Citra Delima Scientific journal of Citra Internasional Institute
p-ISSN: 2087-2240; e-ISSN: 2655-0792

The Effectiveness Of Ball Grip Therapy In Stroke Patients: *Literature Review*

Leya Indah Permatasari[1*], Tania Tiara[2], Khoirun Ni'am[3], Delya Aulina[4]
[1]Lecturer of Professional Study Program, Muhammadiyah University of Cirebon
[2,3,4] Student of Professional Study Program, Muhammadiyah University of Cirebon
*Email: leya.indah@umc.ac.id

Keywords:
Stroke, Ball Hand Therapy, Non-Hemorrhagic

Article Info:

Date sent:
17 October 2024

Revised date:
22 December 2024

Date received:
23 April 2025

DOI Article:
10.33862/citradelima.v9i1.492

Page: 9-20

Abstract

The damage resulting from a stroke is due to the blood vessels of the brain getting afflicted. Stroke ranks second in terms of disability and death globally, only preceded by cardiovascular diseases. In 87% of the countries affected by stroke, Indonesia included, it is estimated that stroke is the leading cause for death and disability. This study aims to analyze whether ball grip therapy is effective in stroke patients. This study is descriptive and analytical in nature focusing on the benefits that stroke patients can gain from ball grip therapy. This study used a quantitative approach which stemmed from research based on an electronic literature review. A wealth of research supports that consistent and repetitive use of a rubber ball grip improves muscle strength effectively. This also proves that the treatment in fact has the potential to improve muscle strength as well as speed up blood circulation. Rubber ball grip exercise therapy is recommended as a nursing intervention for managing muscle strength with non-hemorrhagic stroke clients.

INTRODUCTION

Of all health problems in the world today and in Indonesia, stroke is highly prevalent. Based on the Ministry of Health in Indonesia in 2018, stroke is second in the world's death rate list, after heart disease, and is the third most common cause of disability. Cardiovascular diseases such as stroke have social and economic costs (Aliviana & Fajriyah, 2023). Stroke is the loss of blood flow to the brain which causes blood flow to stop, yielding a number of neurological symptoms. It is a condition that occurs suddenly and persists for more than a day (Kaban, Ginting, & Nasution, 2023).

According to the IHME statistics in 2019, stroke is one of the leading causes of death in Indonesia, constituting 19.42% of fatalities. Based on the 2023 Indonesia Health Survey (SKI) (Hartanto, 2022), the prevalence of stroke in Indonesia is 8.3 per 1,000 people. There are two types of strokes which include haemorrhagic and non-haemorrhagic strokes. Azizah & Wahyuningsih (2020) suggest that haemorrhagic strokes occur when a blood vessel in the brain bursts and bleeds. Auria et al. (2023) refer to stroke as the condition when blood vessels are either partially or fully obstructed, halting blood flow. This leads to a reduced blood supply to soft tissue, resulting in either temporary or permanent damage to motor and sensory functions, severe imbalance, and even lifelong disability (Siswanti, Hartinah, & Susanti, 2021). A stroke causes an individual's muscles to weaken and lose power (Agusrianto & Rantesigi, 2020). Approximately 70-80% of stroke patients experience hemiparesis, which is the loss of voluntary movement in one half of the body, leading to an inability to perform basic daily tasks. (Levia, Suwaryo, and Waladani, 2021). Primary motor cortex degeneration, also known as Brodmann area 4 to 6, leads to hemiparesis which is the weakening of voluntary musculature. This leads to muscle atrophy and failure in delivering signals to the hand's digits.

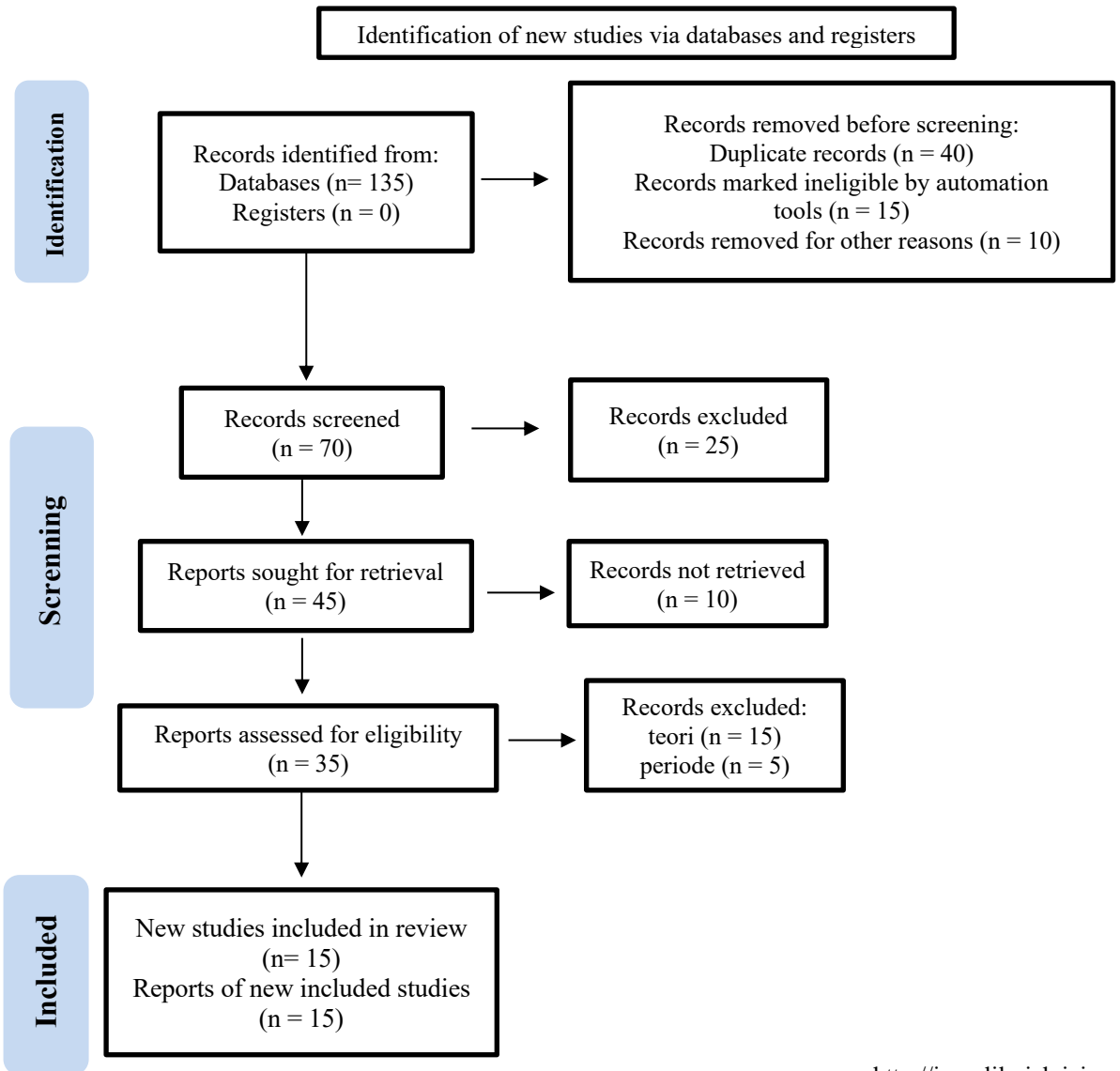
As cited by Khaliri & Waliyanti (2023), pharmaceutical treatment focuses primarily on administering medications that control blood pressure, manage bleeding, and reduce cholesterol levels. Non-pharmacological approaches to stroke rehabilitation include mirror therapy, range of motion (ROM) exercises, and rubber ball grip therapy, which have

been shown to assist patients in recovering muscle strength (Christaputri & Anam, 2023). Rubber ball grip therapy is a functional hand exercise that uses a rubber ball which is compressible, elastic and has prongs to grasp ball-like structures (Kusumaningrum & Wulandari, 2023). Evaluating one's strength of grip through the three-step process of opening one's hand, closing one's fingers to grasp and rigorously assessing the grip provides an excellent way of refining hand movements (Hapsari et al., 2020). Studies show that repetitively and consistently gripping a rubber ball adds to muscle strengthening (Pomalango, 2023). This fact holds true because the exercise promotes muscle fibrils to grow which inevitably increases the amount of work that the muscles perform. Faridah, in 2019, had conducted a study where it was noted that the handgrip muscle strength was 1 before the rubber ball was held and 3 after 5-10 minutes of holding the ball. It was noted that patients who were subjected to the treatment of holding the rubber ball for 10–15 minutes demonstrated significantly stronger handgrip muscles than the control group. Another study found that stroke patients with non-haemorrhagic strokes who underwent therapy with the rubber ball grip exercise showed increased muscle strength (Margiyati et al., 2022).

METODH

The approach outlined in the journals was guided by the PICO framework. This information formed a sample that contained 15 literature review journals. E-database data was obtained using Google Scholar and ProQuest. To further narrow the focus of the journal, the phrase ball grip therapy may be used in conjunction with AND, OR, NOT, or AND NOT. The employed keywords were "effectiveness of ball grip therapy in stroke patients, effectiveness of ball grip therapy in stroke patients: a literature review."

Tabel 1. Journal search process, Prisma 2009 flow Diagram



FINDINGS AND DISCUSSION

Findings

Tabel 2. Study Characteristic

No	Author	Years	Artichle's Title	Metodh (Design, Sampel, Analysis)	Resarch Findings and Discussion
1.	Edwar	2024	"Use of rubber ball gripping therapy to increase muscle strength in a patient with physical mobility disorders, Mrs. S with hemorrhagic stroke, Singgalang room, 3rd floor RSOMH Bukittinggi 2023 "	The participants for this case study were two patients which were derived from the selection criteria.	I am able to augment my muscular strength in four full ranges of motion against gravity and in low resistance after six sessions of rubber ball exercise.
2.	Nur Fauziah, Faishol Roni, Tiara Fatma Pratiwi, Erna Ts Fitriyah, Arif Wijaya	2024	"Nursing For Non-Hemorrhagic Stroke Patients With Nursing Diagnosis Of Physical Mobility Impairment Using Therapeutic Rubber Ball Exercise In Abimanyu Room Of Jombang Regional Hospital"	Non-hemorrhagic stroke patients residing in the Abimanyu room of Jombang Hospital use a handheld rubber ball as a therapy rudiment.	Research concludes that the problem of reduced mobilization is partially solved with the application of rubber ball handheld therapy.

3.	Rosaulina	2024	"Ball Grasp Therapy for Improving Muscle Strength in Stroke Patients at Deli Tua Health Center in 2024"	Patients who had a stroke at Deli Tua Health Center	Based on the results of a ball therapy session, 90 percent of the patients had problems with muscle strength while 10% had problems with thumb opposition" – which functions as a 'pinch' between the thumb and the same hand's fingers.
4.	Pratiwi & Subekti	2024	"Impact of Hand Therapy with Rubber Ball on Muscle Power among Stroke Patients in Anyelir Ward of Regional General Hospital (RSUD)"	2 (two) respondents have suffered a stroke and are post-stroke patients. They met the set inclusion and exclusion criteria.	Based on my observations, both patients' muscle strength was at 3 on Day 1 prior to the commencement of the handheld rubber ball therapy, and increased to 5 by Day 4. This suggests that there was indeed an increase in the patient's strength prior and post to therapy, there was also a difference in the amount of improvement for the two therapies provided.
5.	Kanzler et al.	2022	"Alow-dimensional representation of arm movements and hand grip forces in post-stroke individuals Scientific"	27 individuals who had strokes post-stroke	This indicates that the behavioral repertoire among post-stroke individuals remains mostly intact, warranting therapeutic approaches that enhance the quality of movement and reduce grip strength to enable performance of daily routine activities after stroke rehabilitation.

6.	Margiyati et al.	2022	"Using Rubber Ball Grip Exercises To Improve Strength In Individuals With Non-Hemorrhagic Stroke"	An approach involving a detailed case study was used for this investigation. The inclusion criteria for the first non-hemorrhagic stroke episode included the patient having upper limb weakness, speaking eloquently, and actively engaging in at least two verbal dialogs.	This suffices to claim that following family nursing intervention with ball grip exercise therapy, there was an increase, in the muscle strength values of clients with non-hemorrhagic stroke.
7.	D. M. Sari & Kustriyani	2023	"Using Grasp Ball to Assist with Physical Mobility Limitations in Patients with Non-Hemorrhagic Stroke"	respondent patients who experience criteria of patients with hand muscle weakness	S and A's study conducted from June 14th to 17th and June 19th to 22nd in 2023, respectively, found that handball sessions enhanced muscle strength in non-hemorrhagic stroke patients from Muhammadiyah Darul Istiqomah Kaliwungu District, Kendal Regency.
8.	Khaliri & Waliyanti	2023	"Ball Handset Therapy Activity On Muscle Strength Of The Hand In Elderly With Stroke: A Case Study."	case report using handheld ball therapy, An elderly person with stroke and has muscle weakness in the upper extremities	A useful tool to help stroke patients regain strength in their hands is a handheld therapy ball. The results showed that the elderly can improve their muscle strength with the use of handball handheld treatment when done for four days. Strength was 5 out of 3 before Day 1 of handball treatment. Strength training with handball for four days resulted in a rating of 5 out of 4 for the patient.

9.	Nona & Wijayanti	2024	"Implementation Of Rubber Ball Grip Therapy To Improve Strength In Patients With Non-Hemorrhagic Stroke In The Rose Room Dr. Tc Hiller's Hospital Maumere"	2 subjects who met the criteria of non-hemorrhagic stroke patients, encountered in the Mawar ward of RSUD dr. TC Hillers Maumere.	The activity of the current study suggests that dense rubber ball grip rehabilitation increases muscle strength. This is attributed to the fact that patients willingly engage and gain from the exercises provided.
10.	Azizah & Wahyuningsih	2020	"The Use of Ball Grasp in Non-Hemorrhagic Stroke Patients I Overcome Physical Mobility Disorders"	2 respondents among patients with non-hemorrhagic stroke	As the study results suggest, the muscle strength of non-hemorrhagic stroke patients improved with and without intervention utilizing a handheld ball.
11.	Darmawan et al.	2024	"Use Of Range Of Motion (Rom) Exercises With A Rubber Ball To Improve Strength In Patients Following Non-Hemorrhagic Stroke"	2 Stroke patient respondents	After engaging in range of motion exercises with a rubber ball for 10 to 15 minutes per day, there was improvement in the muscle strength of both respondents after 4 days.

12.	Rahmasari & Purwaningsih	2023	"Grabing A Ball Can Increase Muscle Strength In Stroke Patients"	22 respondents with sampling using probability sampling technique with simple random sampling algorithm	Upper limb stroke rehabilitation patients with paralysis may benefit from the ball hand therapy which targets and strengthens the muscles of the fingers and hands.
13.	Eny Erlinda Widyaastuti, Erni Chaerani, Husman	2023	"Case Study: Hand Muscle Strength Measurement Devices Inflation of Rubber Balls"	A case study was conducted using 130 participants aged 18-50 years. It was showcased that muscle strength divides with age, and one's muscle mass does decrease.	The participants in this study did notice an increase in the strength of their hand muscles with rubber ball grip therapy when compared with control where no treatment was provided.
14.	Olczak & Dornowski	2023	"Case Study: The level of functionality of the affected upper limb in stroke patients depends on the type of therapy used and the lateralization of the subjects body A randomized observational study."	A case study was conducted utilizing 60 stroke patients to analyze the primary problem in stroke patients and concluded that the upper extremity dysfunction is the main issue.	The outcomes of the treatment demonstrated improvements in mobility, movement and reaction speed, as well as enhanced grip strength in the shoulder joint of the affected dominant upper limb.

15.	Zulkifli B	2023	"Case study: rubber ball grip therapy increases muscle strength promoting post-stroke recovery"	Assessing 20 stroke patients, this study analyzed the impact of handheld rubber ball therapy on muscle recovery challenges faced by post-stroke patients.	According to the findings of one study, individuals recovering from a stroke demonstrated improved muscle strength with the use of a rubber ball handheld therapy device.

Ekslusi and Inklusi Criteria

The sample in this study is an article with inclusion criteria such as, the research sample in the article includes patients aged 18-65 years, published within 5 years (2016-2020), Open Access, Quantitative design, Written in Indonesian and/or English, Pertaining to collaborative practice in the operating room at various stages (Pre, intra and post surgery).

Articles that meet these inclusion criteria will be excluded based on these exclusion criteria, Duplication with other journal databases, Lack of congruence between title and content of journal, and sole authorship from a single health profession.

Selection

The outcomes of the review of literature were conducted using e-resources like ProQuest and Schoolar databases. By applying the keyword collaborative rubber ball grip therapy in patient stroke. The researchers came across 135 journals which were subsequently narrowed down to 70 journals based on the abstracts, titles and keywords. Fulfilling the eligibility criteria of the journals, 35 journals were gathered out of which there was some ineligibility for inclusion so after inclusion was done, 15 journals were finalized.

Discussion

This literature review has been prepared based on fifteen documents. As per the inclusion and exclusion criteria, which boundaries were drawn from the fifteen documents, the largest demographic is non hemorrhagic stroke patients. Other sub groups also utilize research on both hemorrhagic and non hemorrhagic stroke case studies. It is possible to assess loss of muscle strength among the elderly stroke population as they age. The stroke signs are one sided weakness (hemiparesis), muscle control problems (aphasia), abnormal walking, imbalance, and muscle atrophy. A stroke happens when there is an interruption of blood supply of blood to the brain because the blood vessels supplying the brain are either blocked or ruptured (Agusrianto & Rantesigi, 2020).

The aforementioned article uses non drug approaches and rubber ball handheld therapy as the intervention. The purpose of the therapy is to develop, maintain, and restore function through movement (physiotherapy). Repetitive achievement of the activity for 7-10 minutes a day for 4 consecutive days is effective in increasing stimulation to these muscles, thereby enhancing and strengthening them.

In the previous article, readers were presented with comparisons of pharmacological treatment alongside physiotherapy and non-contoured rubber balls therapy. The article's case study demonstrates that every single patient has unique level of mobility. From the case study, it was determined that some factors which impinge movement are energy levels, occupational, and nutritional status.

Ball grip therapy is also more effective after the fourth day when it is performed repeatedly and continuously, thus recovery of hand motor function after brain injury is improved. It aims at enhancing the strength, coordination, and flexibility of the hands and fingers of the patient. This type of grip therapy is part of a broader rehabilitative plan and is often used in combination with other exercises and therapies. To achieve maximum outcomes, this treatment must be approached in a systematic and progressive manner.

Some of the reasons why grip therapy can increase muscle strength are, the presence of prescribed measureable resistance, repeated exercises, and of giving rubber balls. Rubber balls given during rehabilitation increase finger muscle strength by stimulating muscle fibers to contract, thus engaging muscles.

The repetitive movement activities conducted with balls will trigger muscle fibers to contract and relax and result in the enlargement (hypertrophy) of muscle fibrils with regular exercise. The increase in the exercises done will result in an increased enlargement of muscle fibrils which is the reason there is increased strength of muscles. (Faridah et al, 2019).

Hence, as one can interpret from the research findings, it is conclusive that the application of rubber balls as a means of treatment can enhance muscle strength. Stroke patients suffering from upper limb muscle weakness demonstrated remarkable improvements in grip strength subsequent to engaging in rubber ball gripping exercises.

CONCLUSION

The application results in multiple studies revealed that rubber ball grip therapy proved successful in overcoming the physical mobility barriers within four days for some subjects with a muscle strength scale value of one to three, along with other subjects within four days with a muscle scale value of two to three. Moreover, for other subjects, some showed changes on day one with a muscle strength scale of two and after the therapy on day four with the increased muscle strength of three.

Continued application of the therapy beyond the fourth day has the potential to greatly improve the recovery of hand motor function impaired by brain damage. The therapy seeks to improve muscle power, dexterity, and range of motion of the fingers and hands of the patients. This ball grip therapy is usually incorporated into comprehensive rehabilitation programs and often combines with other exercises and therapies. A methodical and incremental framework in administering this therapy is crucial in achieving better outcomes.

One of the nursing interventions which increase motor function in the upper limbs with reduced muscular power is gripping a rubber ball. The participants' improvement in muscle power when doing this confirms that this is a good intervention.

Ball Grip Therapy

Few explanations for the impact of ball grip therapy on increasing muscle strength are:

a. Measurable resistance: The materials used to manufacture handheld balls provide some degree of resistance when gripped. This increases effort in the working muscles, thus improving strength. However, too much resistance is bad for the condition and increases fatigue in patients. This is not favorable. According to this literature review, measurable resistance for holding balls takes on average 5-10 minutes 3x a day which can be performed in a many different positions to suit the patient's condition.
b. According to a study conducted by Cantika (2021), repetitive motion treatment involving gripping a portable rubber ball for seven to ten minutes a day over four consecutive days provides constant stimulation to the muscles, encouraging development and strengthening. Each repetitive grip of the portable rubber ball stimulates contraction and relaxation of muscle fibers. Regular exercising assists in recovering muscle and expanding the muscle. Muskulatur wirst – Hypertrophierubuste Microschaden, skurrile American Football. Muskulatur wird fortepi die retrakto. Exercising more leads to an increase in the muscle being exercised, and contributes to gaining strength.
c. The use of rubber balls has an impact on the finger muscle strength and contractile fiber stimulation. It is possible for individuals to regain their strength, range of motion, ability to perform daily functional activities, and even avoid contractures with rubber ball exercises; however, these goals can only be achieved through active involvement in a proper rehabilitation program that motivates them to actuate the ball (Fauzan, 2021).
d. Physical exercise is beneficial in many areas, such as the rehabilitation of stroke survivors. In this activity, we will exercise by reaching out for the ball. The utilization of hands is critical in the recovery of the arm or the upper limb through functional exercises like holding a ball in the hand. Gripping exercises like those performed with a jagged rubber ball led to muscle fiber contractions. Exercises such as abduction, adduction, flexion, extension, opposition

and other finger movements are invaluable for day-to-day activities. (Kusuma et al., 2021)

Besides the hand muscles, the therapy also includes the forearm muscles which assists in the overall development of muscle strength. Squeezing or gripping the ball will make the muscles active again and help reprogram the brain with control. Regular ball movement exercises will cause contraction or expansion of muscle fibers, which will stimulate muscle contraction and relaxation. The increase in strength of muscles is attributed to enlarged muscle fibrils that result from heightened activity (Faridah et al, 2019).

BIBLIOGRAPHY

Agusrianto, A., & Rantesigi, N. (2020). Application of Passive Range of Motion (ROM) Exercises to Increase the Strength of the Limb Muscles in Patients with Stroke Cases. *Jurnal Ilmiah Kesehatan (JIKA)*, *2*(2), 61–66. https://doi.org/10.36590/jika.v2i2.48

Aliviana, N., & Fajriyah, N. N. (2023). Penerapan genggam bola untuk meningkatkan kekuatan otot genggam pada pasien stroke non hemoragik di Ruang Truntum RSUD Bendan. *Prosiding University Research Colloquium*, 1224–1229. file:///Users/macbookair/Downloads/360-Article%20Text-1373-1-10-20240512.pdf

Anggardani, A., Imamah, I. N., & Haniyatun, I. (2023). Penerapan Rom Exercise Bola Karet Untuk Meningkatkan Kekuatan Otot Genggam Pasien Stroke Di RSUD Dr. Moewardi Surakarta. *Jurnal Riset Rumpun Ilmu Kesehatan*, *2*(2), 86–97. https://doi.org/10.55606/jurrikes.v2i2.1738

Anggardani, A., Imamah, I. N., & Haniyatun, I. (2023). Penerapan Rom Exercise Bola Karet Untuk Meningkatkan Kekuatan Otot Genggam Pasien Stroke Di RSUD Dr. Moewardi Surakarta. *Jurnal Riset Rumpun Ilmu Kesehatan*, *2*(2), 86–97. https://doi.org/10.55606/jurrikes.v2i2.1738

Auria, R. W. P., Punjastuti, B., & Maryati, S. (2023). Penerapan mirror therapy untuk meningkatkan kekuatan otot ekstremitas bagian atas pada pasien stroke non hemoragic. *Journal of Nursing and Health*, *8*, 393–399. https://doi.org/10.52488/jnh.v8i4.311

Azizah, N., & Wahyuningsih, W. (2020). Genggam Bola Untuk Mengatasi Hambatan Mobilitas Fisik Pada Pasien Stroke Nonhemoragik. *Jurnal Manajemen Asuhan Keperawatan*, *4*(1), 35–42. https://doi.org/10.33655/mak.v4i1.80

Cahyanti, L. (2022). Terapi cermin terhadap kekuatan otot ekstremitas pada pasien stroke. *Jurnal Ilmiah Kedokteran Dan Kesehatan*, *1*(3), 219–231. https://doi.org/10.55606/klinik.v1i3.2333

Christaputri, S. T. W., & Anam, A. (2023). Perbandingan Implementasi Terapi Genggam Bola Karet Bergerigi dan Tidak Bergerigi Pada Pasien Stroke Nonhemoragik Terhadap Peningkatan Kekuatan Motorik Ekstremitas Atas. *Ners Muda*, *4*(3), 351–357. https://doi.org/10.26714/nm.v4i3.13518

Darmawan, I., Utami, I. T., & Pakarti, A. T. (2024). Penerapan Range Of Motion (ROM) Excercise bola karet terhadap kekuatan otot pasien stroke non hemoragik. *Jurnal Cendekia Muda*, *4*(2), 246–254. https://jurnal.akperdharmawacana.ac.id/index.php/JWC/article/view/586/391

Edwar, A. E. A. (2024). Penerapan terapi menggemgam bola karet terhadap peningkatan kekuatan otot dengan masalah gangguan mobilitas fisik pada poasien Ny S dengan stroke hemorogic di ruang singgalang lantai 3 RSOMH di bukittinggi tahun 2023. *Doctoral Dissertation Universitas Perintis Indonesia*. http://repo.upertis.ac.id/3352/

Fauzan, R. A. (2021). Studi Literatur Asuhan Keperawatan Pada Pasien Stroke Non Hemoragik Dengan Masalah Keperawatan Hambatan Mobilitas Fisik *Doctoral Dissertation, Universitas Muhammadiyah Ponorogo*. https://eprints.umpo.ac.id/id/eprint/7771\

Khaliri, K. P. R., & Waliyanti, E. (2023). Efektivitas Terapi Genggam Bola Terhadap Kekuatan Otot Tangan Pada Lansia Dengan Stroke: Studi Kasus. *Jurnal Syntax Fusion*, *3*(6), 613–621. https://doi.org/10.54543/fusion.v3i06.326

Kim, Y. H., Kim, D. J., & Jai, T.-M. C. (2016). One Destination and Two Events: A Comparative Analysis on Perceived Value, Satisfaction, and Intention to Revisit. *Event Management*, *20*(3), 327–339. https://doi.org/10.3727/152599516X14682560744596

Kusuma, A. P., Utami, I. T., & Purwono, J. (2021). Pengaruh Terapi Menggengam Bola Karet Bergerigi Terhadap Perubahan Kekuatan Otot Pada Pasien Stroke Diukur Menggunakan Hangryp Dynamometer Di Ruang Syaraf RSUD Jend a Yani Kota Metro. *Jurnal Cendikia Muda*, *2*(1), 17–23.

https://jurnal.akperdharmawacana.ac.id/index.php/JWC/article/view/287

Kusumaningrum, A. L., & Wulandari, T. S. (2023). Upaya penyelesaian masalah keperawatan gangguan mobilitas fisik pada pasien stroke dengan teknik latihan penguatan otot menggenggam bola karet. *Jurnal Ilmiah Keperawatan Dan Kesehatan Alkautsar (JIKKA)*, *2*(2), 1–10. https://jurnal.akperalkautsar.ac.id/index.php/JIKKA/article/view/77

Kanzler, Christoph M; Averta Giuseppe; Schwarz, Anne; Held Jeremia P O; Gassert, Roger; Bicchi, Antonio; Santello, Marco; Lambercy Olivier; Bianchi Matteo (2022). *Alow-dimensional representation of arm movements and hand grip forces in post-stroke individuals***.** 12 (1) Doi:10.1038/s41598-022-11806-4

Laus, R., Wida, A. S. W. D., & Adesta, R. O. (2021). Pengaruh terapi cermin terhadap kekuatan otot pasien dengan gangguan mobilitas fisik akibat stroke di ruang perawatan interna RSUD dr. TC Hillers maumere. *Jurnal Keperawatan Dan Kesehatan Masyaraka*, *6*(2), 1–10. https://jkkmfikesunipa.nusanipa.ac.id/cgi-sys/suspendedpage.cgi

Lembaga Penerbit Balitbangkes. (2018). *Laporan RISKEDAS 2018*. *Lembaga Penerbit Balitbangkes*. https://repository.badankebijakan.kemkes.go.id/id/eprint/3514/1/Laporan%20Riskesdas%202018%20Nasional.pdf

Lestari, S. (2018). Pengaruh Terapi Akfit Menggenggam Bola Karet Terhadap Kekuatan Otot Pada Pasien Stroke Non Hemoragik di Wilayah Kerja Puskesmas Pengasih 2 Kulon Progo Yogyakarta. *Skripsi.* STIKES Jendral Achmad Yani Yogyakarta

Lindsay, M. P., Norrving, B., Sacco, R. L., Brainin, M., Hacke, W., Martins, S., Pandian, J., & Feigin, V. (2019). World Stroke Organization (WSO): Global Stroke Fact Sheet 2019. *International Journal of Stroke*, *14*(8), 806–817. https://doi.org/10.1177/1747493019881353

Machyono, M., Tammasse, J., Kaelan, C., Muis, A., & Ganda, I. J. (2018). Efektivitas Terapi Cermin Terhadap Perbaikan Motorik Lengan Pasien Stroke Iskemik Akut. *Majalah Kedokteran Neurosains Perhimpunan Dokter Spesialis Saraf Indonesia*, *35*(2), DOI:10.52386/neurona.v35i2.4

Margiyati, M., Rahmanti, A., & Prasetyo, E. D. (2022). Penerapan Latihan Genggam Bola Karet Terhadap Kekuatan Otot Pada Klien Stroke Non Hemoragik. *Jurnal Fisioterapi Dan Ilmu Kesehatan Sisthana*, *4*(1), 1–6. https://doi.org/10.55606/jufdikes.v4i1.I

Mutiarasari, D. (2019). Ischemic stroke: symptoms, risk factors, and prevention. *Medika Tadulako: Jurnal Ilmiah Kedokteran Fakultas Kedokteran Dan Ilmu Kesehatan*, *6*(1), 60–73. http://jurnal.untad.ac.id/jurnal/index.php/MedikaTadulako/article/view/1 2337

Nona, A. N., & Wijayanti, A. R. (2024). Penerapan Rubber Ball Grip Therapy Terhadap Peningkatan Kekuatan Otot Pasien Stroke Non Hemoragik Di Ruang Mawar RSUD dr. TC Hillers Maumere. *Jurnal Kesehatan Tambusai*, *5*(1), 1137–1143. https://doi.org/10.31004/jkt.v5i1.25102

Notoatmodjo. (2020). *Metodologi Penelitian Kesehatan*. Rineka Cipta.

Nursalam. (2020). *Metodologi Penelitian Ilmu Keperawatan* (4th ed.). Salemba Medika.

Nurshiyam, M. A., & Basri, M. (2020). Asuhan Keperawatan Pemenuhan Kebutuhan Mobilitas Fisik Pada Pasien Stroke Non Hemoragik Di RSKD Dadi Makasar. *Jurnal Media Keperawatan: Politeknik Kesehatan Makassar*. Users/macbookair/Downloads/1555-6734-1-PB%20(1).pdf

Olczak, A., & Dornowski, M. (2023). The level of functionality of the affected upper limb in stroke patients depends on the type of therapy used and the lateralization of the subjects' body-A randomized observational study. *Baltic Journal of Health and Physical Activity*, *15*(3), 5–22. https://doi.org/10.29359/BJHPA.15.3.05

Pomalango, Z. B. (2023). Terapi Genggam Bola Karet Meningkatkan Kekuatan Otot Mendorong Pemulihan Pasca Stroke. *Profesional Health Journal,* *4*(2), 380–389. https://www.ojsstikesbanyuwangi.com/index.php/PHJ

Pratiwi, I. P., & Subekti, E. (2024). Pengaruh Dalam Suatu Terapi Genggam Bola Karet Dalam Kekuatan Otot Pada Pasien Stroke Dibangsal Anyelir Rumah Sakit Umum Daerah (RSUD). *Sukoharjo Nursing Journal*, *1*, 1–12. urnal.ppnisukoharjo.org/index.php/snj/article/view/2/1

Rahayuningtyas, I., & Ismoyowati, T. W. (2024). Case report: Intervensi mirror therapy terhadap

kekuatan otot ekstremitas pada pasien stroke non hemoragik di Rumah Sakit Swasta Di Purwodadi. *SBY Proceedings*, *3*(1), 14–20. https://jurnal.stikesbethesda.ac.id/index.php/p/article/view/457/319

Rahmasari, I., & Purwaningsih, I. (2023). Genggam Bola Mampu Meningkatkan Kekuatan Otot Pada Pasien Stroke. *Journal of Nursing and Health*, *8*(3), 350–354. https://doi.org/10.52488/jnh.v8i3.360

Rahmawati, I., Dewi, R., Pertami, S. B., Budiono, & Pasaribu, E. (2021). Hand Exercise Using a Rubber Ball Increases Grip Strength in Patients With Non-Haemorrhagic Stroke. *Malaysian Journal of Nursing*, *12*(3), 32–36. https://doi.org/10.31674/mjn.2021.v12i03.00

Rahmawati, Y. D., & Yuda, H. T. (2023). Studi Kasus: Efektivitas ROM dan Terapi Genggam Bola Karet dalam Peningkatan Kekuatan Otot Pasien Stroke. *Prosiding University Research Colloquium*, 969–974.http://repository.urecol.org/index.php/proceeding/article/view/2406

Ramadhani, S., Purwono, J., & Utami, I. T. (2022). Penerapan Pursed Lip Breathing Terhadap Penurunan Sesak Napas Pada Pasien Penyakit Paru Obstruksi Kronik (Ppok) Di Ruang Paru Rsud Jend. Ahmad Yani Kota Metro. *Jurnal Cendikia Muda*, *2*(2), 276–284. https://jurnal.akperdharmawacana.ac.id/index.php/JWC/article/viewFile/347/208

Rosaulina, M. (2024). Intervensi Terapi Genggam Bola Untuk Meningkatkan Kekuatan Otot Pada Penderita Stroke Di Puskesmas Deli Tua Tahun 2024. *Jurnal Pengabdian Masyarakat Putri Hijau*, *4*(2), 50–53. https://doi.org/10.36656/jpmph.v4i2.1698

Sari, D. M., & Kustriyani, M. (2023). Penerapan Genggam Bola Untuk Mengatasi Gangguan Mobilitas Fisik pada Pasien Stroke Non Hemoragik. *Prosiding Akademi Keperawatan Widya Husada Semarang*, *5*(1), 163–170. https://prosiding.d3per.uwhs.ac.id/index.php/eproc/article/view/72

Sari, F. M., Hasanah, U., & Dewi, N. R. (2023). Penerapan mirror therapy terhadap kekuatan otot ekstremitas atas pada pasien stroke non hemoragik di Ruang Syaraf RSUD Jend. Ahmad Yani Metro. *Jurnal Cendikia Muda*, *3*(3), 337–346. https://jurnal.akperdharmawacana.ac.id/index.php/JWC/article/view/477

Widyaastuti, E. E., Chaerani, E., Husman, & Yudo, E. (2023). Pengembangan Bola Karet Alat Pengukur Kekuatan Otot Tangan. *Journal Of Telenursing (JOTING)*, 5(1), 143–152. Doi: 10.31539/joting.v5i1.4756

Zulkifli B. Pomalango. (2023). Terapi Genggam Bola Karet Meningkatkan Kekuatan Otot Mendorong Pemulihan Pasca Stroke. *Professional Health Journal*, *4*(2), 380–389. https://doi.org/10.54832/phj.v4i2.450