

# Effects of Group Rehabilitation Gymnastics for Stroke Patients

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**Objective:** This study is an experimental study to investigate the effect of group rehabilitation gymnastics on stroke patients.

**Design:** A randomized controlled trial.

**Methods:** From August 1, 2017, to February 30, 2018, 49 subjects hospitalized after being diagnosed with a stroke at K Rehabilitation Hospital had at least 8 weeks (more than 3 times a week) in the group rehabilitation exercise experimental group (25 patients), and the control group (24 patients) did not attend. Data analysis was performed using paired t-test for dependent variables before and after the experiment using SPSS 25.

**Results:** In the experimental group, daily activities were statistically significantly increased from 59.04±25.19 points before treatment to 66.96±24.35 points after treatment ( $t=2.24$ ,  $p=0.035$ ). Lung capacity also significantly increased from 280.00±86.99 points to 334.40±93.23 points ( $t=4.21$ ,  $p<0.001$ ), and hospital reuse intention also significantly increased from 8.04±1.57 points to 8.88±1.16 points ( $t=2.67$ ,  $p=0.013$ ). In the case of the control group, although the MBI, lung capacity, stress, hospital reuse intention, and hospital use satisfaction increased after the experiment compared to before the experiment, there was no significant difference.

**Conclusions:** In conclusion, group rehabilitation gymnastics for stroke patients is effective for daily living movements, lung capacity, and hospital re-use intention. Therefore, if it is continuously applied to stroke patients, it can be used as an intervention to improve the quality of nursing by enhancing physical function.

**Key Words:** Stroke, Exercise, Stress, Lung capacity, Activities of Daily Living

## Introduction

Stroke is damage to a part of the brain due to rupture or blockage of a blood vessel supplying blood to the brain. In addition, even if they survive, many disorders are accompanied by various neurological symptoms such as movement, cognition, language, emotion, and vision [1]. Stroke patients generally experience neurological disorders such as movement disorders, sensory disorders, cognitive disorders, speech disorders, and emotional disorders [2, 3], and more than half of stroke patients suffer from hemiplegia. As a result, more than 30% of stroke patients have

difficulties in performing independent activities of daily living [4]. Therefore, a rehabilitation treatment approach is important for stroke patients to overcome obstacles and independently perform daily life [5], and evaluating and performing the patient's daily activities after stroke is very important in achieving the patient's rehabilitation goal. It is important and is the most basic for the patient's independent life [6].

Stroke patients require long-term rehabilitation, and this burden causes them to experience financial stress [7]. In addition, they experience psychological, physical, and social stress in the process of having to maintain their daily life with the help of others due to a sudden

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disability while living independently and healthy [8]. As this can even lower the will to rehabilitate [9], active support from family and society is needed to reduce stress. In particular, stress can have a negative effect on recovery of physical function and health-related quality of life in stroke patients by reducing the motivation for rehabilitation [10-12].

The main factors for the stress experienced by stroke patients are impairment of physical function and impairment in activities of daily living [13]. In particular, if chronic stroke patients try gymnastics centered on muscle joint movement, it is effective in maintaining and enhancing physical functions [14, 15].

In all stages of rehabilitation treatment, recovery is possible only through training by the patient himself, not through the unilateral treatment process by medical personnel, and patient participation is essential for that training [16]. In this sense, group rehabilitation gymnastics induces interest and favoritism in stroke patients and has a lasting effect and benefit of exercise. In addition, in the process of performing group rehabilitation gymnastics, by participating in gymnastics with fellow patients, nurses, family members and caregivers, a pleasant and trusting interpersonal relationship was formed, which improved self-confidence and reactivity [17, 18].

Exercise therapy has proven its effectiveness as a long-term and continuous nursing intervention for patients with muscle weakness or chronic diseases. In particular, for stroke patients who are hospitalized, the increase in physical activity leads to a sense of satisfaction and achievement in performing the rehabilitation program, which naturally forms a sense of intimacy and trust between the medical staff and the therapist, and thus increases the satisfaction with the hospital [18]. As described above, satisfaction with rehabilitation treatment can be the strongest factor for reusing the hospital. Therefore, if strategies such as operation of rehabilitation programs to improve hospital use satisfaction, improvement of double-mouth facilities, and improvement of staff friendliness are established, it is a management strategy that can increase hospital re-use intentions [19].

Although exercise has been reported to be effective in maintaining and enhancing physical function even in stroke patients [14], it is not easy to maintain and

continue exercise, so studies on group rehabilitation gymnastics on stroke patients in Korea are very rare. Therefore, the purpose of this study is to confirm whether it can be applied as a nursing intervention for the rehabilitation of chronic stroke patients by developing a group rehabilitation gymnastics program that can trigger the motivation for rehabilitation and inspire the will of rehabilitation, and by verifying its effectiveness.

The purpose of this study is to test the effect of group rehabilitation gymnastics on daily living activities, lung capacity, stress, and hospital reuse intention of stroke patients. The specific hypotheses are as follows.

- The experimental group who participated in group rehabilitation gymnastics had higher Activities of Daily Living (ADL) after participating in group rehabilitation gymnastics than before.
- The experimental group participating in group rehabilitation gymnastics will have a higher lung capacity after participating in group rehabilitation gymnastics than before.
- The experimental group who participated in group rehabilitation gymnastics would have a lower level of stress after participating in group rehabilitation gymnastics than before.
- The experimental group who participated in group rehabilitation gymnastics had a higher intention to reuse the hospital after participating in group rehabilitation gymnastics than before.

## Methods

### Study design

This study is an experimental study with a randomized controlled pre-post design to investigate the effect of group rehabilitation gymnastics for stroke patients.

### Subject

The subjects of this study were those who understood the purpose of the study and agreed to participate in the study for those who were hospitalized with stroke diagnosis at K Rehabilitation Hospital from August 1, 2017, to February 30, 2018.

The number of samples was calculated using G\*power(version 3.1.9.7, University of Duffeldorf, Duffeldorf, Germany). Based on the number of subjects for the paired t-test, the effect size=0.50, significance level ( $\alpha$ )=0.05, power ( $1 - \beta$ )=0.95, which resulted in 54 subjects.

Prior to the study, all participants were informed about the purpose and procedure in accordance with the ethical standards of the Declaration of Helsinki. Only those who voluntarily signed an informed consent form were enrolled.

In this study, 56 people were recruited in consideration of the dropout rate and randomly assigned using a computer program (<http://www.randomization.com>). Among them, 3 people from the experimental group and 4 people from the control group dropped out due to giving up, changing the treatment schedule, or being discharged. For the final analysis, data from 25 people in the experimental group and 24 people in the control group were used.

The criteria for selection of subjects are as follows.

- A stroke patient who has had a stroke within the past 3 years and is hospitalized for rehabilitation
- Persons with unilateral or bilateral paralysis
- Those who have consented in writing to participate in the research

The criteria for exclusion of subjects are as follows.

- Those who have not been diagnosed with dementia (Mini-Mental State Examination-Korea, MMSE-K score of 20 or less)
- A person who cannot read or communicate
- Those who cannot follow gymnastics

## Research tool

### *Activities of Daily Living (ADL)*

In this study, the ADL measurement tool for stroke patients was K-MBI(The Korean Version of Modified Barthel Index), which was translated by Jung [20] from the Modified Barthel Index developed by Shah, Vanclay, and Cooper [21].

The reliability at the time of development was Cronbach's  $\alpha$ =0.95, and in this study, 0.87. The K-MBI consists of 10 items including personal

hygiene, bathing, eating, toilet treatment, climbing stairs, dressing, stool control, urine control, walking (or a chair car), and chair/bed movement.

A score is given according to the importance of each item, and within one item, a score of 5 steps is given according to the degree of functional performance of the subject. K-MBI is 100 points when it can be performed completely independently, and a lower score means higher functional dependence.

### *lung capacity*

For lung capacity, the maximum respiratory rate was measured using a Peak Flow Meter (Micropeak, Cardinal Health, UK). Subjects put the device in their mouth, and after maximal inhalation, the method was measured by the fastest and most powerful exhalation.

### *Stress*

Stress questions were used by modifying the questionnaires of Fava et al. [22] and Lee [23]. The revised questionnaire consists of a total of 19 items (symptoms 7 items, physical stress 6 items, psychological stress 6 items), and each item is on a 5-point Likert scale. The measurement score ranges from a minimum of 19 to a maximum of 95, with a lower score indicating a lower level of stress. In this study, the reliability is Cronbach's  $\alpha$ =0.89.

### *Hospital re-use intention*

It is a two-item, five-point scale tool developed by Lee [24] and modified by this researcher to suit the study. The score range is 2-10, and the higher the score, the higher the intention to reuse the hospital. In this study, the reliability is Cronbach's  $\alpha$ =0.91.

## Program progress

The group rehabilitation gymnastics program was specified by referring to the gymnastics program developed by Yang et al. [18] to be applied to stroke patients, with the advice of 5 head nurses at K Rehabilitation Center.

The program consisted of warm-up exercises, preliminary gymnastics, stroke gymnastics, laughter therapy, and going hiking (while shaking both arms).

The total exercise time is about 20 minutes, and music was played before the start of the gymnastics to raise the mood (Table 1).

Preliminary gymnastics mainly consisted of upper extremity movements such as tapping the face, hands, and body, and stroke gymnastics was performed from easy to difficult movements in the order of upper extremity exercise, trunk exercise, lower extremity exercise, and breathing.

The program was run by two senior nurses with extensive experience in operating group rehabilitation gymnastics. The experimental group continuously participated in morning gymnastics for more than 8 weeks (more than 3 times a week), and the control group was subjects who were unable to attend morning gymnastics due to treatment, etc.

Data collection was recorded with the help of the patient when it was possible to fill out a questionnaire directly after explaining the purpose of the study, and with the help of the researcher when it was difficult to record due to a physical disability.

#### Ethical considerations

This study explained to the participants the purpose of the study, the duration of participation, the method of proceeding, the expected risks or benefits, and the maintenance of anonymity. It was explained that if a research participant did not want to, they could withdraw their consent at any time after participating in the study, and that they would not receive any

disadvantages. A predetermined gift in return was provided to the subjects who participated in the study.

#### Data analysis

Data analysis was performed using SPSS software program (version 25, IBM Corp., Armonk, NY, USA). For general matters, frequency, percentage,  $X^2$ , t-test, and ANOVA tests were used.

Independent t-test was used to test the homogeneity of the dependent variable before the experiment and the control group, and the hypothesis test for the dependent variable before and after the experiment was analyzed by the paired t-test.

## Results

#### Homogeneity test for general characteristics

As a result of the patient's general information and homogeneity test, there was no significant difference in sex, age, marital form, and onset period, confirming the homogeneity (Table 2).

#### Homogeneity test for the health status of the experimental group and the control group

The homogeneity of health status was confirmed as there was no significant difference in the type of paralysis, number of onsets, underlying disease, and MMSE (Table 3).

**Table 1.** Group Rehabilitation Gymnastics Program

Order	Content (total 20 min)
Preliminary gymnastics	Ball rolling, facial massage, hand massage, fist clenching, finger looping, hand brushing, and clap/trunk tapping are repeated twice in 16 beats in each direction to the song.
Stroke gymnastics	<ol style="list-style-type: none"> <li>1. Neck movement (forward/backward, left/right, tilting, turning)</li> <li>2. Shoulder exercise (one shoulder at a time, shoulder rotation, both arms raised)</li> <li>3. Trunk exercise (humidification, lower back, flank exercise, torso forward bending, trunk rotation exercise, whole body exercise)</li> <li>4. Leg exercises (one leg kick, ankle pull/push/rotate)</li> <li>5. Breathe</li> </ol> *Perform each movement in 16 beats to the gymnastic music
Laughter therapy	Big jokes (laugh out loud for 15 seconds)
Going hiking	<ol style="list-style-type: none"> <li>1. Shake your arms 30 times with a command</li> <li>2. Shout "yahoo" three long times</li> </ol>

**Table 2.** Homogeneity test for General Characteristics

Variable	Experimental group (n=25)	Control group (n=24)	$\chi^2 / t / F$	p
Gender				
Male (n/%)	15 (60.0)	19 (79.2)	2.12	0.146
Female (n/%)	10 (40.0)	5 (20.8)		
Age(year)				
≤ 49 (n/%)	4 (16.0)	8 (33.3)	1.90	0.064
50–59 (n/%)	7 (28.0)	9 (37.5)		
≥ 60 (n/%)	14 (56.0)	7 (29.2)		
	58.96 (10.18)	53.73 (8.95)		
Marital status				
Married (n/%)	20 (80.0)	18 (75.0)	0.18	0.675
Other than (n/%)	5 (20.0)	6 (25.0)		
Onset period(Month)				
0–6 (n/%)	16 (64.0)	20 (83.3)	0.97	0.338*
> 6 (n/%)	9 (36.0)	4 (16.7)		
	6.24 (5.10)	5.04 (3.34)		

\*Fisher's Exact Test

The values are presented mean(SD).

**Table 3.** Homogeneity test for Health status

Variable	Experimental group (n=25)	Control group (n=24)	$\chi^2 / t / F$	p
Paralysis type				
Right (n/%)	6 (24.0)	10 (41.7)	1.906	0.386*
Left (n/%)	16 (64.0)	11 (45.8)		
Bilateral (n/%)	3 (12.0)	3 (12.5)		
Number of on set				
1 (n/%)	24 (96.0)	22 (91.7)	0.527	0.609*
≥ 2 (n/%)	1 (4.0)	2 (8.3)		
Underlying disease				
Yes (n/%)	7 (28.0)	9 (37.5)	0.503	0.478
None (n/%)	18 (72.0)	15 (62.5)		
MMSE-K (score)	26.33 (2.63)	26.55 (2.86)	0.974	0.336

\*Fisher's Exact Test

The values are presented mean(SD).

MMSE-K: Mini Mental State Examination-Korea

Changes in ADL, lung capacity, stress, and hospital reuse intention before and after the experiment

In the experimental group participating in the group rehabilitation intervention, ADL increased statistically significantly from 59.04±25.19 points before treatment to 66.96±24.35 points after treatment ( $t=2.24$ ,  $p=.035$ ). After group rehabilitation intervention, the lung capacity significantly increased from 280.00±86.99 to 334.40±93.23 ( $t=4.21$ ,  $p<0.001$ ), and hospital reuse intention also significantly increased from 8.04±1.57 to 8.88±1.16 ( $t=2.67$ ,  $p=0.013$ ). However, there were no significant changes in stress and hospital use satisfaction (Table 4).

In the case of the control group, although the ADL, lung capacity, stress, and hospital reuse intention increased after the experiment compared to before the experiment, there was no significant difference.

## Discussion

This study was attempted to verify the effect of group rehabilitation gymnastics on the level of daily living, lung capacity, stress, and hospital re-use intention after performing group rehabilitation gymnastics for stroke patients admitted to a rehabilitation hospital. Based on the results of this study, we would like to discuss it.

In this study, the level of daily life of the experimental group participating in the group rehabilitation gymnastics increased statistically significantly from 59.04±25.19 points before treatment to 66.96±24.35 points after treatment. This can be explained by the results of a study by Buyn & Chon [16] who reported that the range of motion of the upper extremity joint

increased after rehabilitation exercise was performed in stroke hemiplegic patients. It is thought that this is because, in the group rehabilitation gymnastics conducted in this study, the range of motion required for daily life was increased in patients with hemiplegia who had limited range of motion due to muscle paralysis due to stroke while exercising in the order of upper extremity exercise, trunk exercise, and lower extremity exercise.

In this study, the lung capacity of the experimental group participating in the group rehabilitation exercise significantly increased from 280.00±86.99 points before treatment to 334.40±93.23 points after treatment. This is thought to be due to repeated breathing exercises including breathing exercises in the group rehabilitation program.

In this study, the hospital reuse intention of the experimental group significantly increased from 8.04±1.57 points before treatment to 8.88±1.16 points after treatment. This can be explained by the results of a study by Lee [24] reporting that the quality of nursing service was an important influencing factor on the intention of patients to re-use the hospital. Because the rehabilitation program of the hospital where this study was conducted mainly consists of physical therapy, patients and their families who spend a lot of time in the ward may be bored. For these patients and their families, the nurses performed group rehabilitation gymnastics consisting of gymnastics and laughter therapy at a certain time, and the quality of nursing services was improved.

However, the stress of the experimental group did not change after treatment. It is judged that group rehabilitation exercise alone did not reduce stress because stroke patients have high stress due to the thought

**Table 4.** Changes in ADL, Lung capacity, Stress, and Hospital reuse intention before and after the Experiment

Variable	Experimental group (n=25)				Control group (n=24)			
	pre	post	t	p	pre	post	t	p
ADL (score)	59.04 (25.19)	66.96 (24.35)	2.24	0.035	69.58 (16.04)	77.83 (34.51)	1.27	0.216
Lung capacity (L/min)	280.00 (86.99)	334.40 (93.23)	4.21	<0.001	336.5 (109.80)	348.26 (96.47)	0.80	0.433
Stress (score)	36.08 (11.48)	33.76 (11.19)	1.28	0.214	35.96 (7.77)	33.08 (9.07)	1.60	0.123
Hospital reuse intention (score)	8.04 (1.57)	8.88 (1.16)	2.67	0.013	7.38 (2.48)	8.04 (2.39)	1.65	0.175

The values are presented mean(SD).

ADL: Activities of Daily Living

of being a burden to their family, the prognosis of the disease, and the high cost of treatment. Therefore, in the future rehabilitation program for stroke patients, it is proposed to include programs such as psychological counseling and education that can reduce psychological stress of stroke patients.

The limitation of this study is that the participants are patients admitted to a rehabilitation hospital, so care must be taken in generalizing. In addition, as the sample size is small, the degree of exercise ability is not considered, and further studies are needed.

## Conclusion and Suggestions

As a result of this study, group rehabilitation gymnastics for stroke patients was effective in ADL, lung capacity, and hospital reuse intention. This will be a basic data that can be used to improve the quality of nursing care by applying group rehabilitation gymnastics to stroke patients to improve their physical function.

Based on the results of this study, I would like to make the following suggestions.

- It is necessary to verify the effect on other areas of physical activity (ex. joint range of motion).
- We suggest additional research in the psychological domain (ex. will rehabilitate, self-esteem) for stroke patients.

## Conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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