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The Effect of Early Mobilization and Body Positioning on Functional Ability in Patients with Acute Ischemic Stroke

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A B S T R A C T

There are many physical problems in post-stroke conditions which is decreased functional ability. This study aimed to determine the effect of early mobilization and body positioning on functional ability in acute stroke patients. The study design used a single blinding, randomized, and controlled trial. The sample consisted of 20 acute ischemic stroke patients selected randomly and equal distribution between the group of early mobilization and body positioning (ages 45-70, MMT 2+ and given exercises ranging from 24-48 after the attack) and the control group (age 45-70, MMT 2+ and given passive exercises 24-48 after the attack) for seven days in hospital care. All patients were evaluated with Glasgow Coma Scale, Mini-Mental State Exam, and Barthel Index. Paired t-tests and independent t-tests have been used to evaluate and differentiate between groups. The study results showed the treatment group (early mobilization and body position training) to a level of functional ability $p<0.05$ ($p=0.000$) and the mean -65. The control group (passive exercise) to the level of functional ability $p<0.05$ ($p=0.000$) and the mean-28. The difference effect between the group (early mobilization and body position training) with the control group (passive exercise) on the level of functional ability $p<0.05$ ($p=0.000$) with a mean difference was 36.9. Early mobilization and body position training are other approaches that can improve functional abilities in patients with acute ischemic stroke

INTRODUCTION

Stroke is a disease which affects the arteries that lead to and inside the brain. A stroke occurs when blood vessels that carry oxygen and nutrients to the brain and burst are blocked by blood clots. As a result, the brain cannot get blood and oxygen. Haemorrhagic stroke is acute focal neurological dysfunction caused by bleeding in the brain substance that occurs spontaneously due to the rupture of arteries and capillaries. In contrast, non-haemorrhagic stroke or ischemic is a disease caused by a blockage that cuts off the blood supply to the brain. This condition can cause damage to brain cells (Stroke Association, 2020).

According to data Public Health Office of Central Java (2013), stroke prevalence in Central Java, as many as 40,972 consisted of 28,430 ischemic strokes and 12,542 haemorrhagic strokes. In Surakarta, cases of stroke in the pattern of non-communicable diseases with the prevalence of ischemic stroke as many as 1,309 cases and haemorrhagic stroke of as many as 2,838 (Public Health Office of Surakarta, 2014). The effect of an increase in the stroke incidence is an increase in other health problems due to complications caused, one of which is a decrease in functional ability. Functional ability is an Activity of Daily Living (ADL) consisting of basic actions involving the care of oneself and body, including personal care, mobility, and eating. Often called physical ADLs or essential ADLs, it covers the basic skills that are usually needed to manage basic physical needs (Mlinac & Feng, 2016). Post-stroke patients with a high

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degree of attack often leave residual symptoms that interfere with motor skills. Movement disorders and the inability to perform a movement properly cause a decrease in ADL's ability (Pristianto *et al.*, 2021).

Based on NICE Guidelines (2019), early body position training regularly continuous for seven days can increase the oxygen supply into the brain. The training can activate the damaged cells in the brain so that more oxygen supplies through the blood enter the brain.The brain will get nutrients to function properly, and there will be cell improvements that can affect functional activity well.

A number of training programs can be given to ischemic stroke patients to improve functional abilities, such as early mobilization and body position training. Early mobilization is an exercise that leads to the principle of regular input proprioceptive, inhibition and facilitation. It refers to improving gross motion patterns by providing sensory stimulation to facilitate voluntary movements of the synergy muscles at the onset of stroke (Becheva & Georgiev, 2017). Meanwhile, according to NICE Guidelines (2019), body positioning training help increase the oxygen supply in the blood to the brain to minimize the decrease in brain cell function.

Based on the background, the authors are interested in research to determine the effect of exercise in improving the functional ability of patients with post-acute ischemic stroke. The title is the effectiveness of early mobilization and body position training on the level of functional ability in patients with acute ischemic stroke.

METHOD

The study design was experimental with a single-blinding design. The first group (treatment group) was given passive exercise treatment, early mobilization, and body position training; and the second group (control group) was given passive exercise treatment. This study was conducted in December 2018 in the stroke ward of the Regional General Hospital dr. Soehadi Prijonegoro Sragen. The Institutional Review Board has approved this study of the Medicine Faculty, Universitas Muhammadiyah Surakarta no: 1679/B.1/KEPK-FKUMS/XI/2018.

The population of the study were ischemic stroke patients with sampling determined by inclusion and exclusion criteria, namely (a) Respondents aged 45-70 years, (b) Respondents diagnosed with ischemic stroke attacks current and recurrent acute stage on stroke wards were ascertained no worsening of neurological conditions, (c) Respondents with muscle strength of at least 2+ (antigravity position, through a partial range of motion movements), (d) Respondents with risk factors (hypertension, diabetes mellitus, cholesterol, heart disease (AMI and cardiomegaly), (e) Respondents approved informed consent and (f) were willing to follow the research. Exclusion criteria (a) the respondent was diagnosed with haemorrhagic stroke. (b) Respondents with serious complications, (c) Respondents with aphasia, (d)

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Respondents with decreased consciousness, shock emboli and sepsis, (e) Respondents with severe cognitive impairment where (score MMSE is at least 19).

Respondents were divided into two groups; each group amounted to 10 people, the first group was given early mobilization and body position training, and the second group was given passive exercise treatment. The study began with an explanation by the researcher regarding the course of the research to the enumerator, whom enumerator then took over to explain to the respondent and continued to fill out the *informed consent*. Then, the respondent was given treatment randomly according to the group.

The measurement of the ability of functional activities of patients with post-acute ischemic stroke was using the Barthel Index (BI). Post-acute ischemic stroke in the group was early mobilization patients performed with 8-10 repetitions in 20-45 minutes every day for seven days, working through the application of proprioceptive modalities on sensory and proprioceptive information in improving the efficiency of movement for functional ADL. In general, giving body position training in one week is when the 24-hour acute ischemic stroke one to two sessions per day for seven days. The head may be elevated gradually after 24 hours from lying flat; this position affected the change in the saturation point of oxygen flow in the brain. The form of body position training consisted of side-lying extra positioning, side-lying sinistra positioning and supine-lying positioning on the bed.

Position of side-lying dextra with the weak side above the shoulder and left knee, place the left shoulder straight parallel to the shoulder and give a suspension, then the position of knee flexion, give cushion support. Keep the neck parallel to the spine if it is not aligned, giving a thin pillow next to the waist. Position of the side lying down left with a weak position under the body; the scapula must be shifted forward with the shoulder position until the left wrist goes straight to the ventral parallel of the shoulder. The position of left knee extension was then followed by dextra knee flexion and given a pillow as a suspension. Keep the head parallel to the spine; if it is not parallel, give a thin pillow next to the waist. A supine lying was not allowed for too long because it could cause muscle weakness, especially muscle posture. Give the pillow support from the shoulder to the wrist with the palm supination and the foot propped up using a pillow to make it straight.

In the control group, routine exercise therapy was given 15 minutes per day for seven days of physiotherapy. Passive exercise therapy was also given in the group of early mobilization and body position training. Patients and families of patients have been given information about the purpose of the exercise. The statistics used were Statistical Package for the Social Sciences (SPSS) version 23, which has been used to analyse data acquisition. Shapiro Wilk Test to find out the data was normally distributed ($p>0.05$). Data analysis has been displayed with frequency and percentage for sample characteristics based on age. In contrast, characteristics of functional activity values were categorized as verifiable (Mean, median, standard deviation, maximum and minimum). The results of the normality test data show

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that the data were typically distributed. The parametric statistical test was used, namely the Paired t-test for categorized variables (mean difference). Then the average difference test was carried out between two effective treatments using the independent t-test for categorized variables (mean difference).

RESULT

The sample consisted of 20 acute ischemic stroke patients randomly selected and equal distribution between early mobilization and body position training group (ages 45-70, MMT 2+ and given exercises ranging from 24-48 post-attack) and control group (age 45 -70, MMT 2+ and given passive exercise therapy 24-48 after the attack) for seven days in hospital care. There are differences in the effect of early mobilization and body position training with passive exercise therapy to improve functional ability in acute ischemic stroke patients.

Table 1. Characteristics of Respondents Based on Age

Age	Acute ischemic stroke	
	Frequency	%
45-50	1	5,0
51-55	2	10,0
56-60	4	20,0
61-65	4	20,0
66-70	6	30,0
71-75	3	15,0
Total	20	100

Based on Table 1, the criteria of sample respondents aged 48-73 years. The highest number of acute ischemic stroke patients aged 59, 65, 66 and 70 years (10.0%), while for other ages (5.0%).

Table 2. Effect Test Result

Group	Mean Difference	p Value	Description
Treatment (Bobath concept training and body position training)	-65	0.000	Ha accepted
Control (Conventional)	-28		

The effect test of functional activities using Paired Sample t-test obtained a value of in the treatment group is 0.000. While for the control group, the value is 0.000. Both groups of Ha were accepted because the p-value <0.05 means there is a difference in the influence of the average value of functional activities in acute ischemic stroke patients.

The effect test of functional activities using Paired Sample t-test obtained values in the treatment group is 0.000. While for the control group, the value is 0.000. Both groups of Ha were accepted because the p-value <0.05 means there is a difference in the influence of the average value of functional activities in acute ischemic stroke patients.

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Table 3. Difference Effect Test Result

Group	Mean Difference	p (2-*tailed*)
Treatment (Bobath concept training and body position training)	36.9	0.000
Controls (Conventional)		

The table 3 uses the independent test, the results obtained p = 0.000 between treatment and control groups have the same results. Normal p-value <0.050, then Ha is accepted, and Ho is rejected, which means there is a difference in the influence of the average value of the functional activity that is significant in acute ischemic stroke patients.

DISCUSSION

Our main findings show that giving early mobilization and body position training for 60 minutes can improve functional ability in patients with acute ischemic stroke. When giving early mobilization, a stimulus and conscious movement are needed; when given a stimulus and active movement, it will form a trajectory and connectivity between one nerve cell and another so that will form a signal electric after reaching the excitatory threshold of -40mV to -90mV (Ma *et al.*, 2017).

In this process, there will be Depolarization; certain ion channels will open so that ion displacement will occur down the concentration gradient; this process is called the action potential due to the exchange of K + ions, which are outside the membrane and Na + inside the membrane. As a result of the increase in the amount of sodium in the cell, while the amount of potassium remains, there is a change in the membrane's electrical potential where the intracellular electrical potential becomes more positive than extracellular (Drier *et al.*, 2018).

After Depolarization occurs, the potential resting membrane will be restored through repolarization. In this process, the Na + channel that were previously open will close and is followed by the opening of the K + channel. K + will move down the concentration gradient and return the membrane potential in the cell to negative (Kadir *et al.*, 2018). To generate information, it must reach the threshold (-40Mv to -90mV). The chemical signal will open and then release the vesicle as a giver of information to nerve cells so that nerve cells can synapse to other nerve cells, which will improve brain function and make it easier to embed a pattern such as specific task when giving training, so that it can improve functional activity (Forrest, 2014).

In addition, giving early mobilization will control afferent input and facilitate normal postural reactions. The provision of a mobilization program in a particular region adjusts to the movement ability and ROM (Pristianto *et al.*, 2018). Afferent input is used to improve that region's quality of movement, especially on the lesion side. Facilitation of postural reactions is used to provide the experience that movements are regular (because abnormal movements originate from abnormal tones). Changes or regulation of proximal

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joint position and movement affect tone (Rahayu *et al.,* 2017). Based on Purnamayanti *et al.* (2020), motion exercises given to stroke patients can improve muscle ability and plasticity stimulus. Furthermore, Amalia & Rahman (2022) stated that it is essential to maintain fitness in stroke patients by providing proper exercise.

Body positioning can improve blood circulation, provide appropriate sensory information, and improve postural stability and strength to improve functional activity in patients with acute ischemic stroke. In lying position, the patient needs a good supine position and utilizes the pillow as a support so that the pelvis does not fall backwards. It is increasing the hip extension of the hip joint,which is useful for the walking process so that the hip joint will be mobile and not rotate externally. This position stabilizes the muscles of core stability, such as m. tranversus abdominis, m. multifindus, m.internal oblique, m. external oblique, m. rectus abdominis, m. sacrospinalis (longissimus thoracis and diaphragm), m. latissimus dorsi, m. gluteus maximus and m. trapezius, an increase in muscle core will cause nerve conductivity which can improve intermuscular coordination so that it can increase reaction speed and the mobility of motion function at the position change (Yu & Park, 2019).

When the pelvic floor is stable, it will maintain the projection of the body's centre of gravity when doing a movement (Bettlach *et al.,* 2016). Side-lying to the healthy side is needed in handling early stroke patients to improve the blood flow to the brain due to prolonged immobilization so that it will facilitate information that will be conveyed to the brain for improvement of tone and posture by increasing m. internal intercostalis, m. subcostal, m. transversus thoracis, m. serratus posterior inferior, m. obliquus internus, m. external abdominal obliqus and m. tranversus to repair respiratory muscles due to a centralized thoracic cage in the expiratory position (Stevens *et al.,* 2018). Side-lying to the lesion side with the position of the shoulder pushed forward and not suppressed will provide a stimulus with force used by the healthy side weight to the weak side (Latimer *et al.,* 2019).

Gjelsvik *et al.* (2016) stated that body position training can improve blood circulation, provide appropriate sensory information, and improve postural stability and strength to improve functional activity in acute ischemic stroke patients. As evidenced by previous research by Chatterton *et al.* 2001), body position training can improve tone, prevent lung complications due to bed rest and maintain oxygen in the brain to improve functional activity. Clinically, our research results can help physiotherapist change their rehabilitation programs and contribute to the addition of scientific evidence from early mobilization and body position training.

CONCLUSION

Early mobilization and body position training is a different approach to improve the functional ability of acute ischemic stroke patients. In the future, a different controlled trial is needed to examine the effects of

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early mobilization and body position training with the instrument Brain Derived Neurotropic Factor (BDNF) to see cell regeneration in the blood, which will determine the frequency of exercise in acute ischemic stroke patients.

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