The Effect of the Meaningful Task-Oriented Activity on Upper Extremity Function in Patient with Hemiplegic Stroke

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Abstract

Background/Objectives: The aim of the study was to examine the influence of the meaningful task-oriented activities on upper extremity function in patients with hemiplegic stroke.

Methods/Statistical analysis: The patients were randomly divided into two group: the meaningful task training group (N=13), the general occupational therapy group (N=12). The study group get additional treatment combined with the meaningful task-oriented training, and the control group received general occupational therapy.

Findings: Task-oriented approach is an efficient treatment method consisting of tasks to increase the participation of activities of daily living by effectively providing functional activities to the patient. Unlike the treatment that previously trained a single motion repeatedly, it consists of functional tasks. However, despite this importance, interventions for the recovery of upper extremity function in clinical practice are still focused on simple and repetitive joint motion, recovery of upper extremity function and enhancement of muscle strength on more affected side. Therefore, this study reports the importance of the meaningful task-oriented training in intervention to improve upper extremity function. The result is as follows. Firstly, there was a considerable significant difference between the upper extremity function in the meaningful task training group ($p<.05$), but not significant difference in the general therapy group ($p>.05$). Secondly, there was no significant difference between the two groups after intervention ($p>.05$). The results revealed that there was a significant difference the result in the meaningful task-oriented training group.

Improvements/Applications: It is thought that it can be applied as an effective treatment for recovery of upper extremity function recovery in hemiplegic patients after stroke through meaningful task-oriented training.

Keywords : Stroke, Hemiplegia, Meaningful task-oriented training, Upper extremity function, Manual function test

1. Introduction

Most of the stroke survivors recover their walking ability, but about 30-66% lose the affected upper limb function[1]. The upper extremity function of stroke patients is impaired due to the following causes, including abnormal muscle tone, impaired posture control, sensory impairment, shoulder pain and subluxation, contracture and learned nonuse[2]. These dysfunctions of upper extremity affect the integration of patient's life[3], and as a result, limit independence in activities of daily living (ADL) such as eating, dressing and toileting essential for daily life. It is an important factor that increase dependence of life and decrease quality of life[4]. As an intervention to resolve these problems, the rehabilitation program to improve the upper limb function of stroke patients includes neuro-developmental therapy, constraint-induced movement therapy, task-oriented approach, bilateral upper limb training, cognitive orientation to daily occupational performance, imagination training and mirror therapy etc[5]. Among them, task-oriented training has appeared as the effective approach to motor function restoration for stroke-induced motor impairments[6]. Task-oriented approach is rooted in the system theory of motor control and motor development[7]. The task-oriented approach is an efficient treatment method consisting of tasks for improvement the participation of ADL by effectively providing functional activities to the patient. Unlike the treatment that previously trained a single motion repeatedly, it consists of functional tasks[8]. When do goal-oriented meaningful task, movements appear through interactions between the brain's systems[9]. The evidence for applying a meaningful task approach in occupational therapy is that functional tasks help organize motor behavior, and occupational performance is manifested by complex interactions consisting of people and the environment. In addition, because recovery of patients after brain injury appears through attempts to achieve functional goals, and implementing a variety of situations and strategies is necessary to improve performance skills and motor skills[10]. However, despite this importance, interventions for the recovery of upper extremity function in clinical practice are still focused on simple and repetitive joint motion, enhancement of muscle power on more affected side. Therefore, the aim of this study to examine the effect and importance of upper limb therapy combined with meaningful task-oriented training in stroke hemiplegic patients.

2. Materials and Methods

2.1. Subjects

Tis study were 25 patients who were diagnosed with stroke at B hospital in Korea republic. Those who have agreed to voluntarily enroll in the study are selected as follows. (1) those with a score of 23 or higher on the K-MoCA (Korean version), (2) those who did not have pain or musculoskeletal disease on the upper limb, (3) those who can detect when stimulating the affected hand, (4) those who can sit or walk.

2.2. Materials

The manual function test (MFT) was developed to measure the upper limb function and movement ability of a patient. It consists of three items: upper limb movement, grasping and pinch, and finger manipulation. The result is recorded as 1 point for each execution and 0 if impossible. The result value is obtained by calculating the total of 32 points and converting it into 100 points.

2.3. Methods

2.3.1. Research procedure

Subjects were randomly divided into study group (N=13) and control group (N=12). Two groups get regular rehabilitation program in hospital. In addition, the study group received upper extremity therapy combined with meaningful task training and the control group received general occupational therapy three times per week, 30 minutes per day, for 4 weeks. The flow chart is as follows[Figure 1].
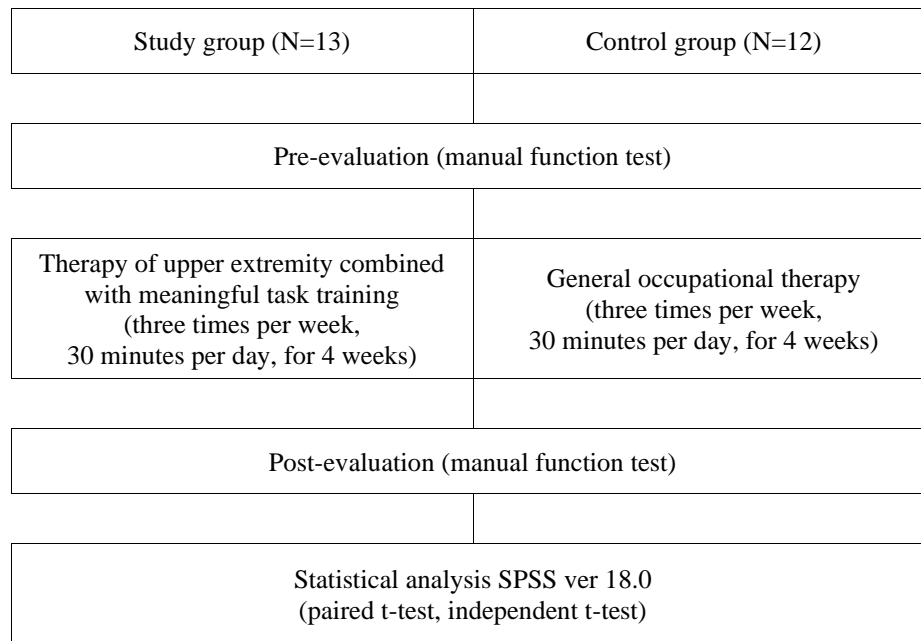
Study group (N=13)	Control group (N=12)

Pre-evaluation (manual function test)

Therapy of upper extremity combined with meaningful task training (three times per week, 30 minutes per day, for 4 weeks)	General occupational therapy (three times per week, 30 minutes per day, for 4 weeks)

Post-evaluation (manual function test)

Statistical analysis SPSS ver 18.0 (paired t-test, independent t-test)

Figure 1. Flow chart of study

2.3.2. Intervention methods

The meaningful task training used in this study consists of a total of five tasks. Among the task-oriented programs applied in the study of Kim et al., five meaningful tasks that can improve the performance of activities of daily living were selected, modified, and supplemented[8]. The program is composed of meaningful tasks that can provide active movement by providing functional tasks according to the principles suggested by Carr and Shepherd[11]. As a general occupational therapy, the control group received joint exercise, strength training, and coordination ability training through various treatment tools. Table 1 shows the meaningful task training program[Table 1]. The five tasks consisted of drinking water, brushing teeth, dressing shirts with button, organizing laundry, and preparing tea. Subjects selected and trained one task per week. The general occupational therapy intervention applied in this study was a conventional treatment for stroke patients, and the tasks designed by using the tools commonly used in the clinical field were performed.

Table 1. Introduction of meaningful task training program

Item	Description
1. Drinking water	Hold the cup stable and drink it by lifting it at an appropriate speed and power.
2. Brushing teeth	This process includes using a toothbrush, toothpaste and rinsing your mouth with cup.
3. Dressing shirts with button	It includes the process of wearing a front buttoned shirt using the more affected side, and the difficulty is controlled by the size of the clothes or the number of buttons.
4. Organizing laundry	Take towels of different sizes from the drying rack, fold them, and place them in closet.
5. Preparing tea	Tear the tea bags and instant coffee prepared on the table with both hands and place them in a cup. Then, pour the water into a cup with a kettle using cold water and stir.

2.4. Statistical Analysis

The statistical analysis of this study was conducted using SPSS version 18.0, the analysis method is as follows. The paired t-test was used for comparison of data pre and post-test after treatment, and the independent t-test was used for determine the difference between the groups. The significance level is .05.

3. Results and Discussion

3.1. Results

3.1.1. Clinical parameters before and after treatment within two groups

Table 2 shows changes in MFT before and after treatment within groups. There was a significant difference in the study group ($p<.05$), but not significant difference in the control group ($p>.05$)[Table 2].

Table 2. Clinical parameters before and after intervention

Variable	Study group		Control group	
	Pre	Post	Pre	Post
MFT(point)	13.53	14.23	10.83	11.33
	(8.54)	(8.14)*	(10.04)	(9.80)

The values are mean (standard deviation) MFT : manual function test
* $p<.05$

3.1.2. Comparison of MFT between the two groups

Changes in MFT between the study group and the control group after the intervention are shown in Table 3. There was no significant difference between the two groups after intervention ($p>.05$) [Table 3].

Table 3. Comparison of results between the two groups

Variable	Study group	Control group
MFT(point)	14.23	11.33
	(8.14)	(9.80)

The values are mean (standard deviation) MFT : manual function test
* $p<.05$

3.2. Discussion

67% of stroke patients have severe upper extremity dysfunction that makes activities of daily living difficult[12]. Previous studies suggested that abnormal upper extremity movements of patient after stroke contribute to subluxation, pain of shoulder which may bring disturb long-term functional recovery[13]. Therefore, there is consistently a need to interventions at reducing post stroke upper extremity function impairment[14]. As previously introduced, there are various treatment methods for the recovery of upper extremity function in stroke patients, the task-oriented approach focuses on the patient and task performance rather than the therapist, and it is said that there is an improvement in function by providing functional tasks to patients rather than repeatedly practicing normal movement patterns and attempting voluntary problem solving[15]. It was published by Carr and Shepherd and is a form of treatment designed for stroke patients based on motor learning theory[11]. The task-oriented approach is an effective treatment method consisting of tasks to improve the performance of daily life activities by effectively providing functional activities to the patient. Unlike the treatment that previously trained a single motion repeatedly, it consists of functional tasks. In addition, task-oriented training trains the skills necessary to achieve task goals, it helps to develop problem-solving skills and practical compensation strategies by improving adaptability in various environments[16]. A previous study reported that an approach that emphasized active exercise and task-oriented training maximizes functional performance and potentially leads to brain reorganization[17]. Also, a study compared several approaches and reported that an intensive and repetitive task-oriented approach restores upper extremity function[18, 21-30] and another research was also reported that the increase of upper extremity function was observed after task-oriented training[19]. Thus, this studies aim was to report the result of therapy combined with meaningful task training and provide a therapeutic intervention for recovering upper extremity function of stroke patients. Intervention in the study group used meaningful activities, and the control group performed conservational occupational therapy using the tools. The MFT showed a significant improvement in the study group after intervention. There was significant difference in the average MFT in the study group, but not significantly in the control group. This demonstrates the effectiveness of the interventional methods that improve the efficiency of task performance and active participation by the patient's will, it is an important factor in treatment. In stroke patient treatment, the patient's will and

motivation are strongly related to the recovery of function. Furthermore, it is possible to establish a neurological internal model through feedback control by various sensory stimuli while the patient actively performs the task, improve the upper extremity movement pattern, and induce reorganization of the cerebral cortex[20]. Therefore, results suggest that meaningful task-oriented training influenced the upper extremity function. But Result of this study may not be fully reflected because of the limited subjects, the insufficient intervention period. Further research will be needed to supplement these limitations in the future.

4. Conclusion

The aim of this study was to investigated the effect of therapy combined with meaningful task training and to increase the upper extremity function of hemiplegic patients. In this study, 25 inpatient subjects were randomly assigned to 13 study groups and 12 control groups and intervention was performed 3 times a week for 30 minutes and 4 weeks. The following conclusions were reported. First, there was a significant improvement in the meaningful task training group in the upper limb function test before and after intervention, and there was no significant difference in the general occupational therapy group. Second, there was no significant difference between the two groups These results indicate that therapy of upper extremity combined with meaningful task training affects the upper extremity function of patients, and further research should be made to supplement the limitations. The study showed the effects of the upper extremity therapy combined with meaningful task training for improving some aspects of motor control strategies of the more affected arm.

5. References

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