



Original Article

# Effects of modified constraint-induced movement therapy on upper extremity function and occupational performance of stroke patients

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**Abstract.** [Purpose] The purpose of this research was to examine the effectiveness of modified constraint-induced movement therapy (mCIMT) on the upper extremity function and occupational performance of stroke patients. [Participants and Methods] An experimental study was carried out on two groups of 7 participants selected by a specific criterion. The experimental group received the mCIMT as well as the conventional rehabilitation therapy (CRT) for 5 days per week over a 2 week period. The control group received only the CRT. Outcome measures included the Manual Function Test (MFT), Motor Activity Log (MAL), and Canadian Occupational Performance Measure (COPM). [Results] Average amount of changes in the MAL and COPM is different in statistical analysis between the mCIMT and the CRT groups before and after the intervention. The mCIMT group showed significant improvements on MFT, MAL, and COPM before and after the intervention. [Conclusion] We suggest that the mCIMT improves the upper extremity function and occupational performance of stroke patients better than the CRT alone.

**Key words:** Modified CIMT, Occupational performance, Upper extremity function

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## INTRODUCTION

Upper extremity function is greatly decreased in approximately 80% of stroke patients as the ability of elbow extension is limited due to spasticity or muscle weakness<sup>1, 2)</sup>. This causes difficulties in the conduction of occupational performance in Activities of Daily Living (ADL), work, or leisure activities<sup>3)</sup>. Although constraint-induced movement therapy (CIMT) can promote the recovery of upper extremities after a stroke, limitations in for resources and safety of the restraint make the clinical use of CIMT more challenging, and a modified version of CIMT (mCIMT) should be used to improve the upper extremity function of stroke patients<sup>4)</sup>.

Numerous studies on mCIMT state that it promotes the recovery of the upper extremities during motor recovery<sup>5)</sup>. However, there are no studies providing objective evidence based on standard clinical tests to assess overall changes in the occupational performance<sup>6)</sup>. That is, changes in overall the occupational performance of an individual, as indicatives of the recovery in to ADLs and upper extremity function before and after medical intervention, need to be considered as well as single measurement of motor function only<sup>7)</sup>.

Therefore, the purpose of the present study is to investigate the effects of mCIMT on the upper extremity function and occupational performance of stroke patients.

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## PARTICIPANTS AND METHODS

A total of 14 patients were allocated to the experimental (n=7) and to the control groups (n=7). The selection criteria were: patients with (1) the onset of stroke within 3 months, (2) MRI showing a first stroke in a right or left hemisphere lesion, (3) at least 20 degrees active wrist extension and 10 degrees of active finger extension, (4) Brunnstrom Stages of Stroke Recovery >5, and (5) Mini-Mental Status Examination score >24. The exclusion criteria were as follows: patients with (1) inability to provide informed consents, (2) a history of stroke, (3) a history of seizure or epilepsy, and (4) unstable medical conditions. (5) Patients who cancelled the participation. This research was approved by the Institutional Review Board of Inje University and conducted in accordance with the Declaration of Helsinki.

The experimental group received the mCIMT<sup>7</sup> and the conventional rehabilitation therapy (CRT) whereas the control group received only the CRT. The hemiplegic upper extremities in the mCIMT group were trained for 5 days/week, during the period of 2 weeks by a licensed occupational therapist. To apply the mCIMT, a group underwent 2 hours per day of adaptive task practice and task training of the paretic limb. In addition, patients wore mitt glove on the unaffected hand for nearly 6 hours of walking. The CRT consisted of occupational and physical therapy, which included strength, ADL, balance, gait, and coordination training. The control group received CRT only, which was comparable with the total hours of training received by the experimental group. Outcome measures included the Manual Function Test (MFT), Motor Activity Log (MAL), and Canadian Occupational Performance Measure (COPM), by which the upper extremity function was measured. The MAL consists of the amount of motor use (A) and the quality of movement (Q). The COPM consists of performance (P) and satisfaction (S). All statistical analyses were performed with SPSS 15.0 software (SPSS Inc., Chicago, IL, USA). To evaluate the intervention effects, the Wilcoxon's signed rank test was used to compare measures before and after the intervention in each group. The independent Mann-Whitney U test was used to compare the changes in outcome measures between the two groups. All data was expressed as mean  $\pm$  SD and statistical significance was accepted for values of  $p < 0.05$ .

## RESULTS

Average amount of changes in the MAL and the COPM is different through statistical analysis between mCIMT and CRT groups before and after the intervention. The average change in the MAL-A for the mCIMT group is about  $37.71 \pm 15.14$ , and  $5.29 \pm 2.50$  for the CRT group. That of the COPM-P is  $4.2 \pm 1.61$  for the mCIMT group, and  $0.46 \pm 0.42$  for the CRT group. The COPM-S showed  $4.3 \pm 1.43$  for the amount of changes in mCIMT group, but  $0.64 \pm 0.53$  in the CRT group. With the MFT, the mCIMT group showed the amount of change of  $2.86 \pm 1.87$  before and after the intervention, but the CRT group did not show much difference of statistical significance by the amount of  $0.86 \pm 1.21$ .

The mCIMT group showed significant improvements on the MFT, MAL, and COPM before and after the intervention. The mCIMT group showed significant improvements from  $23.86 \pm 3.89$  to  $26.71 \pm 4.02$  for the MFT, from  $40.42 \pm 18.86$  to  $78.14 \pm 18.10$  for MAL-A, and from  $39.71 \pm 19.31$  to  $76.00 \pm 14.94$  for the MAL-Q. Improvement for the COPM-P is from  $2.34 \pm 1.05$  to  $6.54 \pm 1.21$  and from  $2.05 \pm 0.84$  to  $6.35 \pm 1.32$  for the COPM-S.

## DISCUSSION

ICF (International Classification of Function, Disability and Health; ICF) suggested by World Health Organization emphasizes the complicated interactions of an individual for one's health with environment, and indicates that the ADL and occupational performance are important for one's health as well as for their motor function. Improvements in the upper extremity function and occupational performance is also important for stroke patients' health. It is known that the CIMT and mCIMT are the most effective medical intervention in the recovery of upper extremity function of stroke patients<sup>8, 9</sup>. Previous studies demonstrated that the mCIMT is effective in improving functional outcomes of the upper limb and activity levels of patients with hemiplegia<sup>5-9</sup>.

The present study demonstrated that the mCIMT group showed better improvements in the occupational performance as well as in the upper extremity function than the CRT group. Average amount of the MAL and the COPM was increased for both group, and more significant increase was observed in the mCIMT group than the CRT group. These results are aligned with those of Yu et al. which indicate that more significant increase was observed in the mCIMT group for the MAL and the Wolf Motor Function Test of the stroke patients than in the CRT group. Significant increases in the MFT, MAL, and COPM was observed in the mCIMT group for the comparison of pre- and post-interventions. This is in good agreement with the study by Wu et al. that the mCIMT for stroke patients with 6 hour tasks in two weeks long training program improves the upper extremity function, ADL and the quality of life. In conclusion, the present study to validate that the mCIMT is effective in the occupational performance of the stroke patients as well as in the upper extremity function.

### *Conflict of interest*

The authors declare that there is no conflict of interest.

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