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Application of Mirror Therapy to Muscle Strength in Non-Hemorrhagic Stroke Patients: A Case Study

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ABSTRACT

Background: One of the therapies that can be used in non-hemorrhagic stroke patients to increase muscle strength is mirror therapy. Mirror therapy is a form of rehabilitation or distance exercise that relies on the patient's motor imagination and imagination using a mirror as a visual stimulation that can be imitated by the part of the body that is disturbed. The mirror stimulates cortical and spinal motors. The parts of the body that are affected tend to mimic mirror reflections, which aids in the recovery process of the extremities. This study aims to apply mirror therapy to physical mobility in non-hemorrhagic stroke patients.
Methods: A descriptive case study on one subject, namely Mrs. S who was diagnosed with a non-hemorrhagic stroke with major nursing problems of physical mobility disorders and was given mirror therapy. The mirror used is 35x30x20 cm for the upper extremities and 30x55x30 cm for the lower extremities. This therapy is carried out for 8 days with a frequency of 1x a day which is done in the afternoon for 30 minutes every day. The ethical approval was issued by the Ethics Commission of the Kendari Ministry of Health's Polytechnics.
Results: After being given mirror therapy to Mrs. S for 8 days, physical mobility increased with the value of the muscle strength of the lower left extremity from 2 to 4 while the upper left extremity did not experience an increase due to more severe nerve damage in the upper left extremity
Conclusion: Physical mobility improved in Mrs. S with the administration of mirror therapy for 8 days. This therapy can be applied in health services, especially in stroke patients with limb weakness.

INTRODUCTION

Stroke is an acute neurological condition that occurs suddenly and can result in local or global neurological deficits lasting 24 hours or more, often leading to fatal outcomes (Faridah et al., 2019). Globally, stroke is a leading cause of disability and the second leading cause of death. According to the World Stroke Organization (WSO, 2022), the number of stroke cases increased by 70% between 1990 and 2019, with a mortality rate of 43%. Furthermore, the Global Stroke Factsheet reported that the lifetime risk of stroke has risen by 50% over the past 17 years, with one in four individuals expected to experience a stroke in their lifetime (World Stroke Organization, 2022).

In Southeast Asia, Indonesia ranks among the countries with the highest stroke-related mortality. National health surveys indicate that the prevalence of stroke in Indonesia reached 15.4% of the population, followed by the Philippines at 11% (WSO, 2022). Data from Basic Health Research (Riskesdas, 2019) show that in 2018, approximately 713,783 Indonesians were affected

by stroke, with West Java recording the highest cases (131,846 people) and North Kalimantan the lowest (1,838 people) (RISKESDAS, 2023). In Southeast Sulawesi, specifically at Kendari City Regional General Hospital, stroke cases increased from 1,596 in 2023 to 2,814 in 2024, highlighting a growing regional burden.

One common complication following stroke is hemiparesis, characterized by partial paralysis on one side of the body. Hemiparesis significantly reduces a patient's ability to perform daily activities independently and often results in decreased quality of life due to limb weakness, typically affecting the arms and legs (Feigin et al., 2021; Zahra & Purnomo, 2022). Addressing this functional impairment is essential to improve post-stroke rehabilitation outcomes (Zahrotul Jannah et al., 2023; Zuliawati et al., 2023).

Mirror therapy has emerged as an effective intervention for improving motor function in stroke patients with limb weakness (Deconinck et al., 2015; Ulfah Kamaliyah et al., 2024; Zahra & Purnomo, 2022). This therapy involves moving the healthy limb while observing its reflection in a mirror, creating a visual illusion that stimulates the brain to activate the affected limb (Auria et al., 2023; Luluk Cahyanti, 2022; Zahrotul Jannah et al., 2023). Mirror therapy is advantageous due to its simplicity, low cost, and feasibility for home-based implementation, offering a practical and comfortable rehabilitation approach (Istianah et al., 2021; Ratri, 2025a). Recommended protocols suggest therapy sessions three to seven times per week, lasting 15 to 60 minutes per session (Kiran et al., 2022; Zuliawati et al., 2023)

Evidence supports the efficacy of mirror therapy in enhancing physical adaptation and muscle strength in post-stroke patients. Saragih (2025) reported significant improvements in motor function, pain reduction, and sensory function in patients receiving mirror therapy (Saragih et al., 2025). Similarly, Ratri et al. (2025) demonstrated that stroke patients with upper extremity hemiparesis experienced an increase in muscle strength from an initial score of 2.00±0.855 on the first day to 2.58±0.776 on the 14th day (p=0.001), confirming the therapy's effectiveness (Ratri, 2025b). Based on these findings, the present study aims to examine the effect of mirror therapy on muscle strength and physical adaptation in post-stroke patients, providing evidence for its implementation in rehabilitation programs.

METHODS

This study uses a descriptive case study approach to provide an overview of the application of mirror therapy to physical mobility through nursing care which includes nursing assessment, diagnosis, planning, implementation, and evaluation. This study consists of 1 case study subject, namely non-hemorrhagic stroke patients who are undergoing treatment at Kendari City Hospital with inclusion criteria: 1. Patients who have decreased muscle strength, 2. Patient who is willing to be respondent. Exclusion criteria: 1. Patient who has complication from non-hemorrhagic stroke, 2. Patient who has decreased consciousness.

The variables in this study are 1. Mirror therapy in this study is a movement exercise that relies on the patient's motor imagination and imagination where the mirror is used as visual stimulation that can be imitated. 2. Muscle strength is a measurement of the study subject's ability to move using a muscle assessment instrument. The assessment of muscle strength is: 1 = No movement but palpable/visible instrument of muscle contraction. 2 = There is movement in the joint but it cannot resist gravity (only shifting). 3 = Can resist gravity but cannot withstand/resist the retainer's prison. 4 = Can move against the examiner's prisoner but his strength is reduced. 5 = Can fight the examiner's detainee with maximum strength.

The tools used to collect data in this study are the format of assessment in non-hemorrhagic stroke patients, namely: 1. Nursing care format consisting of assessment to evaluation of medical surgical nursing 2. Medical records. 3. Observation sheet and 4. Mirrors are 35x30x20 cm and 30x55x30 cm. The mirror models used in this study are:

Figure 2 Mirror for lower extremities

Figure 1 Mirror for upper extremities

RESULTS

The subject of the case study is a female with the initials Mrs. S who is 65 years old, Muslim and has a male ethnicity, the patient is married, has a S1 education, and previously worked as an elementary school religious teacher. Residing in Wowawanggu Village, Kadia District, Kendari City, Southeast Sulawesi Province. Mrs. S had undergone treatment on May 4, 2025 with a medical diagnosis of Non-Hemorrhagic Stroke (SNH) and had returned home. However, on May 18, 2025. Mrs. S was readmitted to the hospital in the Sakura room of Kendari Hospital with the same medical diagnosis. The researcher conducted an assessment on Mrs. S and found that the main complaint was that the left side of Mrs. S's body was difficult to move and felt heavy when moved.

The results of the muscle strength measurement showed that the muscle strength in the upper and lower right extremities reached a score of 4 while the upper and lower left extremities decreased with a score of 2. The physical examination carried out on Mrs. S showed blood pressure results of 160/100 mmHg, breathing 20 times/minute, pulse frequency 69 times/minute, body temperature 36.5 °C, body weight 60 kg, and height of 154 cm. Examination of the level of consciousness showed compositionism with GCS 15, decreased balance, and weakness was found in the left upper and lower extremities so that all the activities of the case study subjects were assisted by the family.

While being treated in the Sakura room of Kendari City Hospital, Mrs. S received pharmacological therapy, namely RL infusion therapy 20 rpm/day, pantoprazole injection 40 mg 1/IV/12 hours, mecabolamin injection 1A/IV/24 hours, clopidogrel bisulfate drug 1x1 day. Based on the results of the assessment conducted by the researcher on Mrs. S, it was found that the nursing diagnosis, namely physical mobility disorders related to neuromuscular disorders, was evidenced by a decrease in muscle strength in the upper and lower left extremities, Mrs. S looked weak, activities were assisted by the family. There are complaints that the left side of the body is difficult to move (SDKI, 2016). Therefore, nursing planning or intervention is needed to support Mrs. S's health to be better, namely with Mobility Support, one of which is non-pharmacological therapy. The non-pharmacological therapy provided is Mirror Therapy which is carried out for 8 days, starting from May 24 to 31, 2025, in the afternoon at 16.00-finish (SIKI, 2018).

Mirror therapy was carried out on Mrs. S for 8 days using a mirror in the form of a triangular prism on the upper extremities with a size of 35x30x20 cm while on the lower extremities a beam-shaped mirror was used and a size of 30x55x30 cm. This therapy is

carried out for more than 30 minutes in each session, which is done in the afternoon. On the first day, it was done in the Sakura room of the Kendari City Hospital and on the 2nd to the 8th day it was done at Mrs. S. Mirror therapy begins with placing a weak hand in the mirror while a healthy hand is in front of the mirror. The same is also done on the legs. Mirror therapy begins in the hand area with basic movements: adaptation, abduction, finger adduction, elbow flexion, elbow extension, and variation. After therapy is carried out on the hands, it is continued with therapy on the feet. Movements in the legs are flexion, extension, hyperextension and leg abduction. The evaluation of this therapy is a measurement of muscle strength before and after the therapy is performed. The results of the observation of muscle strength before and after Mirror Therapy performed on Mrs. S can be seen in the table below:

Table 1. Observation Of Muscle Strength Before And After Mirror Therapy

Day/Date	Muscle Strength Scale Measurement Results				Information
	Hour	Pre	Hour	Post	
Day 1	16:00	2	16.15	2	Upper extremities
Saturday, 24 May 2025	16.16	2	16.45	2	Lower extremities
Day 2	16.00	2	16.18	2	Upper extremities
Sunday, 25 May 2025	16.19	2	16.35	2	Lower extremities
Day 3	16.00	2	16.17	2	Upper extremities
Monday, 26 May 2025	16.18	2	16.33	3	Lower extremities
Day 4	16.00	2	16.15	2	Upper extremities
Tuesday, 27 May 2025	16.18	3	16.31	4	Lower extremities
Day 5	17.05	2	17.20	2	Upper extremities
Wednesday, 28 May 2025	17.21	4	17.36	4	Lower extremities
Day 6	16.00	2	16.15	2	Upper extremities
Thursday, 29 May 2025	16.16	4	16.31	4	Lower extremities
Day 7	16.00	2	16.16	2	Upper extremities
Friday, 30 May 2025	16.17	4	16.31	4	Lower extremities
Day 8	16.00	2	16.16	2	Upper extremities
Saturday, 31 May 2025	16.17	4	16.31	4	Lower extremities

DISCUSSION

The results of the study showed that the effect of mirror therapy on muscle strength measured using the MMT scale showed that there was an increase in muscle strength in Mrs. S. The researcher used mirror media that covered the sore hand and then reflected the healthy hand so that it was as if the hand being moved was a healthy hand with movements in accordance with the standard operating procedure in the form of adaptation movements, basic movements and variation movements for the upper extremities and flexion, extension, hyperextension and abduction movements in the lower extremities. The increase in muscle strength experienced by Mrs. S is in line with a study by (Muhsinin et al., 2024) which reported that mirror therapy increases motor activation through visual stimulation, especially in the lower extremities, due to more structured flexion-extension movements. However, the upper extremity did not show an increase in the MMT score, remaining at a value of 2. This phenomenon is in line with findings (Ratri, 2025b) which explain that the brain's ability response to change and adapt structurally and functionally in the upper extremities requires a longer duration of therapy (≥4 weeks) due to the complexity of fine motor coordination.

Based on the results of the study on the first and second day which were interpreted the upper and lower extremities still showed MMT scores of 2 both before and after therapy, this indicates a latent period in the neuroplasticity response (Barbosa & Septianingrum, 2024). Patients consistently perform all types of movements recommended for the arms and legs in accordance with established standard therapy guidelines (Ventoulis et al., 2024). The consistent

results of the examination on the second day supported the hypothesis that positive changes in the nervous system take longer and repeated exercises to see the changes in the patient's clinical condition. This is supported by the results of studies (Rohani et al., 2024) showing that stroke patients have the potential to restore motor function. However, this potential takes time and repeated practice to be activated. The process of brain reorganization after neurological injury takes place gradually and takes a certain period of time before measurable clinical improvement becomes apparent (Pan et al., 2024).

Furthermore, in the following days, it showed an increase in muscle strength and stabilization of muscle strength in line with the study (Saragih et al., 2025) with 3 subjects suffering from hemiparesis due to non-hemorrhagic stroke experiencing a slow increase in muscle strength for 7 days after mirror therapy. So that this therapy has an effect on improving muscle strength in post-stroke patients with hemiparesis (Widiyono et al., 2023). Based on the results of the study from the first day to the eighth day, the results of mirror therapy were obtained that were effective in increasing the client's muscle strength, characterized by the left leg which was originally full joint movement without resisting gravity (only shifting) after being given therapy increased to 4 full joint movements against gravity and light resistance (Kiran et al., 2022; Zuliawati et al., 2023).

Mirror therapy is a form of rehabilitation or distance exercise that relies on the patient's motor imagination and imagination where it uses a mirror as a visual stimulation that can be imitated by the part of the body that is experiencing disturbances. This is due to the fact that mirror cells (also known as mirror neurons) in the parietal lobe are activated when perceiving movement. Due to its effect on the mirror neuron system, mirrors stimulate cortical and spinal motors. The parts of the body that are affected tend to mimic mirror reflections, which aids in the recovery process of the extremities. Mirror therapy, an alternative treatment method that uses visriomotor-proprioception input to improve how the movement of the limbs is impaired (Auria et al., 2023; Istianah et al., 2021; Kiran et al., 2022; Ratri, 2025a; Zuliawati et al., 2023).

According to the researchers, the increase in muscle strength experienced by Mrs. S patients was corroborated through the Kubler-Ross theory in the journal (Luluk Cahyanti, 2022; Ulfah Kamaliyah et al., 2024; Zahrotul Jannah et al., 2023), specifically at the stage of psychological acceptance. At this stage, the patient has accepted his condition after having suffered a third stroke and shows a good understanding of the rehabilitation process, including movement exercises using mirror therapy that has been taught. In addition, the patient's family has also understood the importance of movement exercises with mirror therapy, thereby supporting the patient's recovery process optimally.

Post-attack stroke patients take a long time to acquire and restore optimal bodily function. The administration of non-pharmacological therapies such as mirror therapy allows for faster healing through neurological effects in the form of perception to improve the patient's mobility and muscle strength. This is supported by a study conducted by (Deconinck et al., 2015) on 548 ischemic stroke patients. The study confirms that early intervention in the form of therapy accelerates recovery, but the achievement of maximum function still takes a long time, especially in patients with severe motor deficits (Zahra & Purnomo, 2022).

The limitation of this study is that the research process on the 7th day in the morning, the client tried Neuro Muscular Electrical Stimulation (NMES) therapy in the upper extremities, so that the upper extremity area where the therapy was carried out was swollen, this resulted in an obstacle to the mirror therapy procedure and caused the muscle strength in the upper extremity to not change. This study can be a reference for further research related to non-pharmacological therapy in non-hemorrhagic stroke patients. This therapy can be developed with a larger sample count

CONCLUSION

Based on the results of the study on the effect of the application of mirror therapy on Mrs. with a medical diagnosis of Non-Hemorrhagic Stroke in the Sakura Room of the Kendari City Regional General Hospital for 8 days, there was an increase in muscle strength in the lower left extremity, the MMT score from 2 to 4 while in the upper left extremity there was no increase in

the MMT score before and after the mirror therapy had the same score, namely the results of this study reached the expected outcome criteria by the researchers that muscle strength from decreasing to increasing enough.

Author's Contribution Statement: Author 1 contributed to the conceptualization, methodology, and investigation of the study. Author 2 was responsible for data curation and writing the original draft. Author 3 handled validation, provided resources, and contributed to writing through critical review. Author 4 performed editing and supervision of the study. All authors have read and approved the final manuscript and take responsibility for all aspects of the work.

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