OPEN ACCESS
Journal of Pubnursing Sciences, 2026, 04 (01): 38-51
eISSN 2988-4330; pISSN 3025-3330; https://doi.org/10.69606/jps.v4i01.310

[Review Article]

Journal of Pubnursing Sciences

Effectiveness of Mirror Therapy on Muscle Strength in Stroke Patients: A Systematic Literature Review

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Article Info:

Received:
(2025-08-18)

Revised:
(2025-12-25)

Approved:
(2026-01-04)

Published:
(2026-02-26)

Abstract

Background: Stroke is still the leading cause of death in brain health problems throughout Indonesia. In stroke patients, 70-80% of patients experience hemiparesis (muscle weakness on one side of the body). One of the rehabilitation and non-pharmacological interventions is muscle strength training, which stimulates nerves and increases functional motor/muscle strength using mirror therapy. Mirror therapy is a treatment for stroke patients that involves the mirror neuron system in the cerebral cortex and helps restore motor skills in the hands and mouth. **Aims:** To know the effect of mirror therapy on the muscle strength of stroke patients. **Method:** This research is a literature review. This review aims to review empirical evidence regarding the effectiveness of mirror therapy in improving muscle strength in stroke patients through a systematic analysis of the literature from 2019 to 2024. The PRISMA-based search and selection procedure yielded 16 articles for analysis. **Results:** Based on an analysis of 16 articles, mirror therapy improves muscle strength in stroke patients ($p < 0.05$). **Conclusion:** Mirror therapy can improve muscle strength and can be used as part of standard care for stroke patients with muscle weakness, both in the hospital and at home. The author recommends the application of mirror therapy in stroke patients for self-care interventions at home.

Keywords: Therapy Reflection; Muscle Strength; Stroke Patients

Cite this as: Saleha, T. Y., & Cahyati, Y. (2026). Effectiveness of Mirror Therapy on Muscle Strength in Stroke Patients: A Systematic Literature Review. *Journal of Pubnursing Sciences*, *4*(01), 38–51. https://doi.org/10.69606/jps.v4i01.310

Introduction

Stroke is a condition due to circulatory disorders in the brain that causes brain tissue death, resulting in a person suffering from paralysis or death (Saleem et al., 2022). Stroke is a disease or functional disorder of the brain, characterised by paralysis of nerves due to obstruction of blood flow to the brain. In simple terms, an acute stroke is defined as a brain disease due to a cut-off blood supply to the brain, due to blockage (ischemic stroke) or bleeding hemorrhagic stroke) (Nursalam et al., 2020). People who experience strokes usually experience various functional disorders, such as motor, psychological, or behavioural disorders, with the most typical symptoms being hemiparesis, weakness of the limbs, loss of facial sensation, difficulty speaking, and loss of vision on one side (Widiyono et al., 2023). Risk factors for stroke include hypertension, hyperlipidemia, atrial fibrillation, carotid stenosis, obesity, smoking, diabetes, and periodontal disease (Prasetyaningsih & Kurniawan, 2021).

Stroke is the third leading cause of death in the world after heart disease and cancer (WHO, 2018). The World Health Organisation estimates that deaths from stroke will increase, along with deaths from heart disease and cancer, from around six million in 2010 to eight million in 2030 (WHO, 2018). A stroke that is not treated correctly will result in extensive paralysis and impaired cognitive function (American Stroke Association, 2021).

Thus, early treatment can reduce the number of physical disabilities due to stroke (WHO, 2016).

Untreated nerve cell death will cause complications (Limtrakarn et al., 2022). Stroke complications that often occur are decubitus ulcers due to sleeping too long; paralysis, causing blisters when lying down; pneumonia, which occurs because patients usually cannot cough or swallow properly, causing fluid to collect in the lungs and then infect, and in addition muscle and joint stiffness due to lying too long, which will cause stiffness in the muscles or joints. One complication that can occur is neurological deficits (Santiago et al., 2022). Neurological deficits that often appear in stroke patients are hemiparetic and hemiplegic (Lee & Kim, 2020).

Upper limb hemiparesis is an example of the most common post-ischemic stroke disability, with a percentage of 73%, compared to hemorrhagic, which is only 13% (American Heart Association, 2019). As many as 80-85% of ischemic strokes occur in the supratentorial area (STS), affecting the vertebrobasilar region, involving the cerebellum and brainstem, and many cause hemiparesis in the upper limbs (WHO, 2017). Meanwhile, if a stroke occurs in the infratentorial area (STS), the clinical symptoms that arise are vertigo, dysarthria, dysphagia, and ataxia.

Hemiparesis or hemiplegia in stroke patients will result in decreased muscle strength. Muscle strength is the power a muscle or group of muscles expends to contract when holding a maximum load (Istianah et al., 2020). In individuals with hemiparesis, spasticity, muscle weakness, and permanent impairment of movement coordination in both fine and gross motor skills, these factors limit self-care (Rofina et al., 2019).

Decreased muscle strength can lead to balance and coordination disorders, so active and passive movement-based exercise interventions are needed to optimise muscle mass, tone, and strength, as well as cardiac and respiratory function, to prevent voluntary muscles from losing tone and strength (Robinson et al., 2023). If muscle strength is not trained, stroke patients will experience impaired physical mobility, which can hinder daily activities and cause complications (Setiyawan et al., 2019). Interventions for healing can be done in stroke patients, other than drug therapy or drugs (Zuliawati et al., 2023). This therapy is carried out by physiotherapy/exercise such as aerobic exercise, range of motion exercises (range of motion), coordination exercises, and strengthening exercises. In addition to ROM rehabilitation therapy, which is often done both unilaterally and bilaterally, other alternative therapies can be applied and combined with stroke patients to improve the functional status of sensory-motor and are non-invasive, economic interventions that are directly related to the motor system by training/stimulating the ipsilateral or contralateral sensory-motor cortex that has lesions, namely range of motion exercise therapy using mirror media.

Mirror therapy is a form of exercise rehabilitation that relies on and trains the patient's motor imagination (Putri & Wasilah, 2019). Mirrors in mirror therapy will provide visual stimulation to the brain's motor cortex, namely the ipsilateral one. (Klinkwan et al., 2022). Ipsilateral functions move the limbs of the hemiparesis body through observation of body movements that tend to be followed like a mirror (Klinkwan et al., 2022). This activity will positively impact nerve damage, mortality, and long-term disability by preventing secondary complications of immobility and nerve dysfunction, as well as recurrent strokes (Santiago et al., 2022).

Mirror therapy was initially developed to reduce limb pain in amputees (Nursalam et al., 2020). The reflection of the intact arm in the mirror gives the client the sensation of having two arms that can move, thereby reducing pain (Lee & Kim, 2020). Mirror therapy is recommended as a simple and inexpensive alternative therapy for treating gross motor function (Nadatien et al., 2024).

This therapy relies on visual-motor perception interactions to improve limb movement in cases of muscle weakness on one side of the body (hemiparesis) (Saleem et al., 2022). Benefits of mirror therapy for stroke patients include improvements in motor function and activities of daily living (ADLs) (Robinson et al., 2023). This mirror therapy is easy to do and requires short training without burdening the patient. Mirror therapy is a treatment for stroke patients that engages the mirror neuron system in the cerebral cortex and helps restore motor skills in the hands and mouth (Simamora et al., 2021). Based on the paragraph above, this literature review aims to determine the effect of mirror therapy on muscle strength in stroke patients.

Methods

The election article is based on the PRISMA (Preferred Reporting Items for Systematic Reviews & Meta-analyses) framework to review the literature and the PICOS format (tabel 2). The secondary data was collected using the electronic databases Google Scholar, PubMed, *and Scopus.* Data sources used were obtained from journals that review therapeutic actions. Look in the mirror. Keywords adapted to *Medical Subject Headings (MeSH)* and compiled in the table below.

Table 1. Keywords *Literature Review*

Reflecting	muscle strength	Stroke Patients
or	or	or
self-reflection	muscular strength	post-stroke patients

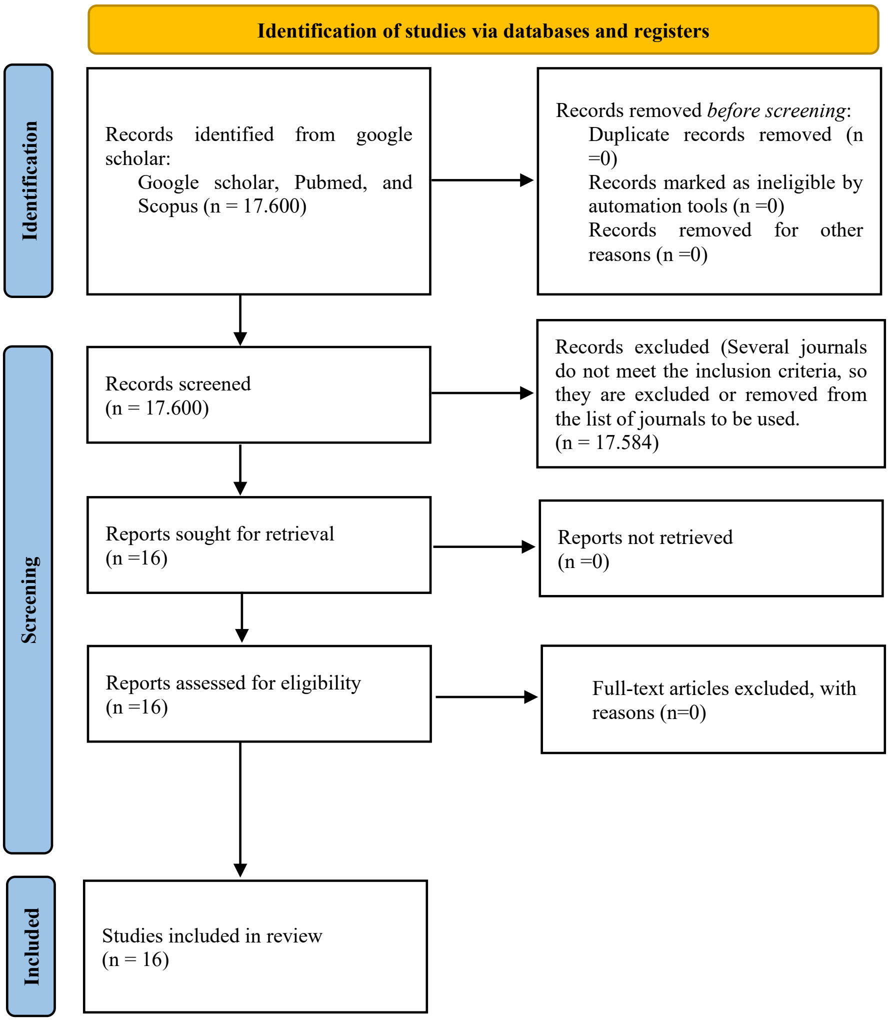

Figure 1. PRISMA diagram

The article selection process for this study followed the PRISMA guidelines, which encompassed three stages: identification, screening, and inclusion. In the identification stage, researchers searched various scientific databases relevant to mirror therapy and muscle strength in stroke patients, yielding 16 articles that aligned with the research focus.

All articles were then screened based on their titles and abstracts. All 16 articles met the initial inclusion criteria, and none were eliminated. In the inclusion stage, a full-text review was conducted, and all articles were deemed eligible and included in the synthesis and analysis of the research findings (Figure 1).

Table 2. Criteria for Inclusion as well as Exclusion, which are used in the *Literature Review*

Criteria	Inclusion	Exclusion
Population	Study on the effect of applying mirror therapy on muscle strength in stroke patients	not any
Intervention	Implementation of mirror therapy	not any
Comparison	*No Comparator*	*No Comparator*
Outcome/Results	The effect of implementing mirror therapy	There is no effect of the application of mirror therapy measures
Study Design and Type Publication	Approach nursing care, trial controlled, quasi - experimental, current tests, *Cross-sectional*	not any
Year published	After 2019	Before 2019
Language used	Indonesian, English, Japanese	Besides Indonesian, English and Japanese

Between 2019 and 2024, the number of articles found in the search-filtered *Google Scholar, PubMed, and Scopus* was 11,700. Based on the determined inclusion and exclusion criteria, researchers identify the data sources to be studied. According to Chart 1, the method of literature collection is

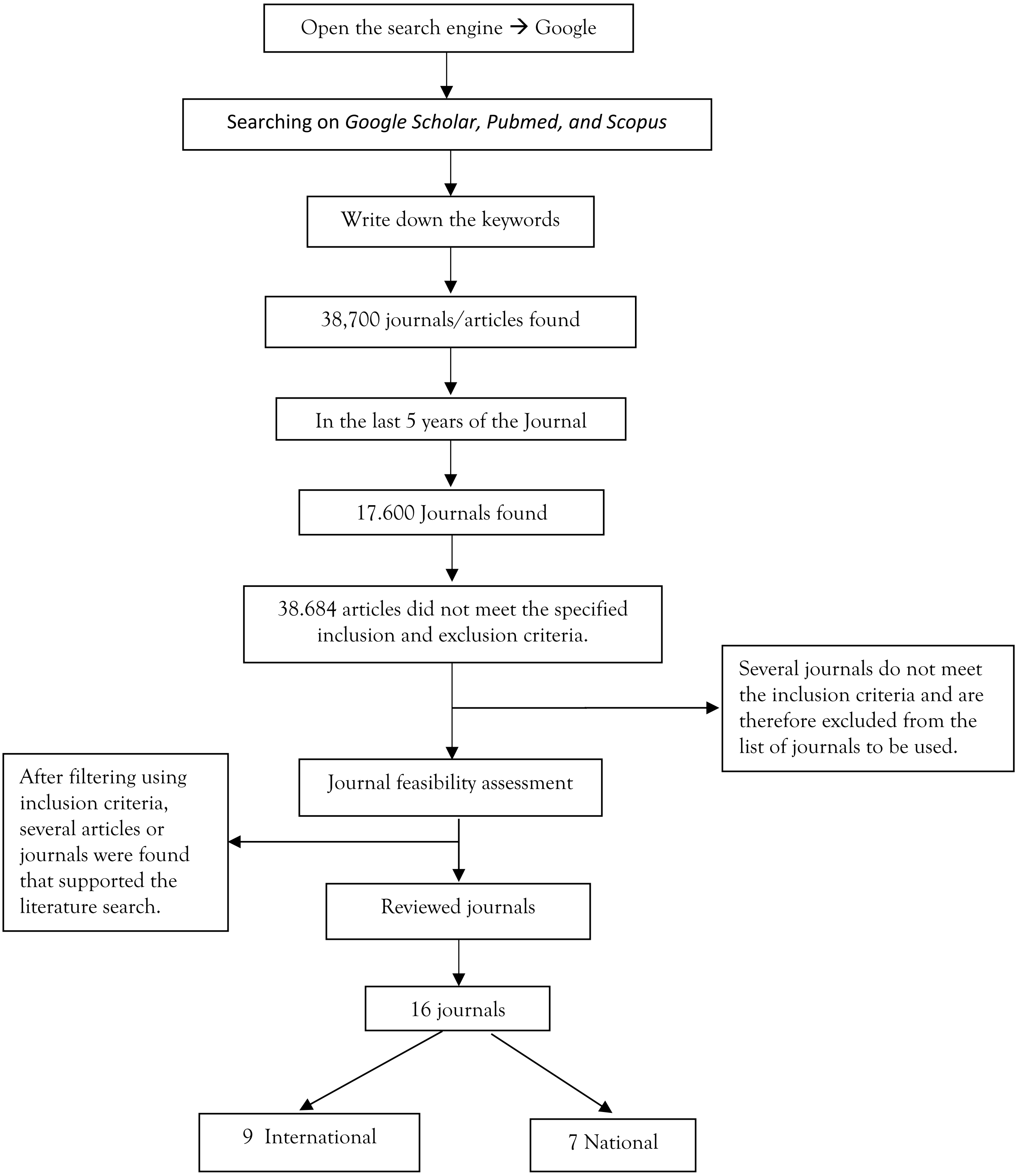

Chart 1. Procedure for Collection of *Literature Review*

Results

Table 3. Effectiveness of Mirror Therapy on Muscle Strength in Stroke Patients

No	Writer	Title	Design & Sampling	Intervention	Results
1.	Rofina et al., 2019	Influence Therapy Mirror to Strength Muscle Patient with Disturbance Mobility Physique Stroke Resulting in Internal Treatment Room of Dr. TC Hillers at Maumere Hospital	**Research methods:** Quantitative research using a quasi-experimental research design with pre- and post-tests. **Sampling:** Consecutive sampling with twenty (20) samples, which were then divided into ten (10) samples in the intervention group and ten (10) samples in the control group.	The treatment and control groups were given muscle strength measurements as baseline data to assess the effect of mirror training. Furthermore, in the treatment group, muscle strength measurements will be conducted after mirror therapy, and in the control group, after training, in accordance with the applicable standards at the Dr. TCHllers Regional Hospital. Maumere for one week (seven days) with a training frequency of once a day.	Based on the data from this study, mirror therapy has a more effective effect with a value of $p = 0.005$ ($p < 0.05$), compared to ROM exercises without a mirror with a value of $p = 0.011$ ($p < 0.05$) on muscle strength in patients with impaired physical mobility due to stroke in the internal treatment room of RSUD dr. TC. Hillers Maumere.
2.	Robinson et al., 2023	The Effect of Mirror Therapy on Strength Testing Muscle Non-Hemorrhagic Stroke Patients at Curup Regional Hospital in 2022	**Research methods:** Quasi-experiments with a pre-test-post-test one-group design. **Sampling:** The sampling method used 15 respondents who met the inclusion and exclusion criteria.	Researchers conducted a mirror therapy intervention twice daily (morning and evening) for 2 weeks, 15 minutes each, combined with several ROM exercises. After that, muscle strength measurements were taken. Researchers used a 25-by-20-inch mirror.	The average muscle strength before being given mirror therapy was 1,600. None of the 16 respondents experienced a decrease in muscle strength test scores; the positive rank is 16, indicating that all 16 respondents experienced an increase in muscle strength after mirror therapy. Statistical test results, Wilcox. The test yielded $\rho = 0.000 < \alpha = 0.05$; H_0 was rejected, and H_a was accepted, indicating a mirror effect. Therapy on muscle strength testing of non-hemorrhagic stroke patients at Curup Regional Hospital in 2022
3.	Zuliawati et al., 2023	The Effect of Mirror Therapy on Strength Muscles in Non-Hemorrhagic Stroke Patients at Sembiring General Hospital	**Research methods:** Quasi-experiment with one research design group before and after the test. **Sampling:** Purposive sample with a sample of 11 people.	Mirror intervention therapy was conducted for 7 days, once daily for 30 minutes, comprising 2 sessions. Each session lasted 15 minutes, with a 5-minute rest between sessions. For evaluation, the action was conducted on the 7th day. The MMT (Manual Muscle Testing) instrument was used to assess muscle strength.	The average muscle strength before mirroring therapy was 2.36 (SD = 1.206), with a minimum of 1 and a maximum of 4, and the 95% confidence interval for the mean was calculated. 1.55-3.17. While the average value of muscle strength of non-hemorrhagic stroke patients after being given mirror intervention therapy is 3.18, with a standard deviation of 1.108, starting from the smallest or minimum value of 2 to the

					maximum value of 5, the confidence interval for the mean (CI 95%) is 2.40-3.97. In the Wilcoxon test results table, the significance value is 0.003, which is < 0.05, so H0 is rejected, and Ha is accepted.
4.	Istianah et al., 2020	The Effectiveness of Mirror Therapy on Strength, Muscle and Functional Status Non-Hemorrhagic Stroke Patients	**Research methods:** Pre-experiment with One Group Pre-approach Test and Post-test Design. **Sampling :** In non-probability sampling, namely purposive sampling, the samples taken were 16 non-hemorrhagic stroke patients with hemiparesis.	Mirror intervention therapy was performed twice daily (morning and evening) for 2 weeks, for 15 minutes each and was combined with several ROM movements. After that, muscle strength and functional status were measured in post-intervention respondents.	The results of the study showed an average muscle strength of 2.69 before the intervention and 3.63 after, and an average functional status of 42.5 before the intervention and 72.5 after. The Wilcoxon test yielded p-values of 0.000 and 0.001 for muscle strength and functional status, respectively, both < 0.05. Then the mirror therapy affects increasing muscle strength and functional status of stroke patients with hemiparesis.
5.	Setiyawan et al., 2019	The Effect of Mirror Therapy on Strength Muscle Extremities in Stroke Patients at Dr. Moewardi Hospital	**Research methods:** Quasi-experimental, with a one-group pretest-posttest design and a control group. **Sampling:** ischemic stroke patients with a consecutive sampling technique, totaling 30 respondents. totaling 30 respondents.	There are 2 groups, namely the treatment group and the control group. The treatment group received mirror therapy from the researchers, while the control group received only standard ROM training from the Anggrek 2 Stroke Unit at Dr. Moewardi Hospital.	The average change in muscle strength after performing standard ROM exercises in the control group was 0.40, and after performing mirror exercises in the intervention group was 0.40. Therapy was obtained at 0.60. The results of the study indicate a mirror effect of therapy on muscle strength in stroke patients: in the upper extremities, p = 0.004 (p < 0.05); in the lower extremities, p = 0.001 (p **< 0.05).**
6.	Putri & Wasilah, 2019	Application of Mirror Therapy for Increase Strength Muscles in Stroke Patients at RSUP Fatmawat: Case Study	**Research methods:** The design of this case study is descriptive with a nursing care approach. **Sampling:** 2 patients.	Mirror intervention therapy was conducted on both subjects for three days, with two sessions per day for 15 minutes. After the intervention was conducted for three consecutive days, the results showed increased muscle strength in both subjects, particularly in the upper extremities.	In this case study, the author measured muscle strength before mirroring therapy: in subject I, I obtained 4444/4444, and in subject II, I obtained 3333/1111. After the mirror application is completed, therapy results in increased upper-extremity muscle strength in subject I (5555/4444) and subject II (4444/1111). Application of the mirror. This therapy is simple, efficient, and suitable for patients with decreased muscle strength, making it applicable to ward nurses.

7.	Simamora et al., 2021	The Effect of Mirror Therapy on the Improvement Strength Muscles in Stroke Patients at Padang Sidimpuan City Regional General Hospital	**Research methods:** Quasi-experiment with design: one-group pretest-posttest design. **Sampling:** Purposive sampling with a sample size of 20 respondents who were stroke patients.	In the research, this is done for practice moving sore hands and feet with the help of a mirror and with the existence of a shadow hand or normal feet so that the feet or a sore hand will also gradually follow hand movement or normal feet, with the respondent seeing the mirror so that there is an existence announcement to the brain from the eye to move the hand like normal hands and feet.	The average muscle strength before mirror therapy was 2.20, with a median of 3.00. The average muscle strength after mirror therapy is 2.00, with a median of 2.00. Based on the table analysis of the control group before and after the intervention using the Wilcoxon test, a p-value of 0.000 (<0.05) was obtained, indicating a difference in average muscle strength after mirror therapy.
8.	Klinkwan et al., 2022	The Effectiveness of Mirror Therapy to Upper Extremity Rehabilitation in Acute Stroke Patients	**Research methods:** This study was a single-masked, randomized controlled trial with pretest and posttest assessments. **Sampling :** The participants were randomly allocated to the CT and MT groups after signing informed consent and before the baseline measurement. A total of 20 participants completed the training course; 10 participants per group were analyzed in this study.	In this therapy, the caregiver will assist with treatment by moving the patient's weak-side arms and hands, as shown in Figure 2. During each movement, the patient will perform the movement at a low speed for 20 sessions/cycle, 2 cycles/day (1 cycle takes about 30–60 min). In this way, the patient was seated close to a vertical mirror (70 × 40 cm). Then, take the weak hand behind the mirror and place the strong arm opposite it. The patient will perform normal hand movements as well as the training position. In each position, the patient should raise the arms slowly, and the caregiver should help observe the patient's symptoms. This practice allows the patient to look at the mirror image of the normal hand and arm and think that the weak hand is moving.	Data were analyzed using the Wilcoxon signed-rank test and the Mann-Whitney U test to assess within-group and between-group differences, respectively. The results revealed that after 12 weeks of treatment, patients in both groups showed statistically significant improvements in all measured variables ($p < 0.05$). Compared with the control group, patients in the MT group showed greater improvement in the proximal movement component of the FMA upper extremity mean score change (15.8 ± 3.2 versus 10.0 ± 2.7, $p = 0.002$). At the same time, no differences were observed in other variables ($p > 0.05$). There were also no adverse events. It suggests that 12 weeks of mirror therapy alone was more likely to improve upper-limb motor recovery and activities of daily living in acute stroke patients than conventional therapy, if started early.
9.	S.-T. Lee & Kim, 2020	The Effects of Convergent Stimulation on tDCS during Mirror Therapy to Improve the Muscle Strength and Gait Ability in Chronic Stroke Patients	**Research methods:** Study quantitative research using a quasi-experimental research design with pre- and post-tests **Sampling:** 12 stroke patients were randomly assigned to group I (n = 6) and group II (n = 6).	Group I was given NDT (non-invasive treatment for development nerves) and therapy mirror with tDCS pseudo, and group II was given NDT and therapy mirror with tDCS pseudo. Every convergent stimulation is done 5 times a week, 30 minutes per session, for a total of 4 weeks. All evaluations were conducted before the intervention and again after 4 weeks.	In conclusion, mirror therapy with convergent tDCS stimulation had a positive effect on lower-extremity strength in paralysis and gait ability through an overlapping interaction.
10.	Santiago et al., 2022	Effectiveness of Intensively	**Research methods:**	Fourteen patients carried on age (>70 years or older with diagnosed	Although both interventions improved muscle activity

		Applied Mirror Therapy in Older Patients with Post-Stroke Hemiplegia: A Preliminary Trial	In conclusion, mirror therapy with convergent tDCS stimulation had a positive effect on lower-extremity strength in paralysis and gait ability through an overlapping interaction. **Sampling:** Randomization in blocks with a 1:1 allocation ratio was performed. For this, one researcher (CMMC) filled 22 sheets with control words and 22 sheets with intervention words. To estimate the sample size, a two-sided F2 test was performed. Taking into account the 95% significance level, statistical power 80%, and differences in treatment effects between groups.	post-stroke hemiplegia were distributed randomly to group intervention intensive (5 times/week for 6 weeks) or to group intervention with distance (3 times/week for 10 weeks), who underwent the same amount of MT sessions (n = 30). Muscle strength and activity were measured at the beginning and at the end of care. Ability functional is also evaluated.	parameters, intensive MT showed a statistically significantly higher intervention effect on electromyographic activity (p < 0.001) and muscle strength (p < 0.001) than the spaced protocol over time.
11.	Prasetyaningsih & Kurniawa, 2021	Application of Mirror Therapy on Upper Extremity Motor Recovery in Post-Stroke Patients	**Research methods:** Pre-experimental quantitative research with a one-group pretest-posttest design. **Sampling:** purposive sampling that meets the inclusion criteria, with a maximum of 15 participants.	The intervention was given for approximately 8 weeks with a therapy frequency of 3 times a week (once in the hospital and twice at home) and a duration of 15-25 minutes. The instrument used is the Fugl-Meyer Upper Extremity Assessment (FMA-UE).	Statistically, the results indicate a significant difference in UE motor ability among post-stroke patients between baseline and after mirror therapy**,** with a mean difference of 5.14 and a p-value of 0.000 (ρ < 0.05). Application of the MT effect on upper extremity motor recovery in post-stroke patients. The MT program is an effective intervention for UE motor recovery and motor function improvement in post-stroke patients. The MT program can be used as a standardized hand rehabilitation intervention in hospitals, clinics, and homes.
12.	Limtrakarn et al., 2022	Mirror Therapy Rehabilitation for Lower Limb of	**Research methods:** Study quantitative research using a quasi-experimental research design	The patient is guided to assume a sitting position in front of a 60 cm x 70 cm mirror placed in the midline between the legs. Thus, the patient is facilitated by looking at the mirror reflection of the	There is significant improvement in the group mirror and group control in matter recovery, motor skills, and balance. Subjects in the second group showed

		Acute Stroke Patients	with pre- and post-tests. **Sampling:** The sample size was calculated with n4 Studies. The required sample size was calculated to be 30 participants (15 per group). Subjects were randomly divided into 2 groups: a control group and a mirror group.	moving leg to imagine performing the movement on the weak leg. The exercises are performed in a half-sitting position on the bed. The exercises consist of 1) flexion-extension of the hip with the knee, 2) ankle dorsiflexion-plantar flexion, and 3) hip adduction-abduction. Both groups were treated with assisted mirror therapy, 60 minutes/day (traditional rehabilitation therapy 30 minutes, followed by mirror therapy 30 minutes), 5 days/week, for 12 weeks. The treatment included normal-limb-position therapy, lower-limb facilitation techniques, balance training, gait training, and activities of daily living. Rehabilitation treatment outcome measurements were conducted at week 0 and week 12 (follow-up). Tools to assess motor and balance recovery before and after treatment include the Brunnstrom stage, Fugl-Meyer Assessment (FMA), and Brunel Balance Assessment (BBA).	statistically significant improvement in all variables ($p < 0.05$). Compared to the control group, participants in the MT group have higher FMA scores (31.0 ± 1.20 versus 28.7 ± 0.58). As a result, MT was shown to be an effective approach for the rehabilitation of patients with post-acute stroke.
13.	Widiyono et al., 2023	Mirror Therapy Can Improve Muscle Strength in Non-Hemorrhagic Stroke Patients	**Research methods:** Pre-experimental design without a control group. **Sampling :** Purposive sampling obtained 35 patients.	The instruments used to measure muscle strength are the MMT (Manual Muscle Testing) observation sheet and the mirror therapy SOP. The intervention provided is mirror therapy for 15 minutes, 6 times a week. The patient is asked to move the arm/leg and observe the movement in front of the mirror, then is asked to feel or imagine that the paretic arm/leg is also moving. Arm/leg movements are repeated 8 times each for 10 minutes.	The average muscle strength of the respondents was 0.90 before mirror therapy and 2.57 after. There was a difference in the average value of muscle strength before and after of 1.67. Nurses can use mirror therapy as an intervention to increase muscle strength in stroke patients.
14.	Nursalam et al., 2020	Mirror Therapy using Cylindrical Grip Muscle Strength and Extremity Range of Motion	**Research methods:** Quantitative with design quasi-experimental research (pre-post - test with a control group design) **Sampling:** purposive sampling, a total of 66 respondents (33 controls and 33 intervention people)	The intervention provided was mirror therapy with a combination of cylindrical grips. Three times a week for four weeks, the goniometer is used to assess the range of joint motion, and the patient's independence level questionnaire is modified to meet post-stroke needs.	Research results show that muscle strength (p=0.000) and range of motion (p=0.000) have a significant influence on the therapy mirror combination grip cylinder. Influence therapy mirror merges strength, muscle grip, cylinder, and span motion member motion above. Can be applied to nurses and physiotherapists for doing complementary therapy. Can also be used as a pharmacological support therapy. For increasing muscle

					strength and range of motion, member motion is on.
15.	Nadatien et al., 2024	Assessment of Stroke Patients' Muscle Strength Following a Combination of Mirror Therapy and ROM (Range of Motion) Exercises Based on Self-Care Theory	**Research methods:** Study quantitative research using a quasi-experimental research design with pre- and post-tests. **Sampling:** Probability sampling using simple random sampling. There were 34 participants in total. In this study, there were 17 people in the control group. interventionist.	The Medical Research Council (MRC) scale is utilized by the device that The Medical Research Council (MRC) scale is utilized by the device that measures muscular strength. Participants underwent a structured intervention program that included both muscular strength. Participants underwent a structured intervention program with both control and intervention groups. The intervention group received a specific dose of physiotherapy exercises tailored to improve muscular strength. The exercises were administered 3 times per week, each session lasting 60 minutes, over 12 weeks. The control group received standard care without the additional physiotherapy exercises. The effectiveness of the intervention was evaluated by comparing pre- and post-test results of both groups, using the MRC scale to measure changes in muscle strength.	In the inpatient ward of the Darus Syifa Surabaya Hospital, stroke patients who undergo a combination of mirror therapy and range-of-motion exercises, guided by self-care theory, show significant improvement in muscle strength, as indicated by the Mann-Whitney test ($p < 0.05$). The study found that stroke patients' muscle strength improved with a combination of mirror therapy and range-of-motion exercises grounded in self-care theory. Cite
16.	Nur'aini et al., 2024	Application of Mirror Therapy on Muscle Strength in Non-Hemorrhagic Stroke Patients: Strength Muscles in Non-Hemorrhagic Stroke Patients	**Research methods:** A descriptive test, which describes the assessment of muscle strength before and after mirror therapy. **Sampling :** Involving 3 research subjects.	The therapy mirror is done once a day for 7 days, with each session lasting 30 minutes, for a total of 2 sessions. Each session lasts 15 minutes, with a 5-minute break between sessions. Each session lasts 15 minutes, with a 5-minute break between sessions. After doing therapy, an evaluation of the strength of the muscle return is conducted. The success of the intervention was assessed with a muscle strength evaluation on day 7. Tools needed in case studies: tools that support the intervention process and tools for measuring muscle. The tools used for support intervention are in the form of a mirror with a 30x30 cm reflection to make it easier for the patient to perform the movement comfortably in the field, with horizontal and vertical movements from the surface table to the shoulder. The instrument used to evaluate muscle strength is Manual Muscle Testing (MMT).	The results after 7 days of mirroring therapy, performed once daily for 30 minutes, showed increased muscle strength. Before the intervention, subject 1's muscle strength was 4, subject 2's was 1, and subject 3's was 3. After the intervention, Subject 1's muscle strength value became 4, Subject 2's muscle strength value became 3, and Subject 3's muscle strength value became 4. The case study concludes that subjects with hemiparesis experienced increased muscle strength after mirror therapy. Mirror therapy increases muscle strength.

In-place findings were gathered from a review of e-literature conducted in various countries. In some research, respondents are patients who experience a decline in muscle strength in space care in the hospital. Of the 16 articles, all influenced by therapy, focus on improving muscle strength. In the original 2019-2024 search, there were 17,600 articles. Then, do the evaluation eligibility. With this, the number of articles that will be reviewed is 16.

Based on a review of sixteen studies, mirror therapy consistently found a positive effect on increasing muscle strength in stroke patients, both hemorrhagic and non-hemorrhagic, in the acute, subacute, and chronic phases. Most studies used a quasi-experimental pretest-posttest design, with intervention durations varying from 7 days to 12 weeks and exercise frequencies ranging from 1–2 times per day to 3–5 times per week.

Research by Rofina et al. (2019), Setiyawan et al. (2019), and Klinkwan et al. (2022), which included control groups, showed that mirror therapy was more effective than standard ROM exercises ($p < 0.05$). This strengthens the evidence that increased muscle strength is not solely due to passive or active range-of-motion exercises, but also to the visual and cognitive stimulation from mirroring the movements of the healthy extremities.

Studies without control groups, such as Robinson et al. (2023), Zuliawati et al. (2023), Widiyono et al. (2023), and Prasetyaningsih & Kurniawan (2021), also showed statistically significant increases in muscle strength scores, with all respondents experiencing improvements post-intervention. Mean MMT and Fugl-Meyer Assessment scores increased significantly after mirror therapy.

Furthermore, several studies have combined mirror therapy with ROM, cylindrical grip, physiotherapy, or tDCS, including Nursalam et al. (2020), Lee & Kim (2020), and Nadatien et al. (2024). This combination has been shown to provide a more comprehensive effect, not only on muscle strength but also on range of motion, functional ability, balance, and daily activities. Studies with RCT designs and long durations (Klinkwan et al., 2022; Santiago et al., 2022; Limtrakarn et al., 2022) show that mirror therapy, when delivered intensively and early, yields better motor recovery outcomes for the upper and lower extremities than conventional therapy alone, without causing side effects.

Discussion

Based on an analysis of 16 articles, mirror therapy improves muscle strength in stroke patients ($p < 0.05$). Patients experience muscle weakness on one side of the body, either the left or right (Prasetyaningsih & Kurniawan, 2021). The average strength of muscles on a scale of 2 (0-5) is due to the mechanism of hemiparesis, which generally occurs in stroke patients (Prasetyaningsih & Kurniawan, 2021). Stroke patients who experience weakness in one side of the body caused by decreased muscle tone are incapable of moving their bodies) (Zuliawati et al., 2023).

Hemiparesis results from loss of the nerve supplying the muscle, so the brain cannot move the affected extremity; this loss of nerve supply causes muscle weakness. No, again, accept signal contractions needed for maintaining normal muscle so that atrophy happens (S.-T. Lee & Kim, 2020). Muscle atrophy resulting from lack of activity occurs only over time, not within a month after a stroke (Limtrakarn et al., 2022). Contracture is one of the reasons for the decline in stroke patients' ability to perform range-of-motion exercises (Widiyono et al., 2023). Contracture is interpreted as the disappearance or decline in the range of motion of joints, both passive and active, due to limitations in joints, tissue fibrosis, supports, muscles, and skin.

Stroke sufferers must be given health interventions so as not to impact disability and death (Santiago et al., 2022). Recovery of motor control after a stroke is a difficult thing. The recovery ability of the motor extremities above is essential (Zuliawati et al., 2023). Six months post-stroke, only 38% of patients experienced recovery of hand ability, and only 12% showed functional recovery, though they underwent rehabilitation. The importance of recovering upper-extremity (UE) motor skills is emphasized throughout the rehabilitation program. This theory posits that neurological and functional recovery is most pronounced at 6 months post-stroke, with most major repairs occurring first at 6 weeks (Nursalam et al., 2020). Motor recovery in 95% of stroke patients will increase the level of neurological function in 12.5 weeks after onset, and individuals with a mild stroke recover more quickly. The journey recovery motor will peak early in the progressive phase of recovery, with only a minor improvement occurring over the next 6 months post-onset.

One beneficial rehabilitation for neuroplasticity therapy is the use of a mirror (Nadatien et al., 2024). Mirror therapy is a form of rehabilitation that relies on motor shadowing, in which a mirror provides visual stimulation perceived by the affected body part. Roger-Ramachandran therapy (Klinkwan et al., 2022) was introduced to manage post-amputation pain. Therapy mirror. This is classified as a new intervention that focuses on moving undamaged body parts. This is a form from an image in which a mirror is used to stimulate the brain visually by observing an unaffected person performing a series of movements. Procedure: General mirror therapy involves the patient sitting in front of an oriented mirror, parallel to the center line, blocking the affected view, with legs positioned behind the mirror (Rofina et al., 2019). While looking in the mirror, the patient sees body parts not positioned as they are with the affected limb. This setting is perfect for making a visual illusion. Where movement or touch of intact body parts can be considered as an influence on the member's paretic body (Zuliawati et al., 2023). After that, the patient performs movement exercises with undamaged body parts, momentarily watching the reflection of the affected leg in the mirror superimposed above (which is not visible) (Klinkwan et al., 2022). A therapy mirror for stroke patients' extremities, sitting, with the mirror parallel to the patient's body.

Neurologists claim that the central nervous system can adapt during development and throughout life (S.-T. Lee & Kim, 2020). The nervous system can recover from grave illness and injury through adaptation and spontaneous healing (Nursalam et al., 2020). Some brain areas, such as the occipital lobes, dorsal frontal regions, and corpus callosum, are involved during mirror therapy interventions (Prasetyaningsih & Kurniawan, 2021). The therapeutic approach triggers plasticity in the nervous system (Irawandi & Alfa, 2017). The bilateral premotor cortex, primary motor cortex, primary somatosensory cortex, and cerebellum are also reorganized to improve the function of the damaged brain (Irawandi & Alfa, 2017). The motor areas of the affected hemisphere receive visuomotor information from the parieto-occipital lobe (Simamora et al., 2021). The damaged motor cortex responds to mirror therapy in various ways and can enhance motor recovery.

The mechanism of mirror therapy involves observing the reflection of a healthy limb in the mirror. In contrast, the paralyzed limb is hidden behind it, thereby positively impacting various clinical conditions ranging from chronic pain to motor deficits (S.-T. Lee & Kim, 2020). The result is a process of realizing the mirror reflection, which will be integrated into the limb's representation. Seeing a healthy limb perform functional motor movements in front of a mirror, as if the limb were paralyzed, will maintain sensory feedback to the brain via visual input (Prasetyaningsih & Kurniawan, 2021).

Mirror therapy is one of the treatments that can be given to stroke patients who experience muscle weakness, in addition to drug therapy (Santiago et al., 2022). The image reflected in the mirror will be captured by the stroke patient, thereby activating the primary motor cortex and is expected to cause cortical reorganization and functional improvement. The brain will be stimulated by visual feedback, optical illusions, and virtual reality that support internal, external, and kinesthetic visual imagery to help restore impaired motor functions, such as upper- and lower-limb hemiparesis (Nur'aini et al., 2024). Mirror therapy is easy to perform and requires only a very short training period, without burdening the patient, as it is carried out with post-stroke patients (Prasetyaningsih & Kurniawan, 2021).

The results of the literature review show that mirror therapy intervention is effective in all stroke patients with hemiparesis (C. Lee et al., 2021). Mirror therapy is effective for 15-60 minutes a day, 3-5 days per week, for 2-12 weeks, with a minimum muscle strength requirement of 2 and ambulation between 3-5. Mirror therapy is better than standard rehabilitation therapy. It is beneficial across the acute, subacute, and chronic phases of stroke and can be integrated into stroke rehabilitation to improve upper-extremity motor function.

Several studies investigating the effects of mirror therapy on the upper limbs in chronic stroke patients have also reported improvements in range, speed, and accuracy of movement, as well as increased grip strength. This intervention requires a high level of concentration (Widiyono et al., 2023). This intervention is considered to have a positive effect in triggering therapeutic motivation, based on the claims of most participants who experienced, and even felt, the sensation of their paralyzed limbs moving in their imagination due to the mirror illusion. However, fatigue factors can still influence outcomes (Rofina et al., 2019). The effectiveness of mirror therapy depends on the patient's motivation to practice. The results are usually satisfactory when the patient practices regularly (Istianah et al., 2020). Therefore, strategies that help the patient continue practicing are essential in mirror therapy (Nadatien et al., 2024).

When performed regularly, mirror therapy may affect hand and foot movement, potentially causing pain or stiffness (Nur'aini et al., 2024). So, the respondent's movements, which had previously been stiff, became slightly more flexible (Saleem et al., 2022). Mirror therapy should be part of rehabilitation in physiotherapy management, as it plays a significant role in improving upper-extremity motor function and strength in stroke patients (Irawandi & Alfa, 2017). Appropriate awareness of mirror therapy techniques should be provided to all physical therapists so they can implement them and assess their effects (Saleem et al., 2022). Mirror therapy has a positive effect on muscle strength in stroke patients, according to a review of 16 journals. The researchers concluded that mirror therapy is a practical and logical way to improve muscle strength in stroke patients.

Conclusion

Based on a review of 16 journals, mirror therapy can improve muscle strength. Therefore, this procedure can be used in standard care for stroke patients in the hospital or at the patient's home. It has no side effects, is inexpensive, and is easy to use for recovery interventions that support increased muscle strength. The author recommends the application of mirror therapy in stroke patients for self-care interventions at home. Despite its positive effects, this review is limited by small sample sizes, varied study designs and intervention protocols, different muscle strength measurement tools, and short follow-up periods, which may affect the generalizability and long-term applicability of mirror therapy findings.

Declaration of Conflicting Interest

No conflict of interest to declare.

Funding

No one funded this research.

Acknowledgment

The authors would like to express their sincere gratitude to Poltekkes Kemenkes Tasikmalaya for the support and facilitation provided during the preparation of this manuscript. We also extend our appreciation to colleagues, reviewers, and all parties who have contributed valuable input to improve the quality of this work.

Author's Contribution

TYS was responsible for the conception and design of the study, data collection, data analysis, and interpretation of the results. YC drafted and revised the manuscript.

Data Availability Statement

The dataset generated and analyzed during the current study is available from the corresponding author upon reasonable request.

Declaration of Use of AI in Academic Writing

Nothing to declare

References

American Heart Association. (2019). *Ischemic and hemorrhagic strokes: Symptoms and outcomes*. https://www.heart.org

American Stroke Association. (2021). *Understanding stroke: The importance of timely treatment*. https://www.stroke.org

Irawandi, D., & Alfa, S. (2017). *Effectiveness of Mirror Therapy for Muscle Strength in Ischemic Stroke Patients with Hemiparesis*. 3(Inc), 3–5. https://doi.org/10.2991/inc-17.2017.6

Istianah, A. G., W. H., & Arifin, Z. (2020). Efektivitas Mirror Therapy terhadap Kekuatan Otot dan Status Fungsional Pasien Stroke Non-Hemoragi. *The Indonesian Journal of Health Science*, *12*(2), 158–168. http://jurnal.unmuhjember.ac.id/index.php/TIJHS/article/view/4872/3056

Klinkwan, P., Kongmaroeng, C., Muengtaweepongsa, S., & Limtrakarn, W. (2022). The Effectiveness of Mirror Therapy to Upper Extremity Rehabilitation in Acute Stroke Patients. *Applied Science and Engineering Progress*, *15*(4). https://doi.org/10.14416/j.asep.2021.05.002

Lee, C., Jeon, S. H., Kim, M. J., Ra, G. D., Lee, Y., Hong, S. H., Shin, B., & Goo, H. (2021). *Obat Faktor-Faktor yang Mempengaruhi Depresi Pasca Stroke Pada Pasien Stroke Iskemik Akut Setelah 3 Bulan*.

Lee, S.-T., & Kim, K.-Y. (2020). The Effects of Convergent Stimulation on tDCS during Mirror Therapy to Improve the Muscle Strength and Gait Ability in Chronic Stroke Patients. *Journal of Industrial Convergence*, *18*(4), 51–59. https://doi.org/10.22678/jic.2020.18.4.051

Limtrakarn, W., Tangmanee, N., & Muengtaweepongsa, S. (2022). Mirror Therapy Rehabilitation for Lower Limb of Acute Stroke Patients. *Applied Science and Engineering Progress*, *15*(4). https://doi.org/10.14416/j.asep.2021.05.001

Nadatien, I., Salamah, U. L., & Hidaayah, N. (2024). Assessment of Stroke Patients' Muscle Strength Following a Combination of Mirror Therapy and ROM (Range of Motion) Exercises Based on Self-Care Theory. *Interest : Jurnal Ilmu Kesehatan*, *13*(1), 59–68. https://doi.org/10.37341/interest.v13i1.635

Nur'aini, L. N., Sukraeny, N., & Armiyat, Y. (2024). Application of Mirror Therapy on Muscle Strength in Non-Hemorrhagic Stroke Patients. *Menara Journal of Health Science*, *3*(2), 256–266.

Nursalam, K., I. D., & Aridamayanti, B. G. (2020). Mirror therapy using cylindrical grip muscle strength and extremity range of motion. *International Journal of Innovation, Creativity and Change*, *13*(6), 263–275.

Prasetyaningsih, R. H., & Kurniawan, H. (2021). Application Of Mirror Therapy On Upper Extremity Motor Recovery In Post-Stroke Patients. *Jurnal Keterapian Fisik*, *6*(2), 136–144. https://doi.org/10.37341/jkf.v0i0.293

Putri, E. L., & Wasilah, H. (2019). Penerapan Mirror Therapy untuk Meningkatkan Kekuatan Otot pada Pasien Stroke di RSU Fatmawati: Studi Kasus. *Multisensory Perception: From Laboratory to Clinic*, 449–461. https://doi.org/10.1016/B978-0-12-812492-5.00020-6

Robinson, D. P., Pansori, H. M., & Hermiati, D. (2023). *Pengaruh Mirror Therapy Terhadap Uji Kekuatan Otot*

Pasien Stroke Non-Hemoragik di Rsud Curup Tahun 2022. *2*(1), 287–295.

Rofina, L., Wida, A. S. W. D., & Adesta, R. O. (2019). Pengaruh Terapi Cermin Terhadap Kekuatan Otot Pasien dengan Gangguan Mobilitas Fisik Akibat Stroke di Ruang Perawatan Interna RSUD dr. T.C.Hillers Maumere. *Jurnal Keperawatan dan Kesehatan Masyarakat*, *VI*(2), 1–10.

Saleem, M., Mumtaz, S., Gill, N., Gulab, A. A., & Bukhari, B. (2022). *Comparison Of Mirror Therapy Versus Muscle Strengthening Exercises For Arm Rehabilitation In Patients With Sub-Acute Stroke : A Randomized Controlled Trial*. 1–7. https://doi.org/10.52229/pjpt.v5i3.1830

Santiago, A. B. G., Martínez, C. M. C., & Hernández-Morante, J. J. (2022). Effectiveness of Intensively Applied Mirror Therapy in Older Patients with Post-Stroke Hemiplegia: A Preliminary Trial. *European Neurology*, *85*(4), 291–299. https://doi.org/10.1159/000522413

Setiyawan, N. P. S., & Harti, A. S. (2019). Pengaruh Mirror Therapy Terhadap Kekuatan Otot Ekstremitas pada Pasien Stroke di Rsud Dr. Moewardi. *JKM (Jurnal Kesehatan Masyarakat) Cendekia Utama*, *6*(2), 49. https://doi.org/10.31596/jkm.v6i2.296

Simamora, A. A., Simamora, F. A., & Silvia. (2021). Pengaruh Mirror Therapy Terhadap Peningkatan Kekuatan Otot pada Pasien Stroke di Rumah Sakit Umum Daerah Kota Padang Sidimpuan. *Sustainability (Switzerland)*, *5*(2), 1–14.

WHO. (2016). *Stroke: A global response for prevention and management*. Geneva. World Health Organization.

WHO. (2017). *Global burden of stroke and its subtypes: Ischemic vs hemorrhagic*. World Health Organization.

WHO. (2018). *The top 10 causes of death.* World Health Organization (WHO). https://www.who.int

Widiyono, H., V. D., & Nurani, W. (2023). Terapi cermin dapat meningkatkan kekuatan otot pada penderita stroke nonhemoragi. *Jurnal Keperawatan Malang (JKM)*, *8*(1), 339–353.

Zuliawati, R., M., & Tane, R. (2023). The Effect of Mirror Therapy on Muscle Strength in Non-Hemorrhagic Stroke Patients in Sembiring General Hospital. *Jurnal Keperawatan Dan Fisioterapi (Jkf)*, *5*(2), 381–388. https://doi.org/10.35451/jkf.v5i2.1402