of the lower extremities. Dysfunctions in upper extremity activities such as reaching, grasping, and object manipulation in children with CP result in dependency in daily activities and a lack of successful social integration²⁾.

Task-oriented training has showed to be effective and efficient in improving the performance of the affected arm in patients with neurological disorders³⁾. Task-oriented arm approaches promote intensive, meaningful, and goal-oriented training in subjects, and the voluntary functional activities of these subjects possibly reduce their motor dis-

abilities⁴⁾. A task-oriented approach to treatment of the affected arm has direct application to occupational therapy practice for motor training of the upper extremity⁵⁾. Task-oriented training essentially helps to improve daily activity performance and arm function because the training consists of play activities and basic activities of daily living (ADL) such as reaching, grasping, and object manipulation⁶⁾.

Children with CP primarily show complex deviations in movement when using the affected arm, although disabilities in the affected arm principally depend on the injured brain areas and induced upper extremity dysfunction. Task-oriented approaches should target more than one disability of the affected arm in children with CP in order to improve their functional abilities, basic ADL, and social skills. The primary objective of the present study was to investigate the effect of a task-oriented approach, which focused on activities such as reaching, grasping, and manipulation of objects of various sizes and shapes, on the functional activities of the affected arm in children with CP.

SUBJECTS AND METHODS

Twelve spastic hemiplegic children with CP were recruited from 2 local rehabilitation centers in Gwangju City, where they were outpatients. Inclusion criteria for the participants were as follows: age 7–12 years, a diagnosis of CP, absence of any neurological and musculoskeletal diseases except CP, and ability to understand and follow verbal instructions. Exclusion criteria included unstable seizures, treatment for spasticity within the past 3 months, and surgi-

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Table 1. Clinical and demographic characteristics of the study participants (N = 12)

Characteristics	Participants (number)
Sex (boys/girls)	7/5
Age (yr)	9.2±1.6*
Hemiparetic side (right/left)	8/4
Standing (independent/dependent)	8/4
Causes (prematurity/early postnatal event/extra-brain pathology)	3/2/7

*Mean±SD

Table 2. The protocol of task-oriented arm training

Subparts of protocol	Contents
Bilateral manipulation	<ol style="list-style-type: none"> 1. Handling a sword 2. Beating the drums 3. Sweeping the deck of the ship 4. Age-appropriate play with dolls or construction materials 5. Cutting with scissors and pasting 6. Games using a ball
Unilateral activities	<ol style="list-style-type: none"> 1. Eating dinner with a fork 2. Holding a drinking cup 3. Carrying and dragging wooden blocks

cal procedures within the past 6 months. This study was approved by the human research ethics committees of the participating institutions, and all of the parents of the children agreed to their participation in the study and voluntarily signed the consent forms. The general characteristics of the participants are listed in Table 1. For each child, the general characteristics included sex, age, hemiparetic side, and ambulatory status.

This study utilized a one-group pretest-posttest design with task-oriented arm training that comprised 30 sessions over 6 weeks. All of the participants received conventional occupational therapy that lasted 30 min for improving the functional activities of the affected arm. The conventional occupational therapy involved range of motion exercise and stretching for the upper extremities. The task-oriented training consisted of activities similar to the daily tasks performed by children, such as playing and basic ADL. Table 2 shows the protocol for the task-oriented training of the affected arm⁶.

The participants underwent the task-oriented arm training (lasting 40 min/sessions) 5 times per week for 6 weeks. The first week of training focused on familiarizing participants with the task-oriented arm training protocol involving bilateral manipulation. Participants were then asked to follow the training protocol for the next 5 weeks. All participants were examined prior to participation in the study (pretest) and at the end of the study (posttest) after 6 weeks by an examiner who was not the training therapist.

The following 3 clinical tools were used in this study: the Box and Block Test (BBT), Manual Ability Measure (MAM-16), and Wee Functional Independence Measure (WeeFIM). The BBT was originally developed to evaluate the gross manual dexterity of adults with CP and is currently used to evaluate physically handicapped individuals. The

test consists of moving, one by one, as many small wooden blocks as possible from one compartment of a box to another within 60 seconds⁷). The test-retest reliability of the BBT was reported to be between 0.93 and 1.00⁸). The MAM-16 is a task-oriented, patient-focused outcome measure and may be best used as a screening tool or in conjunction with other hand-function assessments. This test uses self-reporting to assess unimanual and bimanual function and consists of 16 task items that cover a wide range of difficulty. Individuals are scored using a 5-point ordinal scale from 0 points (unable to perform the movement) to 4 points (able to complete the movement easily). Using Rasch analysis, the MAM-16 was found to have good validity and reliability⁹). The WeeFIM is an 18-item observational instrument modeled on the adult Functional Independence Measure; it measures the severity of disability and changes in the functional abilities of children over time and in rehabilitation settings. The tool measures direct observations obtained from interviews or from the guardian of the children, regarding exercise and performance of cognitive tasks. The WeeFIM can be used for infants and children 6 months to 7 years. The 6 subscales, scored on a 7 points ordinal scale from 1 point (total assistance) to 7 points (complete independence), focus on self-care, sphincter control, transfers, locomotion, and cognition. The inter-rater reliability of the WeeFIM ranged from 0.82 to 0.94¹⁰).

The independent variable of the present study was the task-oriented arm training, and the dependent variables were the BBT scores. The general characteristics of the participants were analyzed using descriptive statistics. Paired *t*-test was used to examine the effects of the task-oriented functional activities of the affected arm in children with CP. The collected data were analyzed using PASW version 18.0 for Windows (SPSS Inc., Chicago, IL, USA), and the sig-

Table 3. Scores of clinical tools for the affected arm in the participants (N=12)

Test	Pretest	Posttest
Box and Block Test	23.3±7.2 [†]	32.9±7.0***
Manual Ability Measure	27.3±4.7	40.5±5.0***
Wee Functional Independence Measure	109.3±4.9	116.8±4.2***

[†]Mean±SD; ***p<0.001

nificance level was set at p<0.05.

RESULTS

Table 3 presents the means and standard deviations of the pre- and post-test of outcome measures in participants, and level of significance of the change scores. The results indicate there were significant differences in the scores of the post-test compared to in the scores of the pre-test. Over 6 weeks training period, a significant increase was observed in the BBT, MAM-16, and WeeFIM scores of the participants.

DISCUSSION

The purpose of the present study was to evaluate the effect of task-oriented arm approach on functional activities of the affected arm in children with CP. The results of the present study support the efficacy of task-oriented training for improving functional activities of the affected arm in children with CP. After training, the improvements in the BBT, MAM, and WeeFIM scores indicate that task-oriented arm training reduced dysfunction in the affected arm as well as basic ADL in the study participants. The changes in the BBT scores indicate that manual dexterity improved after the task-oriented arm training. The statistically significant change observed in the MAM-16 scores of the participants may be of clinical importance. Finally, the changes in the WeeFIM scores of the participants indicate that basic ADL improved after the task-oriented training. These findings suggest that task-oriented arm training may help children with CP to independently perform basic ADL, which is important for their successful social integration.

Previous studies have been reported that the most important factor for motor skill recovery are muscle strengthening and the amount of practice devoted to learning a particular skill. Task-oriented approaches improve the skills and experience of the participants, select a context that enables performance, change aspects of the context to allow participants to perform tasks, and change the course of events by predicting barriers to performance¹¹). Recently, several studies reported that functional activities significantly improved after implementing task-oriented approaches in children with CP¹²⁻¹⁴). Ketelaar et al. performed a randomized controlled study that investigated the effects of a functional therapy program on motor abilities of children with CP and reported that a task-specific therapy program improved capabilities and the level of independence in performing daily motor tasks in these children¹²). Blundell et al. conducted the training program comprising 4 weeks of group circuit

training that focused on functional activities that use lower limb strength and reported that the task-specific exercise program resulted in improved functional performance that was maintained over time in children with CP¹³). Ahl et al. also reported significant improvements in the ability to perform daily activities in 14 children with CP after a 5-month functional training program¹⁴). However, these studies analyzed lower extremity functions or daily activities and not upper extremity functions of children with CP. Because upper extremity functions do not affect locomotion, rehabilitation research and clinical settings have mainly focused on improving lower extremity functions for independent walking in children with CP. Therefore, children with CP may have difficulty in social integration because of their dependency in basic ADL, although they are capable of independent walking.

The results of the present study shows the feasibility of task-oriented arm training in improving functional activities and basic ADL in children with CP. Task-oriented approach generally include daily activities and play activities, and these activities have been beneficial in motivating children. The practice activities of the present study also included repetitive practice of functional activities used in daily activities or play activities. The results indicate that task-oriented arm training significantly improved functional activities of the affected arm. The task-oriented training also reduced the dysfunction in the affected arm. Clinical settings for CP treatment should be selected after considering the effects of task-oriented training on children with CP. However, the present study not include control group for comparison of the effects of task-oriented arm approach. Generalizations of the results of the present study are limited by absence of adequate control or comparison groups. Future studies are need to compare the task-oriented arm approach with the effects of other therapeutic exercise for reducing the affected arm dysfunction of the affected arm in children with CP. Furthermore, follow-up measures were not performed in the present study. Future study is therefore needed to determine the long term effects of a task-oriented training program and to examine the long-term retention and transfer of the training effects.

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