Journal Of Nursing Practice
https://thejnp.org/
ISSN: 2614-3488 (print); 2614-3496 (online) Vol.6 No.2. April 2023. Page.137-144

The Effectiveness of Mirror Therapy in Stroke Patients: *A Systematic Review*

Zahrotul Jannah[1*], Yurike Septianingrum[2], Raden Khairiyatul Afiyah[3], Imamatul Faizah[4]
[1] Master of Applied Nursing, Faculty of Nursing and Midwifery, Nahdlatul Ulama University of Surabaya
[2,3,4] Department of Nursing and Midwifery, Nahdlatul Ulama University of Surabaya
**Corresponding author: 1130016076@student.unusa.ac.id*

ABSTRACT
Background: Stroke is a global problem and the second cause of death in theworld.
Purpose: To find out the effectiveness of giving mirror therapy in stroke patients.
Methods: There are five databases used, namely Science Direct, SAGE Journal, Emerald, ProQuest and PubMed to search for mirror therapy and post-strokes. The inclusion criteria used are for publications for the last 5 years from 2017 to 2022, full-text articles and in English, according to the title, and RCT research or experimental studies.
Results: of the total 7 articles submitted for this systematic review after quality assessment, this included 3 randomized controlledtrials and 4 experimental studies. All muscle strength studies in post-stroke patients after being given mirror interventions experienced an increase inmuscles in parts of the body that experienced hemiperation, thereby increasing independence in patients. From the results of all studies, it was found that theoptimal time in starting the therapy is in the chronic stage, and the therapeutic dose is given with the same intensity (at least five sessions per week) and duration (at least 30 minutes to 90 minutes).
Conclusion: mirror therapy proved to be an effective and viable approach to rehabilitate post-stroke survivors in acute, sub-acute, and chronic phases of the stroke, despite the long-term effects.

Keywords: humans, incidence, mirror therapy

Received February 10, 2023; Revised March 12, 2023; Accepted April 3, 2023
DOI: https://doi.org/10.30994/jnp.v6i2.307

ISSN: 2614-3488 (print); 2614-3496 (online) Vol.6 No.2. April 2023. Page.137-144

BACKGROUND

Stroke is a non-communicable disease which is one of the problems around the world. (Kosasih, Solehati, dan Purba 2018) Theprevalence of stroke in Indonesia increases with age, stroke cases the highest diagnosed were aged 75 years and over (50.2%) and the lowestwas in the age group 15-24 years (0.6%) Sex was more male (11.0%) compared to female (10.9%). Based on the place of residence, the prevalence of stroke in urban areas is higher (12.6%) compared to rural areas (8.8%). (Riskesdas 2018). One of the problems of a physically prominent stoke is weakness, even paralysis of the limbs. This condition causes the patient stroke to have limitations in performing its functions as in daily activities. Stroke patients experience a decrease in doing daily activities independently compared to someone of the same agewho did not have a stroke (Kosasih, Solehati, dan Purba 2018).

Interventions for healing that can be done in stroke patients in addition to medical therapy, namely mirror therapy rehabilitation therapy. Mirror therapy is therapy rehabilitation which depends on and practices the patient's motor imagery/imagination, where the mirror will provide visual stimulation to the brain (cerebral motor nerves i.e. ipsilateral or contralateral to hemiparesis of limb movement. (Usman 2019).

The purpose of this systematic review is to determine the effectiveness Mirror therapy in stroke patients.

METHODS

The method used in the analysis of this evidence-based practice isa systematic review by selecting articles using the PICOS guide. Article searches are carried out on electronic databases including SAGE Journal, Science Direct, Emerald, ProQuest and PubMed. Selected article inclusion criteria 1) published in 2017-2022 2) full-text3) article in English 4) according to the title 5) RCT research or experimental studies. Keywords that are used is "stroke patient" AND "Mirror Therapy" AND "Motor Recovery" AND "RCT research" OR "Studies Experiment" these keywords help in searching the database by using Bolemians to maximize retrieval of the most relevant articles by using and displaying through the PRISMA diagram.

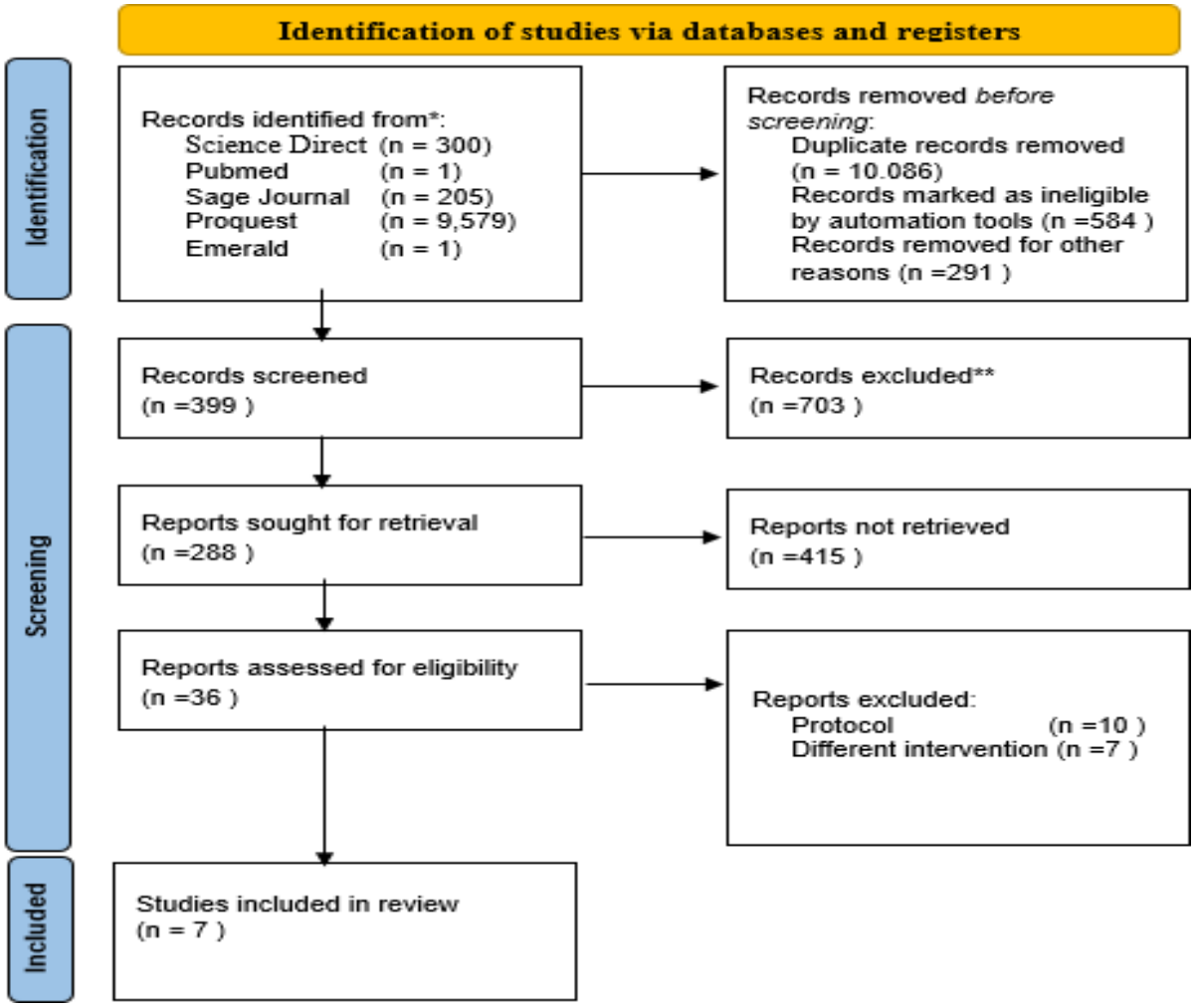
Table 1 Search Terms Used to Identify Relevant Articles

PICOS	Related keywords
Population	*Stroke Patient*
Intervention	*Mirror Therapy*
Comparison	-
Outcome	*Motorcycle Recovery*
Study Design	*RCT research or studies Experiment*

RESULTS

An initial literature search yielded 10,086 articles (1 from PubMed, 205from SAGE Journal, 300 from Science Direct, 9,579 from ProQuest and 1 from Emeralds). After reviewing in terms of research, the selected article is 5 the last year (2017-2022) totaled 399 articles were selected There are 703 articles that must be excluded because it does not meet the criteria. Types of articles included article type full-text research articles there are 288 selected while those who were issued there are 415. The suitability of the title of the selected article is 36, the choice of the full-text is available selected 17 articles and RCT

research or experimental studies there are 7 articles for review, as shown in figure 1. Figure 1: Search Flowchart Using the PRISMA method.



The studies in this systematic review are heterogeneous, 7 articles using a control group and intervention group in the study. A number of including articles also use interventions mirror therapy which has combined. The results of the 7 articles showed the effectiveness of mirror therapy carried out with different concepts and different combinations.

Quality Assessment.

This systematic review uses guidelines to analyze quality reporting among selected studies. The guidelines used are with Critical Appraisal Skills Program Tools/CASP. CASP instruments include a Randomized Controlled Trial Checklistas many as 13 questions include Questions 1–6 relate to the internal validity of the study, 7–8 relate to the validity of the results and questions 9-13 relate to the relevance of practice/external validity (CASP, 2017). In a quasi-experimental design the quality of the experiment was assessed using the JBI instrument CriticalAppraisal Checklist for Quasi-Experimental Studies.

This instrument contains 9 questions related to a quasi-experimental study with the aim of this assessment is to assess the methodological quality of a study and to determine the extent to which a study has addressed possible bias in its design, behavior and analysis.

The results of this assessment can then beused to inform the synthesis and interpretation of research results (Institute 2016).

Bias Risk

The risk of bias in this systematic review is carried out by determining Data extraction including the similarity of studies both in terms of study design, objectives research as well as outcome resulting from the included studies and assessing the quality of the studies reviewed later.

Data Extraction

For this study, a data extraction tool was designed to guide information from the records in accordance with the purpose of the study. Extracted data on each inclusive study includes Last 5 years publications from 2017 to 2022, full-text articles in English, according to the title, and research RCT or experimental study. Furthermore, the data that will be extracted in the section results are: publication of the last 5 years from 2017 to 2022, full-text article in English, as appropriate, and RCT research or experimental studies.

Synthesis of Results

Data synthesis was carried out qualitatively by the author and 3 authors companion by discussing to analyze the selected study. Synthesis the results are shown in table 2.

Table 2 Risk assessment of bias using the JBI critical assessment checklist

No	Author, Year	Critical Appraisal RCT the JBI Critical Appraisal Checklist (The Joanna Briggs Institute, 2017) %	Quality Evaluation
1	(Hung et al. 2022)	85% (11/13)	Strong
2	(Wei et al. 2022)	50% (7/13)	Low
3	(Miclaus et al. 2021)	66.6% (6/9)	Currently
4	(Palomo-Carrión et al. 2021)	66.6% (6/9)	Currently
5	(Noureen et al. 2022)	66.6% (6/9)	Currently
6	(Hsieh et al. 2020)	100% (9/9)	Strong
7	(Gandhi et al. 2020)	85% (11/13)	Strong

Table 3: Characteristics of included-studies

Author(s)	Study Design	Participants' profile	Details of the intervention				Outcome
			Type	Session length	Frequency	Intervention length	
(Hung et al. 2022)	RCT	37 chronic spastic hemiplegia stroke patients	Treatment Combined Robot Assisted training Mirror therapy, and active control treatment	75 min	3 days/ week	8 weeks	The findings of this study showed that each treatment (RT MT, and AC) was effective in treating motor function after BoNT-A in stroke patients who also had UE spasticity. This studydemonstrated that thethree combined treatments induced beneficial effects on motorcycle recovery and spasticity as assessed by the FMA and MAS a post-treatment and follow-up.
(Wei et al. 2022)	RCT	32 Strokes Patients	Group (VRMT) And group (RAVRMT)	20 min/day	1 day	4 weeks	RAT and VRMT are bothhighly effective for treatment in improving upper limb motor cycle dysfunction in stroke patients by activating Brain networks associated with movement and circuitry.
(Miclaus et al. 2021)	Study Experiment	59 patients Post Stroke	Reality therapy virtual (VR) and mirror therapy (MT) exercises physiotherapy classic and rehabilitation	70 min	-	2 weeks	The Mann-Whitney results show that VR and MT as therapeutic interventions have good results better than standard physiotherapy in range of motion ($p < 0.05$, Cohen's d 0.693) muscle strength ($p < 0.05$ Cohen's d 0.924, lower limb function ($p < 0.05$, Cohen's d 0.984) and postural balance ($p < 0.05$, Cohen's d 0.936). Our study shows that MT-associated VR therapy can be successfully replaced classical physiotherapy in lowerextremity rehabilitation after stroke.
(Palomo-Carrión et al. 2021)	Study Experiment	Patients stroke Hemiplegia (number of respondents note mentioned)	Mirror Therapy and observation therapy	1 hour/day	5 sessions/ week	4 weeks	Increased activity of the muscles of the affected hand and increased grip strength.
(Noureen et al 2022)	Study Experiment	36 stroke Patients	Routine physical therapy and mirror therapy	35 min/day	5 days/week	4 weeks	Mirror therapy combined with routine physical therapy is a useful approach and shows better results in reducing phantom limb pain and in psychosocial adjustment to prostheses than routine physical therapy alone.
(Hsieh et al. 2020)	Study Experiment	20 Strokes sub acute	Mirror Therapy and observation therapy	60 min/day	5 days/week	3 weeks	The mirror therapy group improvement in FMA among the other groups

Author(s)	Study Design	Participants' profile	Details of the intervention				Outcome
			Type	Session length	Frequency	Intervention length	
(Gandhi et al. 2020)	RCT	stroke chronic (number of respondents note mentioned)	Mirror Therapy and Rehabilitation	20-90 min/day	3-5 sessions/ week	4 weeks	The role of mirror therapy in acute and chronic stroke Rehabilitation (which suggest a better functional prognosis), its long-term effects, and improved quality of life

DISCUSSION

Optimal time to start therapy

The trend in studies shows that MT appears to be beneficial for participants with chronic stroke, but more evidence is needed for this. No conclusions can be drawn to support effectiveness MT for patients in the acute and sub-acute stages. Seven studies (Hung et al. 2022); (Wei et al. 2022); (Miclaus et al. 2021); (Palomo-Carrión et al. 2021) (Noureen et al. 2022) (Hsieh et al. 2020) (Gandhi et al. 2020) in this review have included participants in the chronic stage and acute but the majority of them consisted of one low-quality RCT (Wei et al. 2022) and 3 experimental studies (Miclaus et al. 2021); (Palomo-Carrión et al. 2021) (Noureen et al. 2022) and two high-quality RCTs (Hung et al. 2022) and (Gandhi et al. 2020) and 1 high-quality experimental study (Hsieh et al. 2020), Furthermore, all case studies used a combination of interventions. Remember the lack of high-quality evidence, it is difficult to conclude that the chronic stageis the optimal time to use this approach. As well as, only two studies involved participants in the acute stage, and recovery motor skills after treatment are often confused with spontaneous recovery in this group.

High-quality RCT (Hung et al. 2022) and (Gandhi et al. 2020) using MT with participants in the acute stage. Both give a clear description of their research protocol and have provided adequate follow-up. Nonetheless, both of them show variations key in the types of participants recruited.

Therapeutic dose and degree of damage

Due to the heterogeneity of the studies, no definite conclusions can be drawn regarding the optimal therapeutic dose. However, a conclusion can be drawn about some possible recommendations for further research the results of all studies showed that the therapeutic dose was given with an intensity of the same (at least five sessions per week) and duration (at least 30 minutes up to 90 minutes). All high-quality RCTs included in this review have therapy. Confused by variation in studies because all three RCTs high quality (Hsieh et al. 2020), (Gandhi et al. 2020), (Hung et al. 2022) involved participants in three different stages of stroke (i.e., acute, subacute, andchronic).

Based on research conducted by (Hung et al. 2022) where the number of samples is 37 people and carried out 8 weeks with a frequency of every 3 days and the implementation time is 75 minutes. Research result demonstrated that RAT and VRMT are both highly effective for the treatment of improve upper extremity motor dysfunction in stroke patients with activated brain networks associated with movement and circuitry. This is too relevant to the study (Wei et al. 2022) The number of samples is 32 people carried out for 4 weeks, with a frequency of once a day and the implementation time is about 20 minutes. The results showed that RAVRMT can improve upper extremity motor dysfunction after stroke better and explored its central mechanism using fMRI.

Based on the research that has been done (Miclaus et al. 2021) where the number of samples is 59 people which will be carried out for 2 weeks with an execution time is 70 minutes. The results showed that VR. Therapy associated with MT can successfully replace classical physiotherapy in lower extremity rehabilitation after stroke. It is also relevant to research (Palomo-Carrión et al. 2021) The number of samples according to the criteria inclusion of children aged 6-12 years, implementation of interventions carried out for four weeks (1 hour per/day; 5 sessions per/week). The results showed that there was an increase in the activity of the hand muscles which impact and increased grip strength. Based on research conducted by (Noureen et al. 2022) Samples were obtained from 36 people, with 4 weeks of implementation carried out in 35 minutes.

The results of the study found that mirror therapy combined with routine physical therapy showed better results in reducing phantom limb pain and in psychosocial adjustment to prostheses rather than routine physical therapy alone. This is relevant to research (Hsieh et al. 2020) The number of samples of 20 people was carried out for 3 weeks with 60 minutes execution time. The results of this study were obtained that the mirror therapy group resulted in the least increase in AMF in among other groups. Other relevant research by (Gandhi et al. 2020) with an inclusion sample of acute and chronic stroke patients whose implementation done 4 weeks with a frequency of 3-5 sessions per week with a time of 20-90 minutes. It was found that the role of mirror therapy in acute stroke rehabilitation and chronic conditions show a better functional prognosis), long-term effects length, and improved quality of life.

Muscle strength in post-stroke patients before being given mirror intervention therapy based on the articles reviewed in this review (Hung et al. 2022); (Wei et al. 2022); (Miclaus et al. 2021); (Palomo-Carrión et al. 2021); (Noureen et al. 2022); (Hsieh et al. 2020); (Gandhi et al. 2020), reported muscle strengthin post-stroke patients before being given mirror therapy intervention post-stroke patient's muscle strength is still experiencing hemiparesis. Meanwhile muscle strength in post-stroke patients after being given a mirror therapy intervention has increased muscle in the part of the body that has hemiperasis thereby increasing the patient's independence (Hung et al. 2022); (Wei et al. 2022); (Miclaus et al. 2021); (Palomo-Carrión et al. 2021); (Noureen et al. 2022); (Hsieh et al. 2020); (Gandhi et al. 2020), thus mirror therapy can increase muscle strength in post-stroke patients.

CONCLUSION

This review provides evidence that mirror therapy is effective to increase muscle strength in post-stroke patients. This review has implications in clinical practice, especially in patients who experience post-stroke. Mirror therapy can be an easy and effective option to improve muscle strength in post-stroke patients. Through this study, intervention with mirror therapy in the practice of rehabilitation therapy of stroke patients that targets the presence of muscle strength. It is hoped that these results will be useful in establishing mirror therapy as an intervention program. the intervention in this article can be a reference for other researchers to be researched further, and as an additional literature in making systematic reviews for students.

REFERENCES

Gandhi, Dorcas B.C., Albert Sterba, Himani Khatter, dan Jeyaraj D. Pandian. 2020. "Mirror therapy in stroke rehabilitation: Current perspectives." *Therapeutics and Clinical Risk Management* 16: 75–85. https://doi.org/10.2147/TCRM.S206883.

Hsieh, Yu Wei, Yu Hsuan Lin, Jun Ding Zhu, Ching Yi Wu, Yun Ping Lin, dan Chih Chi Chen. 2020. "Treatment Effects of Upper Limb Action Observation Therapy and Mirror Therapy on Rehabilitation Outcomes after Subacute Stroke: A Pilot Study." *Behavioural Neurology* 2020. https://doi.org/10.1155/2020/6250524.

Hung, Jen Wen, Chu Ling Yen, Ku Chou Chang, Wei Chi Chiang, I. Ching Chuang, Ya Ping Pong, Wen Chi Wu, dan Ching Yi Wu. 2022. "A Pilot Randomized Controlled Trial of Botulinum Toxin Treatment Combined with Robot-Assisted Therapy, Mirror Therapy, or Active Control Treatment in Patients with Spasticity Following Stroke." *Toxins* 14 (6). https://doi.org/10.3390/toxins14060415.

Institute, Joanna Briggs. 2016. "Critical appraisal tools for use in JBI systematic reviews checklist for prevalence studies." *Adelaide, SA: Joanna Briggs Institute*.

Kosasih, Cecep Eli, Tetti Solehati, dan Chandra Isabela Purba. 2018. "Pengaruh Edukasi Kesehatan Terhadap Pengetahuan Pasien Stroke dan Keluarga: Peran, Dukungan, dan Persiapan Perawatan Pasien Stroke di Rumah." *Media Kesehatan Politeknik Kesehatan Makassar* 13 (2): 8. https://doi.org/10.32382/medkes.v13i2.662.

Miclaus, Roxana Steliana, Nadinne Roman, Ramona Henter, dan Silviu Caloian. 2021. "Lower extremity rehabilitation in patients with post-stroke sequelae through virtual reality associated with mirror therapy." *International Journal of Environmental Research and Public Health* 18 (5): 1–14. https://doi.org/10.3390/ijerph18052654.

Noureen, Ayesha, Ashfaq Ahmad, Arooj Fatima, Kashif Siddique, dan Zain Ul Abbas. 2022. "Effects of routine physical therapy with and without mirror therapy on phantom limb pain and psychosocial adjustment to amputation among prosthesis users." *Physiotherapy Quarterly* 30 (2): 8–14. https://doi.org/10.5114/pq.2021.108680.

Palomo-Carrión, Rocío, Juan Carlos Zuil-Escobar, Myriam Cabrera-Guerra, Paloma Barreda-Martínez, dan Carmen Belén Martínez-Cepa. 2021. "Mirror therapy and action observation therapy to increase the affected upper limb functionality in children with hemiplegia: A randomized controlled trial protocol." *International Journal of Environmental Research and Public Health* 18 (3): 1–10. https://doi.org/10.3390/ijerph18031051.

Riskesdas. 2018. "Laporan Riskesdas 2018 Kementrian Kesehatan Republik Indonesia." *Laporan Nasional Riskesdas 2018*. http://www.yankes.kemkes.go.id/assets/downloads/PMK No. 57 Tahun 2013 tentang PTRM.pdf.

Usman, Andi Mayasari. 2019. "Efektifitas Pemberian Mirror Therapy Pada Klien Post Stroke : a Literature Review." *Efektifitas Pemberian Mirror Therapy Pada Klien Post Stroke: a Literature Review* 4 (2): 52–56.

Wei, Dong, Xu Yun Hua, Mou Xiong Zheng, Jia Jia Wu, dan Jian Guang Xu. 2022. "Effectiveness of robot-assisted virtual reality mirror therapy for upper limb motor dysfunction after stroke: study protocol for a single-center randomized controlled clinical trial." *BMC neurology* 22 (1): 307. https://doi.org/10.1186/s12883-022-02836-6.