

THE INFLUENCE OF STRUCTURED ROM EXERCISE AND PROGRESSIVE MUSCLE RELAXATION (PMR) EXERCISE ON THE FUNCTIONAL ABILITY OF STROKE PATIENTS

Yanti Cahyati*, Ida Rosdiana, Tetet Kartilah

Nursing Department of Tasikmalaya Health Polytechnics, Ministry of Health Republic of Indonesia, Indonesia

**Corresponding Author's Email: yantinaufal@gmail.com*

ABSTRACT

Motoric dysfunction in stroke patients can cause a decrease in the ability of patients to mobilize including doing daily activities. This can cause patients to experience dependence when they are at home. ROM exercises can increase the muscle strength of stroke patients so that functional abilities can increase. This causes patients to be more independent while in the hospital or when they are at home. ROM exercises modified by progressive muscle relaxation exercises can have a better impact on the patient's functional abilities. This study aims to see the effect of structured ROM exercises and progressive muscle relaxation exercises on the functional abilities of stroke patients. This type of research is quantitative research with quasi-experimental pre and post-test. Interventions were carried out on two groups of respondents. The control group performed ROM exercises according to the standard at the hospital while the intervention group performed structured ROM exercises and progressive muscle relaxation exercises. The results showed the average value of functional ability before and after exercise in the control group and intervention group had increased. In the intervention group, the average value of functional ability after exercise increased higher than the control group. This suggests that modified ROM exercises with progressive muscle relaxation exercises can improve the functional ability of stroke patients. This exercise needs to be applied to stroke patients to increase patient independence in carrying out daily activities.

Keywords: *Stroke, Progressive Muscle Relaxation, Functional Ability*

INTRODUCTION

Stroke is a focal or global acute functional disorder due to obstruction of blood flow to the brain due to bleeding (hemorrhagic stroke) or blockage (ischemic stroke) with symptoms and signs according to the affected part of the brain, which can heal perfectly, recover with disability or death (Chen *et al.*, 2015). According to Black & Hawks (2010), stroke is a condition used to explain neurological changes caused by disturbances in blood circulation to parts of the brain. In general, this can cause focal neurological disorders that can arise secondarily to a pathological process in the cerebral blood vessels.

According to the report American Heart Association (AHA), around 700,000 people in the United States have a stroke each year. There are currently 4 million people in the United States who live with physical limitations due to stroke, and 15-30% of them suffer from the permanent disability (Mozaffarian *et al.*). The prevalence of stroke in Indonesia is based on a diagnosis of health personnel by 7 per mile and those diagnosed with health workers or symptoms by 12.1 per mile. In line with these data, in Dr. Soekardjo's Hospital Tasikmalaya, stroke cases ranked first in the most common cases in the neural care room. The incidence of stroke at Dr. Soekardjo's Hospital Tasikmalaya every year always increases. During 2016 there were 652 cases of stroke who were treated at the Dr.

Soekardjo's Hospital Tasikmalaya.

Stroke is the main cause of disability. The World Stroke Organization reports that stroke is the main cause of loss of work days and poor quality of life. Disability due to stroke not only affects the people who have it but also for their family members. Stroke survivors faced difficulties in later life due to physical disabilities, cognitive impairment and emotional disturbances. Indeed, the prevalence of cognitive impairment after stroke is high, 58% of stroke patients were cognitively impaired. Cognitive impairment was reported at approximately 72% at 18 months after a stroke onset (Zulkifly *et al.*, 2016).

The majority of stroke patients had very severe disability functional status. Motoric deficits in the form of hemiparesis or hemiplegia experienced by stroke patients can result in immobility. This condition can cause a decrease in muscle strength which can lead to an inability to the extremity muscles in general, decreased flexibility and joint stiffness which can lead to contractures so that eventually the patient will experience disability, especially in carrying out activities of daily living (Lewis *et al.*, 2007).

Functional ability of stroke patients can be trained as early as possible through the exercise in stroke patients starting in the acute phase. Stroke patients with an acute phase in the hospital can be given good training by aiding early mobilization and programmed with ROM exercises. ROM training has been shown to increase the muscle strength of stroke patients. Conceptually increased muscle strength can improve the functional ability of stroke patients at the hospital, so that when the patient returns home the level of dependence of the patient can be reduced.

So far there have been several researchers who developed ROM exercises by applying the method Neuro-Developmental Approach (NDA). With this method, ROM exercises were carried out on both extremities of patients, both those who experienced hemiparesis and those who were healthy. A healthy patient's extremity needs to be exercised to support an increase in the patient's muscle strength. Researchers are interested in developing this bilateral ROM exercise by applying exercises Progressive Muscle Relaxation (PMR) to the extremities of healthy patients.

Progressive muscle relaxation or Progressive Muscle Relaxation (PMR) is a technique to reduce anxiety by means of tense and relax the muscles alternately (Hahn & Kim, 2006). The application of structured bilateral ROM training methods with a combination of PMR exercises conceptually can help accelerate the improvement of functional abilities of stroke patients. This is because bilateral ROM exercises have been shown to improve motor skills in stroke patients. When combined with PMR exercise fatigue, mental activity, and/or delayed physical exercise can be overcome more quickly by using relaxation exercises. In addition, progressive muscle relaxation is one of the non-pharmacological therapies that can be used in hypertensive patients, because the response of relaxation techniques can reduce heart rate by inhibiting the sympathetic nerve stress response. As is known most stroke patients have a history of hypertension. This PMR exercise can support the healing process of hypertension which is the cause of stroke. This study aims to identify the effect of structured ROM exercises and progressive muscle relaxation exercises on the functional abilities of stroke patients.

RESEARCH METHODOLOGY

Type of research is quantitative with quasi-experimental designs pre and post-test and using control groups. This study was intended to analyze the effect of structured ROM exercises and progressive muscle relaxation exercises on the functional abilities of stroke patients. The study was conducted by selecting respondents who met the criteria, then on the second day of treatment performed structured ROM exercises and progressive muscle relaxation exercises until the 7th day were treated in the intervention group. For the control group, ROM exercises were carried out in accordance with the usual procedure at the hospital.

The population of this research is all stroke patients treated at room Neuroscience Nursing Dr. Soekardjo's Hospital Tasikmalaya. Sampling was done by consecutive sampling, with the sample inclusion criteria of this study were:

- Stroke patients with GCS > 12
- Patients received medical therapy in the form of antihypertensive drugs and neuroprotectors
- Treated at least 7 days in the hospital

- Willing to be respondents

The sample exclusion criteria were:

- Patients who experienced a decrease in the level of consciousness
- Patients did not tolerate ROM Exercise
- Patients were forced to go home before being allowed to go home
- The results of the research activities obtained 26 respondents in the control group and 26 in the intervention group.

Univariate analysis was performed to describe the variables of age, sex, type of stroke, admission time, comorbidities, the frequency of attacks, functional abilities before exercise and functional abilities after exercise. To find out the relationship between the two variables (dependent and independent variables) a bivariate analysis was performed. The bivariate analysis used in this study is a dependent *t*-test (paired *t*-test) to test differences in functional values before and after ROM exercises, while independent *t*-tests were performed to examine differences in muscle strength after exercise in the control group and intervention group.

RESULTS

Univariate Analysis

Table 1: Characteristics of Respondents

variable	Control	Intervention
Average Age	54.15	54.88
Gender:		
Male	69.2%	61.5%
Female	30.8%	38.5%
Stroke Type:		
Ischemic	69.2%	69.2%
Hemorrhagic	30.8%	30.8%
Admission Time:		
a. Less than 6 hours	26.9%	19.2%
b. More than 6 hours	73.1%	80.8%
Comorbidities		
Yes	76.9%	88.5%
No	23.1%	11.5%
The frequency of attacks:		
First	84.6%	73.1%
Deuteronomy	15.4%	26.9%

Based on table 1, it can be seen that the age of the control group and intervention group was quite varied, from 26 respondents in the control group, the average age was 54.15 years, while the intervention group averaged 54.88 years. The youngest age of the control group was 36 years while in the intervention group 40 years. The oldest age in the control group was 73 years and in the intervention group 70 years. The majority of respondents are male. In the control group, as many as 18 people (69.2%) while in the intervention group 16 people (61.5%). The majority of respondents were diagnosed with ischemic stroke as many as 18 people (69.2%) both in the control group and in the intervention group. the majority of respondents came to the hospital for more than 6 hours. In the intervention group there were 21 people (80.8%) and in the control group 19 people (73.1%). The majority of respondents had a stroke with accompanying comorbidities. In the control group, 20 people (76.9%) had concomitant disease while in the intervention group 23 people (88.5%) had the concomitant disease. The majority of respondents had a stroke for the first time as many as 22 people (84.6%) in the control group and 19 people (73.1 %) in the intervention group.

Table 2: Value of Functional Ability Before and After Intervention on Control and Intervention Group

Variable	Control	Intervention
Functional Ability		
a. Before	66.96	70.96
b. After	72.62	86.88

Table 2 shows the average value of functional ability before and after intervention in the control and intervention group. The average value of the functional ability of the control group before the intervention was 66.96 and after the intervention were 72.62. The average value of the functional ability of the intervention group before the intervention was 70.96 and after the intervention were 86.88.

The Analysis Bivariate

Table 3: Average Value of Functional Ability Before and After Intervention in the control and intervention Group

Functional Ability	Mean	SD	SE	p-Value
Control :				
1. Before	66.96	9.77	1.92	0.000
2. After	72.62	9.89	1.94	
Intervention :				
1. Before	86.88	6.79	1.33	0.000
2. After	70.96	12.27	2.41	

Table 3 shows the average value of functional ability before intervention in the control group which is 66.96 while the average functional ability after the intervention is 72.62. Statistical test results obtained *p*-value 0.000, it can be concluded that there is a significant difference between the value of functional ability before and after intervention in the control group. The average value of functional ability before intervention in the intervention group was 70.96 while the average functional ability after the intervention was 86.88. Statistical test results obtained *p*-value 0.000, it can be concluded that there is a significant difference between the value of functional ability before and after intervention in the intervention group.

Table 4: Differences in average value Functional Ability after Intervention Between the Control and Intervention group

Group	Mean	SD	SE	<i>p</i> -Value
Control	72.62	9.89	1.94	0.000
Intervention	86.88	12:27	2:41	

Table 4 above shows that the average value of functional ability after intervention in the control group was 72.62, while the average value of functional ability after intervention in the intervention group was 86.88. The results of statistical tests obtained a *p*-value of 0.000, meaning that at 5% alpha there was a significant difference in the average value of functional ability after training in both groups of respondents.

Table 5: Comparison Changes in Average Functional Ability Value Before and After Intervention in Control & Intervention Group

Groups Group	Mean Before	Mean After	Changing	Meaning
Control	66.96	72.62	5.66	Increased
Intervention	70.96	86.88	15.92	Increased

Table 5 above shows clearly that the average value of functional ability in the control group before intervention is 66.96 and after the intervention the average value of functional ability changes to 72.62, meaning that there is a change in value of 5.66, so that it can be concluded that the average the value of functional ability has increased after ROM exercise intervention according to the standards set by the Hospital. Meanwhile the average value of functional ability in the intervention group before the intervention was 70.96 and after the intervention the value of

functional ability changed to 86.88, meaning that there was a change in value of 15.92, so it can be concluded that the average value of functional ability has increased after exercise intervention Structured ROM and exercise Progressive Muscle Relaxation.

DISCUSSION

The results showed that the age of the control group respondents and the intervention group was quite varied, but both showed the same thing, namely the average age above 54 years. Conceptually, age is a non-modifiable factor for stroke. Age is a factor that increases the incidence of stroke (Black & Hawks, 2010). However, in the present condition stroke can occur in productive age. This is partly due to unhealthy lifestyles, such as smoking, drinking alcohol, diabetes mellitus, and foods high in fat and cholesterol. All of these can cause blockages in the blood vessels of the brain causing a reduction in the supply of oxygen in the blood to all tissues including the brain which can result in tissue death in the brain.

According to Black & Hawks (2010), the incidence of stroke in men is higher than among women. This is in line with the results of research showing that men have a higher incidence than women. Some studies show an analysis that men who have a stroke have lower mortality compared to women. Therefore the incidence of stroke in men always increases every year. Whereas in women the mortality rate due to stroke tends to be higher so that in terms of the incidence of stroke incidence in women is lower than that of men.

Most respondents both in the control group and the intervention group experienced the ischemic stroke. The incidence of ischemic stroke is higher than hemorrhagic stroke, this is related to the increased incidence of vascular atherosclerosis which causes blockage in blood vessels, this blockage which then triggers a stroke (Lipska *et al.*, 2007). Ischemic stroke occurs due to circulatory disorders of the brain blood vessels due to obstruction of blood vessel flow. Obstruction can be caused by a blood clot (thrombus) that forms in a brain blood vessel or distal organ blood vessels. In vascular distal thrombus, the clot can be released or possibly formed in an organ such as the heart and then carried through the arterial system to the brain as an embolus (Price & Wilson, 2006).

Patients with severe strokes and decreased

consciousness and living in areas with easy access to hospitals have a tendency to be hospitalized faster. The 3-6 hours (golden period) is an important time for stroke management because at this time it has proven effective in restoring brain function and minimizing neuronal damage after an ischemic stroke. Therapy that has proven effective in restoring brain function and minimizing neuronal damage after an ischemic stroke is one of which is the administration of tissue plasminogen activator therapy (TPA) given within 3 hours (Lemone & Burke, 2004; Price & Wilson, 2006.; Smeltzer *et al.*, 2010). If in less than 6 hours the patient comes to the hospital and gets TPA therapy, the area around the infarct that is ischemic can still be maintained. Research shows that the initiation of TPA (3-6 hours) can reduce stroke size/degree and improve functional ability within 3 months (Smeltzer *et al.*, 2010). In this study, the average patient both control and intervention came to the hospital for more than 6 hours.

The results showed that the majority of respondents both in the control group and the intervention group had comorbidities such as hypertension, hypercholesterolemia and DM. This condition of hypertension is at risk of causing the rupture of blood vessels which can eventually cause a stroke. According to the concept, the higher the blood pressure the higher the likelihood of a stroke, both nonhemorrhagic and hemorrhagic. Increased levels of cholesterol, especially LDL in the blood are a risk factor for the onset of atherosclerosis. In diabetic patients, high blood sugar levels at the time of stroke will increase the likelihood of infarction expanding due to the formation of lactic acid due to anaerobic glucose metabolism which damages brain tissue.

The results showed that the majority of respondents both in the control group and intervention group were cases of stroke with the first attack. The results of this study are in line with a statistical survey conducted in the United States which revealed that every year approximately 700 thousand people in America experience a stroke. Of that amount, around 500 thousand was the first attack and 200 thousand were repeated stroke attacks (Lloyd-Jones *et al.*, 2009).

The results showed an increase in the average value of the functional abilities of patients after the

intervention. The control group carried out ROM exercises according to the standards at the hospital. After doing ROM exercises for 7 (seven) days, there was an increase in the average functional ability score from 66.96 to 72.62. ROM exercises can increase the muscle strength of stroke patients. Several studies prove the positive effect of ROM exercise on increasing muscle strength of stroke patients. With increasing muscle strength the patient's ability to move will increase. The strength of a patient's muscle will have a good impact on the ability of movement. Someone who is able to move optimally will certainly be able to carry out daily activities. The ability of patients in mobility will reduce the level of dependence of patients in meeting their daily needs. The results of the research described above are in accordance with the theoretical concepts that researchers describe. There is a significant change in the average value of the functional ability of respondents in the control group after ROM exercises.

The average value of functional ability before exercise in the intervention group was 70.96, while the average value of functional ability after exercise in the intervention group was 86.88. This shows that the exercises carried out in the intervention group have a positive impact on the development of functional abilities of stroke patients. The intervention group was given structured ROM exercises 2 times a day and combined with the exercise Progressive Muscle Relaxation (PMR). After doing the exercise for 7 days there was an increase in the average value of the functional ability of respondents from 70.96 to 86.88. As explained above, ROM exercises can increase the muscle strength of stroke patients, which in turn can improve patients' functional abilities. In this intervention group, ROM exercise was combined with PMR exercise.

Progressive Muscle Relaxation is a method to help reduce muscle tension so the body relaxes. First introduced by Edmund Jacobson in 1938 in his book, he explained that when muscle tension significantly decreases, the chance for disease emergence can be reduced. Jacobson also said that relaxation is the direct negative of nervous excitement. It is the absence of nerve-muscle impulse (Snyder & Lindquist, 2010). This PMR exercise has been studied by many people and significantly has a positive influence on blood

pressure reduction. As is known hypertension is one of the risks of stroke cases.

The results showed that both groups had increased functional ability scores after exercise. The intervention group from this study received twice daily structured ROM exercises combined with PMR exercise. This is an important factor in supporting the functional ability of stroke patients. PMR exercise has been shown to provide a relaxation effect, avoiding stress which can ultimately reduce blood pressure. Blood pressure reduction contributes very well to the neurological status of the patient. ROM exercises that are strengthened with PMR exercises will provide better support for improving functional abilities of stroke patients.

CONCLUSION

The results showed that the average value of functional ability before and after exercise in the control group and intervention group had increased. In the intervention group, the average value of functional ability after exercise increased higher than the control group. This suggests that modified ROM exercises with progressive muscle relaxation exercises can improve the functional ability of stroke patients. This exercise needs to be applied to stroke patients to increase patient independence in carrying out daily activities. This research has limitations because it is only carried out in one small city in Indonesia so other research needs to be done in a wider scope.

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