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THE INFLUENCE OF RANGE OF MOTION ON THE LEVEL OF MUSCLE STRENGTH IN STROKE PATIENTS

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Abstract

Strokes can occur due to injuries inflicted upon the blood vessels within the brain, therefore they are more likely to be susceptible to blockages resulting in motor disorders that make it difficult for them to carry out movements caused by motor dysfunction in the extremities. To find the influence of range of motion on the level of muscle strength in stroke patients. This research is a literature review using three databases, including Science Direct, PubMed, and ProQues. The article search results obtained eight articles that were filtered using PRISMA guidelines. This research seeks articles about range of motion on the level of muscle strength in stroke patients who fall within the inclusion criteria. The total number of articles obtained was 1,662 from three databases, with details; 1,000 articles from Science Direct, 89 articles from PubMed, and 573 articles from ProQues. The review results of eight articles show that range of motion can increase the level of muscle strength in stroke patients. Range of motion can be implemented in stroke patients because it has many benefits, one of which is increasing muscle strength.

Keywords: Range of Motion, Muscle Strength, Stroke.

1. INTRODUCTION

Stroke is a health problem in the world caused by high mortality rates and levels of physical and mental disability. According to the World Health Organization (WHO), stroke is one of the three causes of death after heart disease and cancer. Every year, stroke contributes to 15 million people, while 5.5 million of them die and another 5 million stroke sufferers experience lifelong disability (Asín-Prieto et al., 2022).

Strokes can be caused by damage to blood vessels in the brain making them more susceptible to blockage. This can occur due to hypertension, high cholesterol levels, obesity, diabetes, smoking, having a family history of stroke, and being elderly. Several precautions that can be taken to reduce the impact of stroke include maintaining a healthy diet (Jung-Ho & Eun-Ja, 2023). Stroke is the main cause of motor disorders, making it difficult for them to carry out movements caused by motor dysfunction in the extremities, thus having a negative impact on daily activities (R.-K. Kim et al., 2023). Exercise and appropriate treatment for stroke patients are very important for the rehabilitation and recovery period (J. Kim et al., 2020), so that patients can slowly carry out activities independently such as moving, putting on clothes, and eating (Purnamawati et al., 2020).

Range of motion can be applied to stroke patients to increase muscle strength through small movements that can be done independently or accompanied by nurses and other health workers. This survey points to distinguish the benefits of extend of movement on the level of muscle quality in stroke patients. The creators used a written survey approach to describe the benefits of ROM on the level of muscle quality in stroke patients.

2. METHOD

The method we use is the approach of a literarure review to find the influence of range of motion on the level of muscle strength in stroke patients. The search strategy was carried out by looking for related journal articles on range of motion using three databases, including ScienceDirect, PubMed, and ProQues, using the Boelean operator (AND) and RMS keywords.

Articles are determined using two criteria. Inclusion criteria are articles with a period of 5 years, in English, subject to stroke patients, aged >18 years, research review, and meta-analysis. The process we carry out is by first checking for duplications, then selecting them using titles, articles, and abstracts that are appropriate, complete, and adjusted to the specified criteria. The exclusion criteria were review articles and meta-analysis. Article selection uses PRISMA guidelines. The following are the results of the search for selected articles.

3. RESULTS AND DISCUSSION

The articles produced from these three databases were 1,662 articles with the research results showing that 8 articles were reviewed with range of motion on the level of muscle strength in stroke patients. A total of 270 patients from the entire article were stroke patients. Below, we will explain the themes that the writer found in the articles discussed from the summaries of these articles.

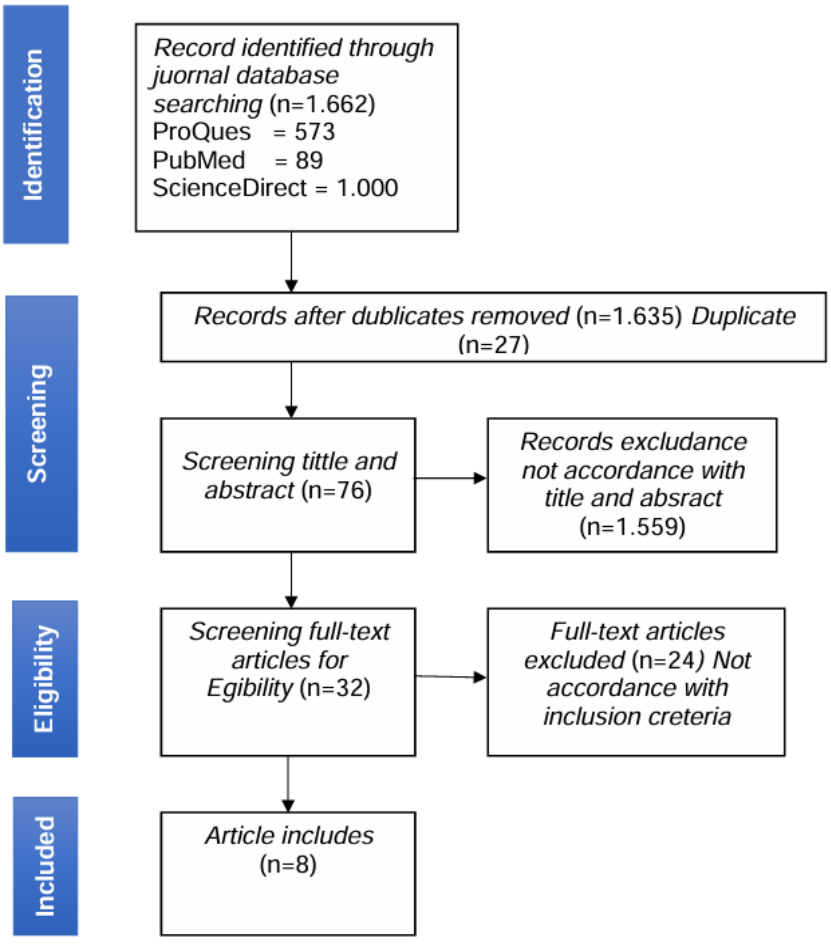

Figure 1: PRISMA (Search and Screening Strategy)

Table 1: Summary of Range of Motion Eight Articles

No	Research Tittle (Year)	Method	Results	Motive
1	(Yazdani et al., 2022) Can Early Neuromuscular Rehabilitation Protocol Improve Disability After a Hemiparetic Stroke? a Plot Study.	**Objective:** To evaluate the effects of a neuromuscular ERT protocol, including ROM passive exercises, resistance training, standing exercises with support, and active exercises, on motor function immediately after hemiplegic stroke. **Design:** Quasi experiment, single blind, convenience sampling. **Sample**: 12 patients. **Intervening:** Performed 2-3 hours 6 times a week for 3 months. **Instrument:** - Fu gle-mayer assessment - Box and blocks test - Timed up and go	The results show that ERT can improve motor function and muscle strength.	Benefit
2	(Trompetto et al., 2023) Increasing The Passive Range Of Motion In Stroke Patiens Using Botulinum Toxin: The Role Of Pain Relief.	**Objective:** To determine the effect of botulinum toxin A on excessive muscle activity, pain in stroke patients (ischemic 47 patients and hemiparetic 23 patients), increased ROM passive. **Design:** Experiment **Sample:** 70 stroke patients **Intervention:** The patient received botulinum toxin therapy and was discharged 3-6 weeks after botulinum toxin A treatment. **Instrument:** - Numeric rating scale - NSR	The results of BoNT treatment - on muscle tone, pathological posture, and pain decreased in the elbow flexors of the fingers, resulting in an increase in muscle strength in the fingers, while p-ROM only increased in the flexors of the fingers, and pain had the benefit of increasing the p-ROM, which was observed after BoNT treatment.	Benefit
3	(Olczak & Truszczyńska-Baszak, 2021) Influence Of The Passive Stabilization Of The Trunk And Upper Limb On Selected Parameters Of The Hand Motor Coordination, Grip Strength And Muscle Tension, In Post-Stroke Patients.	**Objective:** To determine the use of motor coordination parameters of the wrist and hand, grip strength, and muscle strength in patients in the subacute phase after ischemic stroke, the affected trunk and upper extremities (dominant or non-dominant) compared with healthy patients Determine stability. **Design:** Observational study **Sample:** 66 patients **Intervention:** Performed on patients 5-7 weeks after stroke with passive ROM and fingers measured in each position using a hand tutor device. **Instrument:** - EMG software	Increased hand tone and muscle strength, as well as statistically significant greater motor coordination in the fingers ($p<0.001$) and wrist ($p<0.001$) in individuals with ischemic stroke.	Benefit
4	(Anselmo de Athayde Costa e Silva et al., 2020) Positive Balance Recovery in Ischemic Post-Stroke Patients with Delayed Access to Physical Therapy.	**Objective:** To improve balance in chronically suffering patients with stroke hemorhagic intra cerebral (ICHS) or ischemic stroke **Design:** Descriptive observational study. Sample: 34 patients. **Intervention:** There are 20 sessions spanning three weeks each following a standard operating procedure protocol: ROM passive and active, coordination, balance exercises sitting and	Results showed improvements in balance and muscle tone with standing and moving after the intervention.	Benefit

		standing, large muscle activities such as walking, stationary movements. Stairs, seated stepper, arm ergometry, combined arm-leg ergometry, circuit training. **Instrument:** - Capacitive pressure platform		
5	(Gil-Castillo et al., 2022) A Robot-Assisted Therapy to Increase Muscle Strength in Hemiplegic Gait Rehabilitation.	**Objective:** Enhancing posture and movement control through movement-based exercises based on self-mobilization should result in a change in muscle strength at the extremities related to functional gait with ROM, as well as strengthening exercises that support muscle growth. **Design:** Clinical studies **Sample:** 23 patients **Intervention:** 24 sessions with 2 sessions per week for 12 weeks, each lasting 1 hour, **Instrument:** - Before and after therapy	The results indicating that training therapy increased muscle and joint strength, especially at the level of hip and knee joint strength.	Benefit
6	(Taketomi et al., 2021) Hybrid Assistive Limb Intervention for Hemiplegic Shoulder Dysfunction Due to Stroke.	**Objective:** Using a single-joint hybrid assistive limb (HAL), seated elevation training was performed on a 54-year-old lady who suffered a stroke and was left with right hemiplegia. **Design:** Experiment **Sample:** 1 patient was 54 years old **Intervention:** the patient performed a total of 10 20-minute HAL sessions over three months with shoulder scapula flexion exercises with HAL in range of motion (ROM) **Instrument:** - Before, after and 6 months after the HAL intervention	Right upper extremity results improved with shoulder flexion passive and active ROM of 105° be 115° and 65° be 105°, MMT from 2 to 4 right hand box and beam test from 1 to 8 proper grip strength, less than 5 to 7.4kg and action research test total score from 10 to 20.	Benefit
7	(Winkler et al., 2019) The first patient treated with a triple combination therapy after recurrent ischemic stroke.	**Objective:** To find out the 3 combination therapy for functional motor recovery **Design:** Experiment **Sample:** 1 patient was 65 years old **Intervention:** giving 3 therapies (intensive occupation for at least 1 hour and conventional rehabilitation for 2-3 hours per day for 28 days, anodal transcranial direct current stimulation every day, 2 weeks of treatment with daily intravenous infusion of 30 ml of cerebrolysin for 14 days) combined for 14 days and perform small things (picking up small pieces, range of motion in arms) **Instrument:** - Before and after being given therapy for 14 days	After conducting before and after tests (nine-hole peg test, grip strength, functional hand scale 1-5, ARAT, active ROM for left shoulder) showed marked improvement in functional motor recovery and muscle strength after being given a combination of therapy.	Benefit
8	(Shao et al., 2023) Strength Training of the Nonhemiplegic Side Promotes Motor Function Recovery in Patients With Stroke: A Randomized Controlled Trial.	**Objective:** To determine the effect of strength training on the non-hormeplegic side on balance function, mobility, and muscle strength in ischemic stroke patients. **Design:** Single-blind randomized controlled trial (evaluator) **Sample:** 63 **Intervention:** 45 minutes, once a day, 5 times a week for 6 weeks with forward stepping exercises, lower extremities stepping over obstacles or climbing platforms repeatedly, and doing ROM in the hands and touching objects repeatedly. **Instrument:** - BBS 14 item	The results show that strength training on the non-hormeplegic side can help restore balance, mobility and muscle strength in stroke patients	Benefit

Table 2: Description of Characteristics

No	Characteristics	Frequency (N)	Percentage (%)
1	**Country**		
	Asia		
	China	1	12,5%
	Japan	1	12,5%
	Iran	1	12,5%
	Australia		
	Australia	1	12,5%
	Europe		
	Poland	1	12,5%
	Spain	1	12,5%
	Italy	1	12,5%
	America		
	Brazil	1	12,5%
2	**Study Design**		
	Experiment	4	50,0%
	Observational study	2	25,0%
	Clinical study	1	12,5%
	Randomized controlled trials (RCTs)	1	12,5%
3	**Types of Stroke**		
	Ischemic	234	86,7%
	Hemiplegia	24	8,9%
	Hemiparetic	12	4,4%
4	**Gender**		
	Male	168	62,2%
	Female	102	37,8%
5	**Age**		
	Age > 45	237	87,8%
	Age < 45	33	12,2%

4. DISCUSSION

Discussion Of Stroke

The research results show that ROM can increase muscle strength in stroke patients. Stroke is caused by damage to the corticospinal tract and spasticity (Ho Seok Lee et al., 2021). On the side of the body, stroke patients usually experience hemiparesis, resulting in muscle weakness and joint strength (Arislander Jonathan Lopes Dumont et al., 2022), so the stroke patients experience difficulty in moving, standing, turning around while standing, or climbing up the stairs (Cumplido-Trasmonte et al., 2023). Recovery in stroke patients is very important for their ability to carry out daily activities (Seok-Hui et al., 2021). Decreased muscle strength can be caused by several factors, the most common being muscle disorders. The distribution pattern of primary weakness is found in differences between muscle groups such as the upper and lower extremities (Khan et al., 2019). The application of training or interventions such as planned, textured, and repetitive training can increase muscle strength and fitness during the rehabilitation period for stroke patients (Kang et al., 2023). ROM is included in several training programs that can be applied to stroke patients. ROM can help increase muscle strength, resulting in increased mobility. Intervention range of motion on an increase in muscle strength is influenced by an inadequate decrease in muscle mass, which requires muscle contractions (Cho et al., 2021). Based on the table above, researchers obtained information that the most numerous continents are Asia, such as China, Japan, and Iran, and Europe, such as Poland, Spain, and Italy. The

method that is often used in this table is an experiment that is suitable to determine the effect of Range of motion before and after intervention on the level of muscle strength in stroke patients.

Types and Factors of Stroke

Types of Strokes

Based on the results of the review of the article, it shows that the type of stroke that often occurs is ischemic stroke 234 (86.7%) patients. This is in line with research conducted by Nadhifah & Sjarqiah (2022) with the results that ischemic stroke occurred more frequently, namely in 49 patients with a percentage of 94.2% in Jakarta Sukapura Hospital in 2019. This is supported by research conducted by Bachmid et al., (2019) based on the results of CT scans, it showed that ischemic strokes occurred more frequently in 72 patients with a percentage of 80.9%, while hemorrhagic strokes occurred in 19 patients with a percentage of 19.1%.

Gender

Based on the results of the review of the article, it shows that the male gender experienced the most strokes compared to the female gender, namely 168 men in the sample (62.2%). This is in line with research conducted by Rahayu (2023), which states that the majority of stroke sufferers are men. This is in line with research conducted by Sinata and Maryani (2023) on the percentage of research conducted on ischemic stroke patients, it was found that men had the highest percentage, namely 63%, compared to the percentage of women of 37%. This also has similarities with research conducted by Sultradewi Kesuma et al., (2019) which said that most of the stroke patients hospitalized at Klungkung Regional Hospital were male, amounting to 70.8%. Men have a higher risk of having a stroke due to several factors, including an unhealthy lifestyle such as smoking, consuming soft drinks, and rarely exercising or moving (Dedi et al., 2023).

Age

Based on the results of the review of the article, it shows that those aged >45 years experienced the most strokes, namely 237 patients (87.8%). This is in line with research conducted by Andini et al., (2023), the results of an univariate analysis of ischemic stroke with age showed the highest results with age >46 years. This is supported by research conducted by Karangan and Setyawati (2022), based on the results, obtained that strokes tend to strike at the age of 46-55 years, or the early elderly. This is in line with research conducted by Laili & Taukhid (2023) that, based on the results, most of them consisted of people over 50 years of age.

5. CONCLUSION

Based on the results of the influence literature review range of motion on the level of muscle strength in stroke patients. Range of motion can be applied to stroke patients, which can provide benefits, one of which is increasing muscle strength. Based on the 8 articles that have been analyzed, it can be concluded that muscle strength can increase after ROM was done. Based on the results of the literature review, it is hoped that intervention will be carried out ROM in stroke sufferers by asking for help from nurses and other health workers or independently, either at home or in a clinical environment.

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