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The Effect of Range of Motion (ROM) Application on Muscle Strength in Elderly Stroke Sufferers at the Tresna Werdha Asisi Social Institute Sukabumi City the Year 2022

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A B S T R A C T

A stroke is a brain dysfunction that occurs suddenly due to abnormal blood circulation in the brain. An elderly is someone who has entered the age of 60 years and over. Muscle strength is the strength of a muscle or muscle group produced to fight resistance with maximum effort. Range Of Motion (ROM) is an exercise performed to maintain or improve the ability to move joints normally and completely to increase muscle mass and tone to prevent deformities, stiffness, and contractures

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INTRODUCTION

After cancer and cardiovascular disease, stroke is the third most prevalent cause of death in developed countries. A stroke affects more than 700,000 Americans annually, 25% of whom are under 65, and 150,000 people may away as a result of a stroke or its complications. According to Goldszmidt and Caplan (2017), 4.7 million Americans have experienced a stroke at some point in time. According to Hearth Disease and Stroke Statistics - 2017 Updates from the American Hearth Association/American Stroke Association (AHA/ASA), a stroke occurs in America every 40 seconds on average, and a stroke-related death occurs every 4 minutes (Roger et al., 2017).

Cerebrovascular disease is one of the second leading causes of death and the third leading cause of disability globally (Hosseini et al., 2019). The World Health Organization estimates that 7.75 million people worldwide died from strokes in 2018. According to the Centers for Disease Control, one person in the US passes away from a stroke every four minutes as of 2020.

The main causes of death based on the system registration sample (SRS) include non-communicable diseases (PTM), namely stroke in the first place, coronary heart disease in second place, and diabetes mellitus third (Ministry of Health, 2016). Riskesdes results in 2018 showed the prevalence of stroke (Permil) based on diagnosis in residents aged > 15 years by province 2013 - 2018 in Indonesia reached 10.9% in 2013, and 2018 it increased to 14.7%, according to the characteristics of 2018 the highest age stroke is 75 years and over. The results of the number of stroke sufferers in Indonesia in 2013 based on the diagnosis of health workers (Nakes) were estimated at 1,236,825 people (7.0%), while based on the diagnosis of Health Workers/symptoms, it was estimated that there were 2,137,941 people (12.1%). Based on the diagnosis of health workers and diagnoses/symptoms, West Java Province has the highest estimated number of sufferers, namely 238,001 people (7.4%) and 533,895 people (16.6%). In contrast, West Papua Province has the least sufferers, namely 2,007 people (3.6%) and 2,955 people (5.3%). According to the 2018 Basic Health Research (Riskesdas) report, Indonesia experienced an increase in the incidence of stroke from 2013 to 2018, namely 7% in 2013, while in 2018, it rose to 10.9%, with the specification of 11.0% male, 10.9% female.

The 2018 Riskesdas data shows that the highest prevalence of stroke in Indonesia is in the Province of East Kalimantan (14.7), and the lowest is in the Province of Papua (4.1%). The prevalence of stroke in South Sumatra is 10% (Ministry of Health, 2019).

Basic Health Research (Riskesdas) results in 2018 showed that 10.9% or 713,783 Indonesians had a stroke. Meanwhile, West Java Province has a prevalence of stroke sufferers based on a doctor's diagnosis of 11.4% or 131,846 residents of West Java who have had a stroke.

Stroke causes damage to the brain that appears suddenly, progressively, and quickly as a result of non-traumatic brain blood circulation disorders; these sudden disturbances can cause symptoms including changes in consciousness, visual disturbances, speech not fluent, slurred speech to paralysis of the entire face or limbs, and others (Riskesdas, 2018). After a stroke, hemiparesis or one-

sided muscle weakness is a serious motor disorder affecting 65% of stroke survivors. Muscle weakness can cause immobilization in sufferers, so reduced activity can cause serious complications (Wist et al., 2016).

According to Tiarnida (2019), Range Of Motion exercises are a part of rehabilitation that has a large enough role in restoring the patient's ability to move again, and meet their daily needs, until they can return to work. Research conducted by Susanti and Bistara (2019) shows that the muscle strength in the hands before the Range of Motion was carried out. Namely, there were 11 respondents on a scale of 3 and 17 respondents on a scale of 4; after the Range of Motion was carried out, the respondents experienced an increase in muscle strength on a scale of 4, totaling 25 respondents.

Agonwardi and Budi (2016) said that Range of Motion (ROM) exercises could be useful for maintaining and improving the ability to move joints normally and completely to increase muscle mass and tone. This statement has similarities with the results of Basuki's research (2018) that the application of ROM is very effective for patients who experience post-stroke muscle weakness.

Based on a preliminary study conducted at the Tresna Werdha Asisi Social Institution, Sukabumi City, on May 26, 2022, the number of elderly living in the orphanage is 48 older adults with an average age of 70-80 years. Of all the elderly living in the Tresna Werdha Asisi Social Institution, Sukabumi City, there are several elderly who still have health problems that cause disease, such as Diabetes Mellitus. As many as eight people, stroke 11 people, rheumatism five people, and around 24 people have limited ADL. (preliminary study input)

Researchers consider that muscle strength in elderly stroke sufferers is a serious problem because of post-stroke motor disorders, so patients experience deficits in their ability to do activities in the future. Therefore, researchers are interested in conducting research to identify how implementing a range of motion affects muscle strength in elderly stroke sufferers.

THEORETICAL REVIEW

According to Tiarnida (2019), Range Of Motion exercises are a part of rehabilitation that has a large enough role in restoring the patient's ability to move again, and meet their daily needs, until they can return to work. Research conducted by Susanti and Bistara (2019) shows that the muscle strength in the hands before the Range of Motion was carried out. Namely, there were 11 respondents on a scale of 3 and 17 respondents on a scale of 4; after the Range of Motion was carried out, the respondents experienced an increase in muscle strength on a scale of 4, totaling 25 respondents.

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METHODOLOGY

This study used a pre-experimental research design with the one-group pre-test post-test method. The sampling technique in this study was a total sampling of 7 respondents. Bivariate analysis in this study used a paired t-test.

RESULTS

Univariat Analysis

1. Characteristics of Respondents Based on Gender

Table 1. Characteristics of Respondents Based on Gender at Tresna Werdha Asisi Social Institution, Sukabumi City, in 2022

No.	Gender	Frequency (F)	Presentase (%)
1.	Women	4	57,1%
2.	Men	3	42,9 %
	Total	**7**	**100**

Source: Data Primer, 2022

Table 1 shows four female stroke sufferers (57.1%) and three male stroke sufferers (42.9%)

2. Characteristics of Respondents Based on Gender

Table 2. Characteristics of Respondents Based on Ages at Tresna Werdha Asisi Social Institution, Sukabumi City, in 2022

No.	Ages	Ages (F)	Presentase (%)
1.	55 – 65	4	57,1 %
2.	66 – 75	1	14,3 %
3.	76 – 85	2	28,6 %
	Total	**7**	**100**

Source : Data Primer, 2022

Table 2 shows that the largest age of stroke patients is at the age of 55-65 years, totaling 4 people (57.1%), the lowest is at the age of 66-75 years, amounting to 1 person (14.3%), and ages 76-85 amounting to 2 people (28,6%)

3. Characteristics of Respondents Based on Gender

Table 3. Characteristics of Respondents Based on education at Tresna Werdha Asisi Social Institution, Sukabumi City, in 2022

No.	Pendidikan	Frekuensi (F)	Presentase (%)
1.	SMP	2	28,6 %
2.	SMA	3	42,9 %
3.	SARJANA	2	28,6 %
	Total	**7**	**100**

Sumber : Data Primer, 2022

Table 3 shows that there are 2 junior high school students (28.6%), 3 senior high school students (42.9%) and 2 graduate students (28.6%).

4. Muscle Strength Before the Application of ROM in the Elderly Stroke

Table 4. Muscle Strength before ROM was applied to the elderly Stroke at Tresna Werdha Assisi Social Institution, Sukabumi City, in 2022

Stroke	N	Mean	Median	Modus	Minimum	Maximum
Before strength muschle	7	2.57	2.00	2	1	4

Table 4 shows that of the seven respondents, the results of this study showed that the respondent's muscle strength before being given the ROM application intervention obtained a minimum value before 1, a maximum value before four, and an average value before 2.57.

5. Muscle Strength After Being Given the Application of ROM in the Elderly Stroke

Table 5. Muscle Strength after being given the Application of ROM to the elderly Stroke at the Tresna Werdha Assisi Social Institution, Sukabumi City, in 2022

Stroke	N	Mean	Median	Modus	Minimum	Maximum
Before strength muschle	7	3.29	3.00	3	1	5

Tabel 5 menunjukkan bahwa dari 7 responden hasil dari penelitian ini menunjukkan bahwa kekuatan otot responden sesudah diberikan intervensi latihan ROM didapatkan nilai minimum sesudah 1, untuk nilai maximum sesudah 5 dan untuk nilai rata-rata sesudah 3.29.

Bivariate Analysis

1. **Analyzing the Effect of ROM Implementation on Muscle Strength in Stroke Elderly**

Table 6. Pengaruh Penerapan ROM Terhadap Kekuatan Otot Pada Lansia Stroke

Kekuatan Otot	N	Mean Rank	pValue
Before Strength Muscle	7	2.57	0.262
After Strength Muscle	7	3.29	0.591

The results of the data normality test using the Shapiro Wilk Test found that the data were normally distributed because the muscle strength values showed a p-value> $\alpha = 0.262$ for the pretest and 0.591 for the posttest. Meanwhile, the requirement for the data to be normally distributed is $p > \alpha = 0.05$. So the researchers took the Paired T-Test as a test to see the effect of implementing ROM on muscle strength in stroke patients at the Tresna Werdha Assisi Social Institution, Sukabumi City. The results of the Paired T-Test can be seen in Table 7 below:

Table 7. The Effect of Application of ROM on Muscle Strength in Stroke Elderly at Tresna Werdha Assisi Social Institution, Sukabumi City, in July 2022

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Before Strength Muscle	2.57	7	1.134	.429
After Strength Muscle	3.29	7	1.496	.565

Paired Samples Correlations

	N	Correlation	Sig.
Before Strength Muscle & After Strength Muscle	7	.968	.000

Paired Samples Test

				95% Confidence Interval of the difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig.(2-tailed)
Before Strength Muscle After Strength Muscle	-714	.488	.184	-1.166	-263	-3.873	6	.008

Research conducted for six days showed that applying ROM can increase muscle strength. The results of the Paired T-Test on muscle strength showed an effect of the application of ROM on muscle strength in the elderly with stroke at the Tresna Werdha Asisi Social Institution, Sukabumi City, or an increase in muscle strength after the application of ROM.

Based on the results of Table 7, the conclusion that can be drawn is that there is an effect of the application of ROM on muscle strength in the elderly with stroke at the Tresna Werdha Assisi Social Institution, Sukabumi City. The results of the Paired T-Test, the results of study proved that H1 was accepted, which means that there was an effect of the application of ROM on muscle strength in stroke patients at the Tresna Werdha Asisi Social Institution, Sukabumi City, or an increase in muscle strength after the application of ROM.

DISCUSSION

1. Muscle Strength Before the Implementation of Range of Motion (ROM) at Tresna Werdha Assisi Social Institution, Sukabumi City, in 2022

The study results of 7 respondents at the Tresna Werdha Asisi Social Institution, Sukabumi City, before being given ROM exercises, was the average muscle strength before ROM exercises in stroke patients was 2.57. The lowest muscle strength is one, and the highest is 4.

According to (Nurrahmani, 2016), other factors that influence stroke are that men have a higher risk of a stroke earlier. Men also have a greater risk of morbidity and mortality from several cardiovascular diseases, while stroke occurs more frequently in women over 50. This theory supports the research results that most of those who suffer a stroke are female. The ROM mechanism will stimulate motor neurons (brain) by releasing transmitters (acetylcholine) to stimulate cells to activate calcium so that protein integrity occurs. If calcium and troponin C is activated, actin and myosin are maintained to maintain skeletal muscle function, increasing muscle tone. (Guyton, 2015)

From the description above, the researcher argues that the female gender over 50 is a factor causing stroke, and in this study, many female respondents over 50 had suffered a stroke.

According to Kwakkel et al. (2013), it was said that 30-60% of stroke responders who experience less muscle strength would experience loss of upper and lower extremity function within six months.

Researchers argue that the conditions from the data above can cause a decrease in muscle strength in the extremities in general, and a decrease in flexibility and joint stiffness, which can lead to contractures so that, in the end, the respondent will experience limitations, especially in carrying out activities.

Muscle strength is closely related to the neuromuscular system, namely the ability of the nervous system to activate the muscles to contract. So that the more muscle fibers that are activated, the greater the force generated by the muscle. The muscle strength of the legs, knees, and hips must be adequate to maintain body balance when there is external force pressure. Muscle strength is directly related to the ability of the muscles to resist the force of gravity and other external loads which continuously affect body position (Risangdiptya, 2016).

2. Muscle Strength After the Implementation of Range of Motion (ROM) at Tresna Werdha Assisi Social Institution, Sukabumi City, in 2022

The results of the study of 7 respondents at the Tresna Werdha Asisi Social Institution, Sukabumi City, after being given ROM training, the average was 3.2. The lowest muscle strength was one, and the highest was 5. From the muscle strength before and after ROM training, five people experienced an increase in muscle strength, and two others had constant muscle strength. In 2 patients who had fixed muscle strength, it may have been because while the ROM exercises, the patients could not follow ROM exercises properly.

According to (Nurarif; Hardhi, 2015), many risk factors cause stroke, such as factors that cannot be changed (gender, age, genetics) and factors that can be changed (hypertension, heart disease, cholesterol, obesity, and diabetes mellitus). Older age is more susceptible to stroke. In general, the risk of a stroke starts at

age 35 and will double in the following year. The study results found that the age characteristics of the largest stroke sufferers were at the age of 55-65 years, amounting to 4 people (57.1%), and the lowest at the ages 66-75 amounting to 1 person (14.2%).

The results of this study are supported by Nurrahmani's theory (2016) which says that the age factor is one of the causes of increased stroke occurrence. Meiwanto (2013) states that the risk of having a stroke with age, especially those over 50 years old, respondents will enter the elderly period, causing respondents to experience many physiological changes such as decreased elasticity of blood vessels which causes arteriosclerosis/narrowing of blood vessels so that blood flow to the brain is disrupted resulting in stroke which in the end the elderly experience a decrease in muscle strength.

From the description above, the researchers argue that age is a factor in the cause of stroke, mostly at 55-65 years. Other factors that can influence it are gender and heredity.

Hasan's research (2013) said education comes from the word "didik," which means Bina, which means the nature of the act of fostering and training, teaching and educating, therefore education is coaching, training, teaching, and all things that are part of human efforts to increase intelligence and Skills.

Notoadmodjo (2013) states that the higher a person's education, the higher his understanding of something. So, the education level has a very important role in determining the human quality or mindset; the higher a person's level of education, the higher the quality or, the better his mindset.

Based on the facts of the research above, it is argued that after ROM, muscle strength mostly increases. This shows that the provision of Range Of Motion (ROM) can positively impact increasing muscle strength in stroke patients.

According to (Puspawati, 2014), intervention with Range Of Motion (ROM) on muscle strength twice a day is more effective than using ROM once a day because it can increase strength more effectively and achieve good muscle strength.

3. The Effect of Application of Range of Motion on Muscle Strength at Tresna Werdha Assisi Social Institution, Sukabumi City

Based on the results of this study, to determine whether there was an effect of implementing ROM, a normality test was previously carried out, namely Shapiro Wilk; the results were 0.262 for the pre-test and 0.591 for the post-test, namely normal, then using the Paired T-test. The signed rank test showed that the statistical test results obtained $p = 0.008 < \alpha = 0.05$, which means that H1 is accepted, which means that there is an effect of the application of Range Of Motion on muscle strength in stroke patients at the Tresna Werdha Assisi Social Institution, Sukabumi City. The conclusion from this statistical test is that there is an effect of the application of Range Of Motion on muscle strength in stroke patients at Tresna Werdha Asisi Social Institution, Sukabumi City, or there is an increase in muscle strength when doing ROM exercises.

Research conducted by Judi Nurbaeni, I Ketut Sudiana, and Harmayetty by doing ROM increases muscle strength because when ROM is done to mobilize

joints, this activity will stimulate cells to activate Ca+ so that muscle protein integrity occurs. If Ca+ and troponin are activated, actin and myosin are maintained so that the muscles can move the skeleton. The skeletal movement will be followed by muscle contractions so that the muscles expand, enlarge, and tone arises. Finally, muscle strength can appear, immobilization can be eliminated, and joint contractures can be prevented. Exercise is physical activity to condition the body to improve health and maintain physical health (Potter & Perry, 2013). ROM is a joint movement exercise that allows contraction and muscle movement, where the client moves each joint according to normal movement, either actively or passively.

The pathophysiology of stroke, namely cerebral infarction, is reduced blood supply to certain brain areas. The extent of infarction depends on factors such as the location and size of the vessel and the adequacy of collateral circulation to the area supplied by the occluded vessel. The blood supply to the brain may change (slower or faster) in local disturbances (thrombus, embolism, hemorrhage, and spasm). vascular) or due to general disorders (hypoxia due to pulmonary and cardiac disorders). Atherosclerotic often/tends to be an important factor in the brain, which is stenosed, where blood flow will be slow, or turbulence occurs. Oxygen is very important for the brain; if hypoxia occurs as occurs in a stroke, the brain will experience metabolic changes, cell death, and permanent damage that occurs within 3 to 10 minutes (American Heart Association, 2015). The blood vessels most commonly affected are the cerebral and internal carotid arteries in the neck (Guyton & Hall, 2015).

In this study, according to the researchers, ROM exercises have been proven to increase muscle strength in stroke patients. With the results for muscle strength that experienced an increase, there were five respondents, who had the same results, there were two respondents, and for those who experienced a decrease, there were none (0). This means that ROM exercises can increase muscle strength in stroke patients. It also proves that ROM exercises can increase muscle strength in stroke patients. So according to researchers, ROM exercises can increase muscle strength in stroke patients.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the research and discussion of the effect of applying a range of motion (ROM) on muscle strength in elderly stroke sufferers at the Tresna Werdha Assisi Social Institution, Sukabumi City, it can be concluded:

1. Muscle strength in the elderly with stroke at the Tresna Werdha Assisi Social Institution, Sukabumi City, the average muscle strength before being given the Range Of Motion exercise intervention is 2.57 rounded to 3, which means that muscle movement can only fight gravity.
2. Muscle strength in stroke patients at the Tresna Werdha Assisi Social Institution, Sukabumi City, the average muscle strength after being given the Range of Motion exercise intervention is 3.29 rounded to 4 means that muscle movement can defy gravity and light resistance.

3. Range of Motion Exercise affects Muscle Strength in Stroke Patients at Tresna Werdha Assisi Social Institution, Sukabumi City.

FURTHER STUDY

You can do the same research but with different physical exercises or therapies for further research. So that future researchers can find out that physical exercise or other therapy can also increase muscle strength.

ACKNOWLEDGMENT

It is hoped that this KTI can be used as a reference for students who will conduct further research so that students can learn about the effect of applying Range Of Motion on muscle strength in elderly stroke sufferers at the Tresna Werdha Asisi Social Institution, Sukabumi City.

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