

Original Article

# The Effect Of Giving A Combination Of Mirror Therapy And Rom (Range Of Motion) Based On Self Care Theory On Muscle Strength In Stroke Patients

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**ABSTRACT**

**Background:** Stroke is a state of neurological deficit that occurs when some brain cells die due to flow disturbances. Stroke patients experience hemiparesis and have limitations in upper and lower limb motor function and motor function, leading to limitations on functional mobility. According to Riskesdas (2020) Indonesia, the prevalence of stroke has increased from 7% to 10.9%, while stroke sufferers in East Java are 507 people. The purpose of this study was to analyze the effect of giving a combination of mirror therapy and ROM based on self care theory on muscle strength in stroke patients in the Inpatient Room of RSI Darus Syifa' Surabaya


**Methods:** This type of research used True Experimental with Pretest-Posttest Control Group Design. The population in this study were 103 stroke patients. The sampling technique used probability sampling by simple random sampling, the sample size in this study was 34 respondents, 17 respondents for the control group and 17 respondents for the intervention group. The instrument for measuring muscle strength used the Medical Research Council (MRC) scale. The data obtained were analyzed using Wilcoxon Sign Rank Test and Mann Whitney.


**Results:** The results of Mann Whitney on muscle strength variables with a significant level of  $0.000 < = 0.05$ , indicate that there is an effect of a combination of mirror therapy and rom (range of motion) based on self care theory on strength. muscles in stroke patients in the inpatient ward of the rsi darus syifa 'surabaya.

**Conclusion:** The conclusion of this study is that the combination of mirror therapy and ROM based on self care theory has an effect on muscle strength in stroke patients and is easy to do, so that it can be applied as a nursing intervention in inpatient rooms for the development of nursing science in hospitals.

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## Introduction

Stroke is a state of neurological deficit that occurs when some brain cells die due to impaired blood flow due to

blockage or rupture of blood vessels in the brain. The phenomenon that occurs is that stroke patients suffer from persistent neurological deficits that interfere with their daily life activities so that it can cause



paresis of upper limb complications in patients because it can cause motor control disorders in stroke patients resulting in loss of coordination, body balance ability and the ability to maintain certain positions. In addition, stroke survivors experience hemiparesis and 55%-75% have limitations in upper extremity functioning and motor function of both upper and lower extremities is often impaired, leading to limitations on functional mobility (Broderick et al., 2018; Guo, Qian, Wang, & Xu, 2019).

*World Health Organization* states that stroke is the second leading cause of death in the world after heart disease (WHO, 2018). Stroke is also the second global cause after heart disease in 2020 and the fifth leading cause of death in the United States with a total of 129,000 per year. Stroke sufferers in the United States aged between 55-64 years as many as 11% have silent cerebral infarction, the prevalence increases to 40% at the age of 80 years and 43% at the age of 85 years. In Indonesia, the prevalence of stroke has increased from 7% in the 2018 Basic Health Research to 10.9% in the 2020 Basic Health Research (Kemenkes RI, 2020). The prevalence of stroke in Indonesia based on diagnosis by health workers is 7 per mile and those diagnosed by health workers or symptoms are 12.1 per mile, the prevalence of stroke based on diagnosis by health workers and symptoms is highest in South Sulawesi (17.9%), DI Yogyakarta (16.9%), Central Sulawesi (16.6%), followed by East Java at 16 per mile (Riskesdas, 2018). The prevalence of stroke in the city of Surabaya also increased in 2007–2013. In 2007 the prevalence of stroke in Surabaya was 0.7% then in 2013 it increased by 16.2% (Depkes RI, 2013). According to the results of the 2013 Riskesdas survey, the number of stroke sufferers was 507 patients in the

province of East Java, and the highest percentage of stroke sufferers was in the city of Surabaya, and data on the dependency level of the elderly due to stroke was 39.53% depending on the total and 7.63% depending on moderate. in meeting daily needs.

Stroke is a disruption of the blood supply to the brain which usually occurs due to the rupture of a blood vessel or a blockage due to a blood clot. This causes disruption of the supply of oxygen and nutrients in the brain to the occurrence of damage to brain tissue. Stroke is a rapid development of focal or global clinical signs caused by disturbances in brain function with symptoms that occur within 24 hours or more and can cause death (WHO, 2020). Stroke patients will experience weakness on one side of the body/hemiparesis, hand and foot weakness in stroke patients will affect muscle contraction. Reduced muscle contractions are caused by reduced blood supply to the hindbrain and midbrain, so that it can inhibit the main conduction between the brain and the spinal cord (Ryan et al., 2021; Tofani et al., 2022). *Theory care* defines *self-care* or self-care as the continuing contribution of adults to their existence, health, and well-being. Orem said that *self-care* is a personal activity to maintain and maintain health and also prevent complications from diseases experienced by individuals. Stroke has a long-term impact on the life of a person with a stroke, which is characterized by signs and symptoms that appear and interfere with health. *Self care* in stroke is an important factor in controlling the disease.

Based on a preliminary study conducted by researchers, at the Islamic Hospital Darus Syifa' Surabaya from January to March 2022 as many as 103 stroke patient clients were treated in

inpatient rooms and as many as 82% (84 patients) experienced hemiparesis. Interventions in stroke patients who experience hemiparesis are carried out in the form of passive ROM exercises for approximately 10 minutes once in the inpatient period guided by a physiotherapist where the implementation involves the patient's family, with the hope that the family will be more optimal in providing psychological support or support for the client. and can be done on the client after discharge from the hospital.

Researchers also obtained data that the success rate of ROM (*Range of Motion*) therapy to increase the degree of muscle strength was still not optimal, namely 87% (73 patients) with a muscle strength scale of 1-2 when discharged from the hospital.

One solution to improve muscle strength in stroke patients is a combination of mirror therapy and *range of motion*. Mirror therapy is one of the new therapeutic methods in rehabilitation that focuses on moving healthy limbs. Mirror therapy is done by looking at and moving healthy limbs in front of a mirror and sick ones behind a mirror (*bilateral training*) and mirror therapy can reduce pain and improve motor function of the upper extremities in stroke patients (Weber, Nilsen, Gillen, Yoon, & Stein, 2019; R.-Z. Yuan et al., 2021). That mirror therapy can improve muscle strength movement in stroke patients. While *range of motion* (ROM) is carried out to maintain or

improve the level of perfection of the ability to move joints normally and completely to increase muscle mass and muscle tone, giving ROM exercises early can increase muscle strength because it can stimulate the motor units involved, there will be an increase in strength. muscles (Birinci, Kaya Mutlu, & Altun, 2022; Hekim, Çolak, & Bonab, 2023; Louw et al., 2017; Tekeoglu Tosun, Ipek, Razak Ozdinciler, & Saip, 2021). ROM has an effect on increasing the strength of the respondent's hands and feet and the loss of stroke patients if not treated immediately will result in permanent disability (Potter & Perry, 2017).

Based on the description above, it is interested to conduct a study "The Effect of Combination of Mirror Therapy and ROM (*Range Of Motion*) Based *Self Care Theory* on Muscle Strength in Stroke Patients in the Inpatient Room of RSI Darus Syifa' Surabaya".

## Methods

Type of research uses *True Experimental with Pretest-Posttest Control Group Design*. The population in this study were 103 stroke patients. The sampling technique used probability *sampling* by *simple random sampling*, the sample size in this study was 34 respondents, 17 respondents for the control group and 17 respondents for the intervention group. The instrument for measuring muscle strength uses the *Medical Research Council* (MRC) scale. The data obtained were analyzed using the *Wilcoxon Sign Rank Test* and the *Mann Whitney*.

## Results

Table 1. Distribution of the frequency characteristics of respondents who had a stroke at Darus Syifa' Hospital Surabaya in 2022.

Characteristics	Group				Total		of Equity Value
	Intervention		Control		F	%	
	F	%	F	%			
<b>Age</b>							
46 - 55years	10	57	9	54	19	56	0.368



Characteristics	Group				Total		of Equity Value
	Intervention		Control		F	%	
	F	%	F	%			
56 – 50years	6	40	7	43	13	38	
> 65years	1	3	1	3	2	6	
<b>Total</b>	17	100	17	100	34	100	
<b>Gender</b>							
Male	14	83	7	24	21	62	0.123
Female	3	17	10	76	13	38	
<b>Total</b>	17	100	17	100	34	100	
<b>Education Level</b>							
(SD, SMP)	10	74	8	68	18	53	0.549
Secondary (SMA)	15	22	6	19	11	32	
High(D3,S1,S2)	2	4	3	13	5	15	
<b>Total</b>	17	100	17	100	34	100	
<b>Employment</b>							
Not Working	8	49	6	31	14	41	0.205
PNS/TNI/Polri	2	14	2	15	4	12	
Farmers/traders/laborers	5	32	6	31	11	32	
Private/ Entrepreneurs	2	5	3	23	5	15	
<b>Total</b>	17	100	17	100	34	100	
<b>Length of Suffering</b>							
< 1year	14	89	12	79	26	77	0.144
> 1year	3	11	5	21	8	23	
<b>Total</b>	17	100	17	100	34	100	

Source: Primary Data, July 2022.

Based on the table 1 it can be seen that most (62%) of the respondents who experienced stroke were male, 14 people in the intervention group and 7 people in the control group with a value of 0.123 which means that there is no gender difference between the intervention group and the control group. Based on the age of the respondents who had a stroke, most (56%) aged 46-55 years (early elderly) as many as 19 people, 10 people in the intervention group and 9 people in the control group with a value of 0.268, indicating there was no age difference between the intervention groups. and control group. Based on the level of education, most of the respondents who had a stroke (53%) had basic education, 10 people in the intervention group and 8 people in the control group with a value of 0.549, meaning that there was no difference in the level of education between the intervention group and the control group. control. Based on occupation, almost half of the respondents who had a stroke (41%) did not work, and the value of 0.205 showed that there was no difference in the level of work between the intervention group and the control group. Based on the length of suffering, almost all (77%) of respondents who suffered from stroke were less than 1 year, and the value between the control group and the intervention group was 0.144, which means that there was no difference in the length of suffering between the intervention group and the control group.



Table 2. Data analysis of muscle strength before and after giving a combination of mirror therapy and ROM based on *Self Care Theory* on muscle strength of stroke patients in the Inpatient Room of RSI Darus Syifa' Surabaya in 2022

Variables	Group	N	Mean Rank	Sum of Rank (Positive)	Min-Max
Muscle Strength	Interventional	17	9.00	153.00	3 – 5
	Control	15	8.00	120.00	2 – 4
Statistical Analysis		<i>Wilcoxon</i> = 0.000 < (0.05)			

Source: Primary data, July 2022

In table 2 above explains that in *Negative Ranks* there is no respondent who has a posttest score lower than on the *pretest*, *Positive Ranks* has 17 people in the intervention group and 15 people in the control group respondents with a *posttest* higher than the *pretest*, while in *Ties* there are 2 respondents in the control group who have the same value in the pretest and posttest. Muscle strength in the intervention group and the control group was analyzed using the *Wilcoxon Sign Rank Test* the value of sig (2-tailed) = 0, 000 < = 0.05, then there was a significant difference between the results of muscle strength in the pre-test and post-test in the intervention group and the control group.

Table 3. The effect of the intervention of a combination of mirror therapy and ROM (*range of motion*) based on *self care theory* on the muscle strength of stroke patients in the Inpatient Room of RSI Darus Syifa' Surabaya in 2022

Variables	Group	N	Mean Rank	Sum of Rank	Mann-Whitey U
Muscle Strength	Interventional	17	25.06	426.00	16.000
	Control	17	9.94	169.00	
Statistical Analysis		<i>Mann - Whitney</i> = 0.000 < (0.05)			

Source: primary data, July 2022

In table 5.5 above explains that of the two groups that have the highest average value is in the intervention group. Results Muscle strength in the intervention group and control group was analyzed using the *Mann - Whitney* obtained a sig (2-tailed) value = 0.000 < (0.05), then there was a significant difference between the control group and the intervention group in the results of muscle strength, so that There is an effect of a combination of mirror therapy and ROM (*Range of Motion*) based on *self care theory* on the muscle strength of stroke patients in the Inpatient Room of RSI Darus Syifa' Surabaya.

## Discussion

Based on the results of the study in table 1 explains that in the intervention group and control group analyzed using the

*Mann – Whitney* the value of sig (2-tailed) = 0.000 < (0.05), then there is a significant difference between the posttest data of the control group and posttest of the





intervention group on the results of muscle strength, so that there is an effect of the combination of mirror therapy and ROM based on *self care theory* on muscle strength of stroke patients in the Inpatient Room of RSI Darus Syifa' Surabaya.

Mirror therapy is a form of rehabilitation that relies on motor imagery, where the mirror will provide visual stimulation that tends to be imitated like a mirror by the affected body part. This therapy was first introduced by Roger - Ramachandran to treat pain symptoms after amputation. This mirror therapy is relatively new, a therapeutic intervention that focuses on a sensory-motor approach, namely by seeing and moving healthy limbs in front of a mirror, while paresis of limbs behind a mirror with the aim of conveying a visual illusion of motor recovery (Kim, Song, Park, & Lee, 2023; Seyyah & Topuz, 2023; R. Yuan et al., 2023).

Stroke sufferers after the first and subsequent attacks need time to recover and get the maximum adjustment function. However, for post-first attack stroke patients, recovery is faster than post-second stroke/advanced stroke patients so that therapy is urgently needed to reduce advanced cerebral injury, one of the rehabilitation programs that can be given to stroke patients is joint mobilization with *range of motion*. Medical rehabilitation in the form of physiotherapy is an option to help recovery in stroke patients. Physiotherapy helps develop, maintain, restore movement and body function in patients. Physiotherapy programs for stroke patients require seriousness in living them. Everyone involved in the physiotherapy program must be serious in carrying out the physiotherapy program in order to accelerate the improvement of body movement and function. Patient compliance in undergoing physiotherapy will affect the success of this program. Non-

compliance with physiotherapy can have a negative impact on patients (Rahayu, 2020). Based on table 5.1, respondents who had a stroke at RSI Darus Syifa' Surabaya < than 1 year were 26 people, 14 people in the intervention group and 12 people in the control group.

There are other alternatives that can be applied to stroke patients to improve sensory-motor functional status and are non-invasive, economical interventions that are directly related to the contralateral motor system that has lesions, namely range of motion exercise therapy using *mirror therapy*) (Phansopkar & Qureshi, 2022; Salhab, Sarraj, & Saleh, 2016; Yalçın, Mülkoğlu, Gülmez, & Genç, 2024). This procedure is performed by placing a mirror in the patient's midsagittal plane, so that the patient can see the image of the healthy limb, and provides visual feedback that can correct the paresis of the limb.

*Range of Motion* (ROM) is an exercise performed to maintain and improve the level of ability to move joints normally to increase muscle mass and muscle tone. Giving ROM exercises early can increase muscle strength because it can stimulate motor units so that more motor units are involved, there will be an increase in muscle strength, the loss of patients with hemiparase if not treated immediately, permanent disability will occur (Li, Wei, Gou, & He, 2018; Rispawati, Ernawati, Supriyadi, Riskawaty, & Halid, 2023; Suwardianto, 2013) In the combination of mirror therapy and *Range Of Motion* (ROM) motor functions, apart from being stimulated through afferent nerve stimulation in the *Range Of Motion* (ROM) exercise, are also stimulated through visual stimulation in mirror therapy which is able to induce activation of the sensory motor cortex nerves which will then stimulate the parietal cortex. and the cerebellum which triggers muscle contraction. In addition, the

visual stimuli in mirror therapy will also stimulate the visual cortex of the brain, which activates neuron cells and stimulates motor activation and coordination of extremity movements. This condition causes the restoration of motor conditions in patients who are given a combination of mirror therapy with ROM (*range of motion*) to experience better recovery (Alitonang, 2020; Amasyali & Yaliman, 2016; Ribeiro & Silva, 2019; Suryani, 2019; Wilastri M. Alitonang, 2020).

Another study, according to Indrawati (2018), showed the effect of a combination of ROM exercise therapy and *mirror therapy* on upper extremity motor strength and cortisol levels in post-stroke clients at RSUD Dr. Wahidin Sudiro Husodo Mojokerto using 30 respondents. This is in line with the results of Rofina's research (2019), which states that there is an effect of mirror therapy on the muscle strength of patients with impaired physical mobility due to stroke in the internal treatment room of RSUD dr.TCHillers Maumere with a sample size of 10 respondents.

From the explanation above, it shows empirical evidence that the combination exercise technique of mirror therapy and ROM is able to increase muscle strength and physical mobility in stroke patients. Where *mirror therapy* can help increase muscle strength, joint muscle stiffness so that patients can see the image of a healthy hand, and provide visual feedback that can improve hands. Therapy performed on stroke patients is aimed at developing, maintaining and restoring motion by means of motor exercise therapy, stimulating the hands to perform a movement or muscle contraction, thus helping to restore limb function lost due to stroke.

## Conclusion

There is a significant difference between muscle strength before and after

administration of a combination of mirror therapy and ROM (*range of motion*) based on *Self Care Theory* for stroke patients in the Inpatient Room of RSI Darus Syifa' Surabaya. There is an effect of a combination of mirror therapy and ROM (*Range of Motion*) based on *self care theory* on the muscle strength of stroke patients in the inpatient room of RSI Darus Syifa' Surabaya.

## Authors Contributions

The manuscript reflects the contributions of all authors, with one member guiding study conceptualization and design, another member performing data collection and analysis, and a third member aiding in manuscript drafting and revision. All authors have participated in manuscript preparation and approval.

## Conflicts of Interest

The research team declares that no external influences, whether financial, personal, or organizational, have affected the methodologies or conclusions of this study, ensuring it was conducted with complete independence.

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