The effects of mirror therapy with tasks on upper extremity function and self-care in stroke patients

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Abstract. [Purpose] The purpose of this study was to determine the effects of mirror therapy with tasks on upper extremity function and self-care in stroke patients. [Subjects] Thirty participants were randomly assigned to either an experimental group (n=15) or a control group (n=15). [Methods] Subjects in the experimental group received mirror therapy with tasks, and those in the control group received a sham therapy; both therapies were administered, five times per week for six weeks. The main outcome measures were the Manual Function Test for the paralyzed upper limb and the Functional Independence Measure for self-care performance. [Results] The experimental group had more significant gains in change scores compared with the control group after the intervention. [Conclusion] We consider mirror therapy with tasks to be an effective form of intervention for upper extremity function and self-care in stroke patients.

Key words: Mirror therapy, Stroke, Upper extremity function

INTRODUCTION

A paretic upper extremity (UE) is a common consequence of a stroke1). UE function is essential in most activities of daily living (ADLs), and therefore UE motor recovery can help maintain independence and improve the quality of life for stroke victims2). There are several evidence-based treatments for poststroke UE recovery3). Most treatments for improving the paretic upper limb are labor intensive and need one-on-one interaction with a therapist for several weeks4). But mirror therapy (MT) is a simple, inexpensive, and patient-directed treatment that may provide better UE capacity1).

In MT, the patient observes the movement of the unaffected hand in a mirror and is given the impression that the affected hand is moving. This delusion may activate a hemispheric cortical motor network that accelerates recovery5). Several studies have demonstrated beneficial effects on motor function, ADL, and unilateral neglect in stroke patients5–9). However, existing MT programs consist of simple forearm supination and pronation, wrist flexion and extension, and finger flexion and extension movements. These programs are limited in terms of being able to improve UE motor function10).

Previous studies have emphasized the development of MT programs with interesting tasks and tasks useful in daily life. Stevens and Stoykov11) reported a significant improvement in UE and ADL as a result of MT with tasks in stroke survivors. However, theirs was a case study that provided short-term treatment and did not suggest task activities in detail. In this study, our aim was to investigate with more subjects the effect of MT with tasks on UE function and self-care in stroke patients. We hypothesized that MT with tasks would significantly improve paretic UE motor functioning and self-care performance.

SUBJECTS AND METHODS

The 30 stroke patients recruited in this study were referred by the Department of Rehabilitation Medicine of B Hospital. The patients were required to meet the following inclusion criteria: (a) had a stroke identifiable by computerized tomography (CT) or magnetic resonance imaging (MRI), (b) had no cognitive dysfunction that would interfere with the study purpose as indicated by a Korean Mini-Mental State Examination score [MMSE-K]>2412), (c) had no perceptual disorder or unilateral neglect that would have interfered with the study purpose as indicated by the Motor-free Visual Perception Test [MVPT]13), (d) were 3 months post stroke, and (e) had a Brunnstrom score between stages I–IV for the UE14). Candidates were excluded if they (a) had aphasia, (b) had vision or hearing disorders, or (c) had had MT previ-
improvement in the experimental group (p<0.05) (Table 3). Comparison of the changes in the MFT and FIM self-care scores from baseline to 6 weeks between groups revealed significant differences in the MFT and FIM self-care scores (p<0.05). After the intervention, both groups showed a significant improvement. No significant differences between groups in the MFT and FIM self-care scores were evaluated using descriptive statistics. The independent t-test was used to compare change scores within groups. The paired t-test was used to compare differences between the groups. The Manual Function Test (MFT) is used to assess UE motor function and action ability after a stroke. The Manual Function Test with tasks (MT) program was composed of eight tasks (Table 1) and was administered 5 days/week for 6 weeks. During the MT with tasks program, participants were seated close to a table on which a mirror was set vertically in the center. The affected arm was placed behind the mirror, and the unaffected arm was placed in front of the mirror. The experimental group practiced eight tasks with the unaffected arm while they were looking in the mirror. The control group performed the same tasks with the unaffected arm and verified twice under the hypothesis that the programs would affect UE motor recovery and self-care.

**DISCUSSION**

We aimed to identify the effect of MT with tasks on UE function and self-care in stroke patients. We recruited subjects who had had a stroke 3 months previously to decrease the bias on natural recovery and who had Brunnstrom stage scores between stages 1 and 4 for the UE. MT programs need to be developed because simple exercises for the hand offer limited improvement of UE motor function. The Manual Function Test (MFT) and the Functional Independence Measure (FIM) are used to improve UE function in stroke patients. The Manual Function Test with tasks program was composed of eight tasks. In a previous study, some tasks were used depending on the individual’s ability and experiences in MT. MT with tasks that rely on common ADLs can affect a patient’s motivation during the period of treatment. Eventually, subjects would concentrate and participate in the program more actively, leading to improved UE motor recovery and self-care.

**RESULTS**

There were no significant differences between the groups based on demographics and clinical characteristics of the subjects (p>0.05) (Table 2). At baseline, there were no significant differences between groups in the MFT and FIM self-care scores (p>0.05). After the intervention, both groups showed a significant improvement. Comparison of the changes in the MFT and FIM self-care scores from baseline to 6 weeks between groups revealed significant improvement in the experimental group (p<0.05) (Table 3).

### Table 1. MT with tasks program

| Tasks | Directions (cm) |
|-------|-----------------|
| 1. Reach to press a switch<sup>39</sup> | Switch placed 30 cm in front of patient. Reach to press it with the palm. |
| 2. Reach to grasp a cone<sup>55</sup> | Cone placed 30 cm in front of patient. Reach to grasp it (diameter 5.0 cm, height 18.0 cm). |
| 3. Grasp a small bean bag<sup>55</sup> | Small bean bag placed in the middle of the table. Grasp and release it (diameter 6.0 cm). |
| 4. Grasp a cup<sup>51</sup> | Cup placed in the middle of the table. Grasp and release it (diameter 8.0 cm, height 10.0 cm) |
| 5. Lift a plastic bottle<sup>39</sup> | Lift and put down a plastic bottle in the middle of the table (diameter 6.5 cm, height 15.0 cm). |
| 6. Lift a cup<sup>51</sup> | Cup placed in the middle of the table. Lift and put down it (diameter 8.0 cm, height 10.0 cm) |
| 7. Put coins into the hole in a money box<sup>15</sup> | Money box and 10 coins placed in the middle of the table. Hold the 10 coins in the palm, and then put them into the in the money box with the thumb and index finger. |
| 8. Pick up and place Baduk stones in the palm<sup>15</sup> | 10 Baduk stones placed in the middle of the table. Pick up the stones and place them in the palm with the thumb and index finger. |

### Table 2. Demographics and characteristics of subjects

| Characteristics | Experimental group (n=15) | Control group (n=15) |
|-----------------|---------------------------|----------------------|
| Gender          |                           |                      |
| Male/female     | 8/7                       | 7/8                  |
| Paretic side    |                           |                      |
| Right/left      | 6/9                       | 7/8                  |
| Lesion type     |                           |                      |
| Ischemic/hemorrhagic | 9/6               | 8/7                  |
| Age (years)     | 58.3±12.9<sup>a</sup>    | 61.7±10.8            |
| Duration (months) | 7.9±7.5         | 8.7±7.3              |
| MMSE-K score    | 26.7±1.5                 | 26.2±1.4             |
| Brunnstrom stage| 3.0±0.9                  | 2.9±1.0              |

MMSE-K: Korean Mini-Mental State Examination  
<sup>a</sup>Mean±SD. *p<0.05
findings were reported previously for the effects of MT with tasks on UE motor recovery and self-care]. Our study also showed significant differences in UE function and self-care within groups. The control subjects received additional rehabilitation services, and this might be one reason why the control group also showed significant changes. The limitations of this study include the inability to generalize the results to all types of stroke victims and the lack of follow-up. Further studies are necessary to evaluate MT with tasks in comparison with conventional MT in order to determine which method is more effective on UE function and self-care in stroke patients.

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Table 3. Upper extremity function and self-care scores for the experimental group and control group

|                         | Experimental group | Control group |
|-------------------------|--------------------|---------------|
|                         | n=15               | n=15          |
| Before                  | After              | Before        | After |
| MFT                     | 25.6±12.4*         | 49.4±16.9†    | 26.7±10.9 | 37.3±11.4* |
| FIM                     | 17.1±5.9           | 24.5±5.7†     | 17.3±6.4  | 20.0±5.0*  |

MFT: Manual Function Test, FIM: Functional Independence Measure
*Mean±SD. †Significant difference within group at <0.05. ‡Significant difference between groups at <0.05