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Review Article

Effect of Range of Motion Exercise on Extremity Joint Muscle Strength in Ischemic Stroke Patients a Literature review

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Abstract

Aims: Muscle strength and Range of Motion (ROM) are very important for ischemic stroke patients because they can prevent contractures, and increase the muscle strength of ischemic stroke patients. *Range of motion* (ROM) exercises in the upper extremities can increase muscle strength so that post-stroke patients can perform *Activities of Daily Living* independently. Objective: To know about the effect of the effectiveness of ROM with various methods to increase muscle strength and range of motion of joints.

Method: Literature review to determine range of motion exercise on limb joint muscle strength in ischemic stroke patients with 5 articles with 4 data search tools: PubMed, NCBI, Science Direct, and Proquest. The inclusion criteria were patients who had an ischemic stroke, randomized control trials, and the full text available in a literature review published in the last five years, i.e. 2018-2023, articles in English.

Results: From the articles obtained, 556 articles were found Research campresearch searched in accordance with creteria found 5 articles on the effect of range of motion exercise on muscle strength of the extremity joints in ischemic stroke patients. Positive results were obtained from the benefits of muscle strength and ROM. Clinical evidence was obtained from five journals analyzed that there was an increase in strength and range of motion and there were differences in the results of the experimental group and the control group.

Conclusion: The provision of ROM intervention techniques is proven to increase muscle strength and joint range of motion in ischemic stroke patients, so as to help patients in the process of maintaining muscle strength and joint range of motion. In the future, this activity can be done independently by patients at home.

Keywords:

Motion Exercise, Muscle Strength, Range of Motion, Stroke, Review

INTRODUCTION

A stroke is a critical medical situation in which a nervous breakdown arises from reduced blood supply to a specific region of the brain (1) In Indonesia, stroke is the leading cause of death (2). Based on the results of Riskesdas 2018, the prevalence of stroke in Indonesia increased from 7 per 1000 population in 2013, to 10.9 per 1000 population in 2018 (3) Impact of stroke due to the consequences of reduced blood supply to the brain can lead to substantial disability or tissue death (4) Globally, stroke poses a significant public health problem, given the high rates of morbidity and mortality (5)

This noncommunicable condition results in substantial annual mortality and has the potential to affect individuals in all age groups worldwide. In 2019, about 17.9 million people, accounting for 32% of global deaths, experienced cardiovascular disease-related deaths. The vast majority, 85% of this total, is associated with heart disease and stroke (6). Stroke, characterized by impaired cerebral blood flow, is usual (7) Ischemic stroke occurs when blood flow to the brain stops, This happens due to blood clots that clogging of blood vessels and resulting in brain cell damage (8) Ischemic stroke patients often experience a variety of problems, including muscle weakness and limitations in Range of Motion (ROM) (3). Based on research, muscle weakness is the biggest impact on stroke patients (3) To maintain or maintain muscle strength, joint mobility, and stimulate circulation, Range of Motion (ROM) or joint motion exercises are required (9)

In this exercise will use a tool equipped with indicators that are able to record the frequency of exercises performed in each session (10) The purpose of the literature review was to determine the extent to which Range of Motion (ROM) exercises can improve extremity joint muscle strength in ischemic stroke patients. More over

Improve the quality of life of ischemic stroke patients through improvements in muscle strength and joint range of motion (11)

METHODS

Study design

The research methodology used includes literature review by utilizing the Preferred Reporting Items for Literature Review and Meta-Analysis (PRISMA) guidelines for article selection (REFERENCES).

Search strategy

The article search phase systematically uses keywords, either recorded manually or used through the search feature within each database. The search terms used for article retrieval are "Range of Motion" AND "Muscle Strength" AND "Stroke Patient." Keywords in Medical Subject Heading (MeSH) include Ischemic Stroke, Ischemic Strokes, ROM, high blood pressure or hypertension.

Electronic searches are used to identify related articles, drawing from databases including Pubmed, Science Direct, and Proquest. Articles published in the last five years (2018-2023), articles in English, Inclusion and exclusion criteria

This should include inclusion for (Create in a narrative way)

P: e.g. ischemic patients over 45 years old,

I: the intervention should conteant the range of motion for the extremities

C: can have or not

O: The result of the study is muscle strength or what.

Q: if you need to be specific on the study design that you can name, the study should be conducted using randomized controlled trials.

While Exclusion criteria be Review article, you should mention others but not duplicate by stating the opposite of the inclusion criteria.

RESULTS

You should mention the process you found on the search as described in Figure 1.

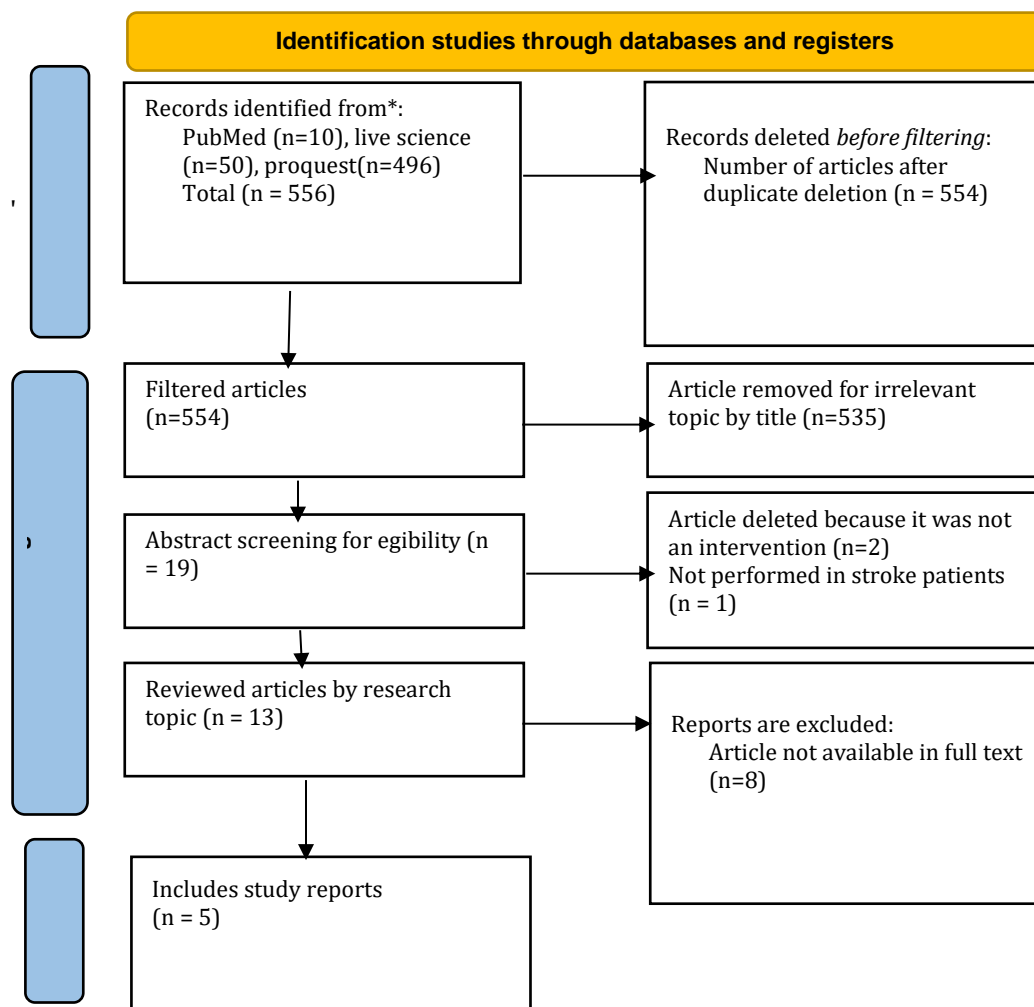


Figure 1. PRISMA 2012 flowchart

Search Results

RESULTS

A literature review search yielded 5 articles that met criteria from PubMed/NCBI, Science Direct, and Proquest. The selected articles were identified using the Joanna Brigg Institute (JBI) questionnaire, and an assessment of the quality of these articles using creteria "Yes", "No", "Not Applicable". From 5 Articles conducted literature review can be applied(12).

Characteristics of included studies

These featured articles were published between 2019 and 2022, consisting of one in 2019, two in 2021, and two in 2022. The five articles stipulated are carried out outside Indonesia.

Author, year	Study design	Method	Interventions and instruments	Participants	Settings	Result
Zahra-Sadat Hosseini	Assessors blinded by randomized controlled trials	Randomized Control Trial	Initial passive Range of Motion (ROM) exercises 4 times a day, each session lasts 15-40 minutes, and this intervention is carried out for 3 months.	The study population was patients over the age of 18 with a diagnosis of ischemic stroke.	Iran	Stroke, range of motion, articular, hemiplegia, motor activity
Kyung-now Kim, Sang-now war	Assessors blinded by randomized controlled trials	Randomized Control Trial	The cognitive sensory-motor training intervention (CSMT) was performed for 30 minutes, 5 times a week and lasted for 6 weeks.	Patients who suffered a stroke more than 6 months ago.	Korea	Cognitive sensory motor, muscle strength, postural balance, stroke
Wajiha Mahmood	Randomized controlled trials	Randomized Control Trial	Conduct core stabilization training interventions for stroke patients. Each patient receives 5 treatment sessions per week, lasting 8 weeks.	Male and female participants with a history of chronic ischemic stroke (more than 6 months, no more than a year).	Pakistan	Core stabilization, exercise, mobility, quality of life, range of motion (ROM), stroke
Hui Ju Muda	Randomized controlled trials	Randomized Control Trial	Movement-to-Music (M2M) intervention for stroke patients. Training is conducted 3 times per week for 60 minutes, for a total of 12 weeks of training.	Participants were aged 18-65 years, who had had a stroke for more than 6 months.	America	Dancing, sports, physical performance, quality of life, rehabilitation, stroke
Ji-eun Cho A, Wan-hee Lee B, Joon-Ho Shin Si, Hojin Kim	Randomized controlled pilot trials	Randomized Control Trial	Leg muscle strengthening intervention using AMT (ankle muscle training) devices. AMT is performed for 40 minutes per day, 5 times per week and lasts for 4 weeks.	Patients who have post-stroke hemiparesis and weakness of the ankle muscles.	Korea	Ankle, strengthening, activation, feedback, gait, stroke

Key findings

You should report here from five studies, how effective ROM is on muscle strength

DISCUSSION

According to findings from an analysis of five journals, demonstrated that Range of Motion (ROM) interventions can improve muscle strength and joint range of motion in stroke patients. ROM training usually lasts 1-3 months and is supervised by a therapist. At a research by Hosseini (13) Passive range of motion exercises on the extremities begin in the first 48 hours post-stroke, following the "Passive Range of Motion Exercises for Post-Stroke" protocol. Researchers performed this exercise four times a day, each session lasting 15-40 minutes, for 3 months. The results showed higher average scores for upper and lower extremity motor function in the experimental group compared to the control group. A comparison of upper extremity muscle strength between the experimental and control groups showed a value of 1.09 vs 0.58, $P = 0.045$. Similarly, a comparison of lower extremity muscle strength showed greater improvement in the experimental group (0.76 vs 0.00) compared to the control group. Previous research similarities have both shown that passive range-of-motion exercises performed early after a stroke can improve motor function and muscle strength. As for the differences, a is Research by Hosseini conducted four times a day for 15-40 minutes, for 3 months. Meanwhile, another study² conducted therapy three times with a duration of exercise of 20 minutes.

By Kyung-Hun Kim (2022)(14) The purpose of this study was to assess the effectiveness of Cognitive Sensory-Motor Training (CSMT) on muscle strength and balance in post-stroke individuals. CSMT sessions, lasting 30 minutes, are conducted five times a week over a span of 6 weeks. Sensory-motor cognitive training combines visual, somatosensory, and spatial senses, with programs designed to increase the sharpness of distance and direction. This study aimed to evaluate the extent to which Cognitive Sensory-Motor Training (CSMT) can improve muscle strength and balance in

individuals who have had a stroke. CSMT, which lasts for 30 minutes per session and is conducted five times a week for 6 weeks, is a program that integrates visual, somatosensory, and spatial senses to improve distance and direction acuity. In evaluating the strength of the tibial anterior muscle using the MRC scale, the CSMT group showed statistically significant differences compared to the control group. Post-test measurements for the experimental and control groups were 16.88 vs 14.78 with $P = 0.00$. This implies that the implementation of CSMT interventions has the potential to modify sensory input from muscle and joint receptors, along with skin receptors on the soles of patients' feet. Changes in sensory input can, in turn, drive changes in the patient's motor system, indicating a rehabilitative effect on motor function (15,16).

Research by Wajiha Mahmood (17) evaluate the effects of core stabilization training on stroke patients. The training involves abdominal drawing maneuvers (ADIM) that focus on strengthening the contractions of the transversus abdominis muscle. This intervention is carried out 10-20 times depending on the patient's condition. In addition, pelvic movement exercises are also performed, which involve anterior-posterior tilt, lateral shift, and transverse rotation in an upright position. Results from this 4-week training showed a significant increase in lower extremity muscle activity in the experimental group compared to standard physical therapy, with a P value of <0.05 (18).

By Hui Xu Muda (19) The Movement-to-Music (M2M) intervention spanning 36 sessions is designed to improve mobility through limb muscle strengthening, combining synchronized movements with music. This action the equation is designed to improve mobility and muscle strength in post-stroke patients. Both involve a series of physical exercises performed regularly over a period of time The session begins

with a sitting warm-up, emphasizing the range of motion of the upper and lower extremities, followed by balance exercises performed in a sitting or standing position. The regimen to strengthen the muscles of the extremities is designed to improve the patient's balance. Results from the application of the M2M intervention for 12 weeks with 36 sessions for post-stroke patients showed improved walking endurance among participants in the experimental group. The assessment used, the Six Minute Walk Test (6MWT), measures walking strength by recording the distance traveled in a duration of 6 minutes. A comparison of the 6MWT results between the experimental and control groups showed a value of 157.4 vs 132.2.

As shown by Ji-Eun Cho A (20) Speakers This exercise uses an AMT (Active Movement Trainer) device to strengthen the leg muscles of post-stroke patients aimed at strengthening the leg muscles that involves the utilization of AMT devices. Experimental participants were instructed to take a comfortable sitting position in an AMT chair, facing a monitor screen that displayed visual feedback. The intervention consists of three stages. The initial stage involves passive stretching training, in which the maximum passive Range of Motion (ROM) of the ankle is measured, followed by repeated ROM exercises according to the direction of movement. The second stage is focused on training in controlling ankle muscle contractions. At the third stage, participants engage in active resistive force training, moving their ankles from their original position to the target position without external assistance (21). After four weeks of AMT administration, significant improvements were observed in two-way ankle muscle strength, balance, and walking speed in stroke patients. A comparison between the experimental and control groups showed ankle muscle strength values of 22.3 vs 14.0 with $P = 0.034$. The balance scale value is 52.4 vs 50.2 with $P = 0.214$, and the walking speed value is 1.22 vs 0.84 with $P = 0.090$. AMT

intervention programs have been shown to be effective in increasing ankle muscle strength through regular exercise. As a result, the AMT protocol in this study showed positive effects on ankle paretic function, balance, and gait in stroke patients.

Although these studies show positive results, the effectiveness of AMT may vary between individuals. Factors such as stroke severity, health background, and an individual's recovery capacity can affect the outcome.

CONCLUSION

Based on research that has been conducted, the interventions Range of Motion (ROM), Cognitive Sensory-Motor Training (CSMT, Movement-to-Music (M2M), and Ankle Movement Training (AMT) have been shown to be effective in increasing muscle strength and range of motion in post-stroke patients(22). Implications for Practice i.e. Integration into Care, Healthcare, particularly in Indonesia, may consider integrating these interventions into the care of stroke patients. This can help improve the quality of life of individuals affected by stroke (23). Given the effectiveness of this intervention, it is important for the patient to perform this exercise routinely, ideally between 1-5 times per week, depending on the patient's condition and the type of intervention.

Range of motion (ROM) intervention, using various versions and methods, positively affects the extremities of stroke patients. This approach demonstrates the ability to increase muscle strength and range of motion in the patient's joints. The consensus of five articles advocates ROM intervention between 1-5 times per week as an effective strategy to increase muscle strength in the limbs of stroke patients (24).

In early journals, Range of Motion (ROM) interventions were given four times daily over a span of three months. The second article on Cognitive Sensory-Motor Training

(CSMT) involves sessions conducted five times a week for six weeks. The third intervention, outlined in the third article, took place five times a week for eight weeks. The fourth article focuses on the Movement-to-Music (M2M) intervention, which is implemented three times a week over a 12-week period. Finally, the fifth article details Ankle Movement Training (AMT), conducted five times a week for four weeks. The aspiration is that healthcare in Indonesia can integrate ROM interventions into the care of stroke patients, with the aim of improving the quality of life of individuals affected by stroke (25,26).

Although the results of this study are promising, more research is needed to validate these findings and further explore the effectiveness of these different types of interventions. Future studies may compare the relative effectiveness of these different types of interventions to determine which are most effective in a given context. Further research can evaluate how these interventions affect patients' quality of life, including psychological and emotional aspects.

REFERENCES

1. Donkor ES. Stroke in the 21(st) Century: A Snapshot of the Burden, Epidemiology, and Quality of Life. Stroke research and treatment. 2018;2018:3238165.
2. Prentice RL, Aragaki AK, Chlebowski RT, Rossouw JE, Anderson GL, Stefanick ML, et al. Randomized Trial Evaluation of the Benefits and Risks of Menopausal Hormone Therapy Among Women 50-59 Years of Age. American journal of epidemiology. 2021 Feb;190(3):365–75.
3. Adams HPJ, Bendixen BH, Kappelle LJ, Biller J, Love BB, Gordon DL, et al. Classification of subtype of acute ischemic stroke. Definitions for use in a multicenter clinical trial. TOAST. Trial of Org 10172 in Acute Stroke Treatment. Stroke. 1993 Jan;24(1):35–41.
4. Thuijs DJFM, Habib RH, Head SJ, Puskas JD, Taggart DP, Stone GW, et al. Prognostic performance of the Society of Thoracic Surgeons risk score in patients with left main coronary artery disease undergoing revascularisation: a post hoc analysis of the EXCEL trial. EuroIntervention : journal of EuroPCR in collaboration with the Working Group on Interventional Cardiology of the European Society of Cardiology. 2020 May;16(1):36–43.
5. Kementerian Kesehatan RI. Penyakit Tidak Menular. 2022.
6. World Health Organization. Cardiovascular Diseases (CVDs). 2021.
7. Bradbury CA, Lawler PR, Stanworth SJ, McVerry BJ, McQuilten Z, Higgins AM, et al. Effect of Antiplatelet Therapy on Survival and Organ Support-Free Days in Critically Ill Patients With COVID-19: A Randomized Clinical Trial. JAMA. 2022 Apr;327(13):1247–59.
8. Kuriakose D, Xiao Z. Pathophysiology and Treatment of Stroke: Present Status and Future Perspectives. International journal of molecular sciences. 2020 Oct;21(20).
9. Eng JJ. Fitness and Mobility Exercise (FAME) Program for stroke. Topics in geriatric rehabilitation. 2010;26(4):310–23.
10. Xia J, Pei S, Chen Z, Wang L, Hu J, Wang J. Effects of Conventional Speech Therapy with Liuzijue Qigong, a Traditional Chinese Method of Breath Training, in 70 Patients with Post-Stroke Spastic

- Dysarthria. *Medical science monitor : international medical journal of experimental and clinical research*. 2023 Jun;29:e939623.
11. Faridah AA, Noor Istiqomah I, Kurnianto S, Khovifah N. The Effectiveness of Range of Motion (ROM) on Increasing Muscle Strength in Stroke Patients: Literature Review. *Nursing and Health Sciences Journal (NHSJ)*. 2022;2(2):137-42.
 12. Hillman K, Dix K, Ahmed K, Lietz P, Trevitt J, O'Grady E, et al. Interventions for anxiety in mainstream school-aged children with autism spectrum disorder: A systematic review. *Campbell systematic reviews*. 2020 Jun;16(2):e1086.
 13. Hosseini ZS, Peyrovi H, Gohari M. The Effect of Early Passive Range of Motion Exercise on Motor Function of People with Stroke: a Randomized Controlled Trial. *Journal of Caring Sciences*. 2019;8(1):39-44.
 14. Kim KH, Jang SH. Effects of cognitive sensory motor training on lower extremity muscle strength and balance in post stroke patients: A randomized controlled study. *Clinics and Practice*. 2021;11(3):640-9.
 15. Rhestifujayani E, Huriani E, Muharriza M. Comparison of muscle strength in stroke patients between the given and not given range of motion exercise. *Nurse Media Journal of Nursing*. 2015;5(2):88-100.
 16. Srinayanti Y, Widiyanti W, Andriani D, Firdaus FA, Setiawan H. Range of motion exercise to improve muscle strength among stroke patients: a literature review. *International Journal of Nursing and Health Services (IJNHS)*. 2021;4(3):332-43.
 17. Mahmood W, Ahmed Burq HSI, Ehsan S, Sagheer B, Mahmood T. Effect of core stabilization exercises in addition to conventional therapy in improving trunk mobility, function, ambulation and quality of life in stroke patients: a randomized controlled trial. *BMC Sports Sci Med Rehabil*. 2022;14(1):62.
 18. Nadia Saleem M, Iqra Waseem M, Farwah Batool M, Tahir Mahmood M, Wajeaha Mahmood M, PPDPT B. Effect of Pilates based exercises for improving pain and physical function in symptomatic knee osteoarthritis—a randomized controlled clinical trial. *Anaesthesia, Pain & Intensive Care*. 2022;26(3):291-6.
 19. Young HJ, Mehta T, Herman C, Baidwan NK, Lai B, Rimmer JH. The Effects of a Movement-to-Music (M2M) Intervention on Physical and Psychosocial Outcomes in People Poststroke: A Randomized Controlled Trial. *Archives of Rehabilitation Research and Clinical Translation*. 2021;3(4).
 20. Cho JE, Lee WH, Shin JH, Kim H. Effects of bi-axial ankle strengthening on muscle co-contraction during gait in chronic stroke patients: A randomized controlled pilot study. *Gait and Posture*. 2021;87:177-83.
 21. Cho KH, Park SJ. Effects of joint mobilization and stretching on the range of motion for ankle joint and spatiotemporal gait variables in stroke patients. *Journal of Stroke and Cerebrovascular Diseases*. 2020;29(8):104933.



22. Young HJ, Mehta T, Herman C, Baidwan NK, Lai B, Rimmer JH. The Effects of a Movement-to-Music (M2M) Intervention on Physical and Psychosocial Outcomes in People Poststroke: A Randomized Controlled Trial. *Archives of rehabilitation research and clinical translation*. 2021 Dec;3(4):100160.
23. Venketasubramanian N, Yudiarto FL, Tugasworo D. Stroke Burden and Stroke Services in Indonesia. Vol. 12, *Cerebrovascular diseases extra*. Switzerland; 2022. p. 53–7.
24. Abdillah A, Istiqomah IN, Kurnianto S, Khovifah N. The effectiveness of range of motion (ROM) on increasing muscle strength in stroke patients: Literature review. 2022;
25. Cho JE, Shin JH, Kim H. Does electrical stimulation synchronized with ankle movements better improve ankle proprioception and gait kinematics in chronic stroke? A randomized controlled study. *NeuroRehabilitation*. 2022;51(2):259–69.
26. An CM, Won JI. Effects of ankle joint mobilization with movement and weight-bearing exercise on knee strength, ankle range of motion, and gait velocity in patients with stroke: a pilot study. *J Phys Ther Sci*. 2016;28(2):689–94.