

# Impact of task-oriented training on hand function and activities of daily living after stroke

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**Abstract.** [Purpose] We examined the improvement of hand function and activities of daily living in stroke patients after carrying out task-oriented training. [Subjects] Thirty-two patients who had been diagnosed with stroke and underwent rehabilitation therapy participated in the task-oriented training. [Methods] The participants carried out task-oriented training for 30 min per day for 4 weeks. Their hand function and activities of daily living were evaluated before and after the training. [Results] The task-oriented training had a significant impact in terms of improving hand function and activities of daily living. [Conclusion] According to the results of this study, task-oriented training resulted in improved hand function and activities of daily living in stroke patients.

**Key words:** Task-oriented training, Hand function, Activities of daily living

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## INTRODUCTION

Stroke may cause serious problems in terms of physical, mental, and social function, and the patients' quality of life will deteriorate as they must rely on others in their everyday life<sup>1)</sup>. Previous research has shown that the quality of life of stroke patients deteriorates markedly versus that of healthy subjects, and their activities of daily living are restricted<sup>2)</sup>.

Some studies have shown that task-oriented training can help to improve functional movement in a natural environment during rehabilitation<sup>3)</sup>. Task-oriented training is aimed at improving the control strategy by solving difficulties through various measures<sup>4)</sup>. During task-oriented training, stroke patients make various movements and learn to reduce inappropriate movements, improving their adaptation ability<sup>5)</sup>. Also, task-oriented training has been used to facilitate functional improvement of the musculoskeletal and neuromuscular systems<sup>6)</sup>. It has been reported that task-oriented training can result in improvements in balance ability, movement, and task performance ability in stroke patients<sup>7)</sup>. However, most existing studies relating to task-oriented training for stroke patients focus on trunk control and balance ability. Research on changes in hand function and activities of daily living in stroke patients is lacking.

Thus, in this study, we sought to evaluate the efficacy of task-oriented training by carrying out a comparative analysis

of its effect on patients' hand function and activities of daily living in patients undergoing occupational therapy.

## SUBJECTS AND METHODS

Participants in this study were patients diagnosed with stroke and undergoing rehabilitation therapy in hospital between June and October 2014. The participants understood the purpose of the study and provided written, informed consent prior to participation. The study protocol was approved by the Inje University Institutional Review Board.

The criteria for selection of participants in this study were: 1) patients diagnosed with cerebral hemorrhage or cerebral infarction less than 6 months prior to the training, 2) test results of manual muscle tests of the affected hand were higher than 'fair' with spontaneous movement, 3) recognition ability was sufficient to make routine communications and follow directions, and 4) patients could move independently with or without a wheelchair for more than 30 min.

To assess the influence of task-oriented training on hand function and activities of daily living in stroke patients, the affected hand was tested using power grip, lateral pinch, palmar pinch, and box and block tests, and activities of daily living were evaluated using the modified Barthel Index. Power grips were measured using a Jamar hydraulic hand dynamometer and lateral pinch and palmar pinches were measured using a Jamar hydraulic pinch gauge. The average value of three measurements was calculated, and expressed in pounds (lb). The manual dexterity of hand function was measured using the box and block test; this consists of moving, one by one, as many small blocks as possible from one compartment of a box to another within 60 s<sup>8)</sup>. The test-retest reliability of the box and block test has been reported to be between 0.93 and 1.00<sup>9)</sup>. The ability to perform activities of

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**Table 1.** Clinical characteristic of the study participants (n=32)

Characteristic	Participants
Gender (male/female)	19 (59.4%)/13 (40.6%)
Age (yrs)	61.4±11.3*
Affected side (right/left)	14 (43.7%)/18 (56.3%)
Causes (hemorrhage/infarction)	11 (34.4%)/21 (65.6%)

\*Mean±SD

daily living was measured using the modified Barthel Index. The test-retest reliability of the Modified Barthel Index was reported to be between 0.93 and inter-rater reliability of 0.99<sup>10</sup>.

The task-oriented training included eating (using a cup and spoon), dressing (wearing and taking off a shirt, using a belt and zipper), personal hygiene (using a towel, combing, tooth brushing), and standing up and sitting down (standing up from and sitting down on a chair<sup>11</sup>). The training was carried out for 30 min per day for 4 weeks during the hospitalization period, and the participants were provided with oral explanations and guidance about the training under the supervision of a therapist.

The SPSS software (ver. 18.0) was used for statistical analyses. The clinical characteristics of the study participants were subjected to a frequency analysis. A paired t-test was used to evaluate the effects of the task-oriented functional activities on the affected hand function and activities of daily living. The significance level was set at  $p < 0.05$ .

## RESULTS

The participants consisted of 19 (59.38%) males and 13 (40.62%) females; their average age was 61.36 years. The affected side in 14 (43.75%) patients was the right side, and in 18 (56.25%), the left. The numbers of cerebral hemorrhage and cerebral infarction patients were 11 (34.38%) and 21 (65.62%), respectively (Table 1).

Hand function ( $p < 0.05$ ) and activities of daily living ( $p < 0.01$ ) were improved after the training (Table 2). According to these results, we conclude that the 4-week task-oriented training led to a significant improvement of stroke patients' hand function and ability to perform activities of daily living.

## DISCUSSION

It is known that 80% of stroke patients have problems with hand function due to hemiplegia. Such individuals must concentrate on their movements, so that great effort is required to carry out everyday life activities, which are highly dependent on hand function<sup>12</sup>. Indeed, hand function is crucial for performing delicate movements in everyday life, such as eating meals and dressing<sup>13</sup>. Identification of solutions for hand function disorders in stroke patients is important because they restrict everyday life activities.

In this study, we assessed a method of improving hand function and activities of daily living in stroke patients; i.e., task-oriented training. The results indicated that hand functions and activities of daily living in stroke patients could be

**Table 2.** Scores of clinical tools for the affected side hand function and ADL in the participants (n=32)

	Pre (Mean±SD)	Post (Mean±SD)
Power grip (lb)	13.6±6.2	14.9±5.4*
Lateral pinch (lb)	4.5±2.2	4.9±3.4*
Palmar pinch (lb)	4.3±2.6	4.8±2.5*
Box & block test (score/60sec)	11.3±8.3	15.7±7.2*
Modified Barthel Index (total score)	45.4±11.1	73.2±13.1**

Mean±SD

\*Significant difference  $p < 0.05$ , \*\* Significant difference  $p < 0.01$ 

improved significantly by task-oriented training.

Recently, issues related to practical and task-oriented training have come to the fore<sup>14, 15</sup>. However, research related to task-oriented training for stroke patients undergoing occupational therapy is lacking. Based on this study we recommend task-oriented training to improve hand function and activities of daily living. These results support the use of task-oriented training programs in occupational therapy.

Limitations of this study include that the patients' everyday life with the therapy sessions could not be controlled, and there was no follow-up test with which to evaluate the long-term effect. Thus, it would be valuable to perform longitudinal case studies over a longer period to confirm the effects of task-oriented training.

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