e-ISSN 2985-4156
JOURNAL OF INTERNATIONAL PUBLIC HEALTH

The Effect Of Constraint Induced Movement Therapy (Cimt) On Gripping Strength In Stroke Patients At Siti Aisyah Hospital, Lubuklinggau City

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ARTICLE HISTORY
Received [20 Mei 2023]
Revised [25 Mei 2023]
Accepted [30 Juni 2023]

Keywords :
Stroke, Constraint Induced Movement Therapy, Hemiparesis.

ABSTRACT
Stroke is a serious, life-threatening medical condition in which poor blood flow to the brain leads to cell death. Patients who are suffering from stroke certainly have various kinds of problems, one of which is body weakness (paresis) limitations in grasping. The problem of the research is that there are still many cases of stroke patients with a decrease in grasping strength at Siti Aisyah Hospital, Lubuklinggau City. The purpose of this study is to determine the effect of Constraint Induced Movement Therapy on gripping strength in stroke patients.This study uses a type of quantitative research with a pre-experimental design approach with a one-group pre-test-post test design, namely research carried out for a population group of 60 patients and a sample of 10 patients. The bivariate statistical analysis method used in this study is the Paired T Test.The results of the study obtained the average value of grasping strength before Constraint Induced Movement Therapy, which was 9,150. The results obtained the average value of grasping strength after Constraint Induced Movement Therapy which was 12,950. The results of the bivariate analysis test with the T test showed that there was an effect of Constraint Induced Movement Therapy on grasping strength in stroke patients with a p value = 0,000.The results of the study suggest to provide Constraint Induced Movement Therapy exercises with longer application and are expected to be used to administer Constraint Induced Movement Therapy to stroke patients who experience grasping weakness.

INTRODUCTION

The government's programme to prevent and control stroke includes developing strategies to reduce the prevalence of stroke in Indonesia. Starting with strengthening public health promotive and preventive efforts such as campaigning for consumption of balanced nutritious food, maintaining blood sugar levels, routine physical activity and last but not least, routine health checks at least once every 6 months. Next, is strengthening health services for stroke. The Minister said that currently the number of health service facilities and surgeons is inadequate. In addition, the fulfilment of health workers is also very necessary. Another effort being made by the Government is the utilisation of digital technology in improving stroke services in all health facilities. The Minister of Health wants stroke health services to continue to develop along with the times (Ministry of Health, 2022).

According to data from the World Stroke Organisation in 2022, there are 12,224,551 new cases each year and 101,474,558 individuals currently living have experienced a stroke. According to World Stroke Organisation (WSO) data 13.7 million new strokes occur annually, and approximately 5.5 million people die from stroke. The incidence of stroke increases with age. About 60% of all strokes occur in people under the age of 70 years and about 8% under 44 years (Lindsay et al., 2019). Based on the results of the Basic Health Research (Riskesdas 2020), in Indonesia alone the incidence of stoke shows an increasing trend in stroke disease with a total of 1.7 million cases (Beyer et al., 2020). The province with the highest stroke prevalence (per cent) in Indonesia is Maluku province at 14.7%, and the lowest is Papua province at 4.1%. Men and women have similar stroke prevalence rates, 11% and 10% respectively (10.95). Meanwhile, the prevalence rate of stroke in South Sumatra Province in 2018 was 22,013 people (10%), the incidence rate of stroke in Palembang City alone in 2020 was 601 people (South Sumatra Health Office, 2020).

Based on data obtained from the medical records of Siti Aisyah Hospital in 2021 there were 27 stroke patients, in 2022 there were 32 stroke patients, in 2023 there were 44 stroke patients. In 2024 there were 60 stroke patients obtained during 2024 at Siti Aisyah Hospital. Stroke patients at Siti Aisyah Hospital during the last 3 years have increased. According to data on visits and hospitalisations at Siti Aisyah Hospital, stroke patients who experience body weakness, especially in the upper extremities, which results in patients being unable to grasp, resulting in the inability of patients to carry out daily activities as many as 47 patients. Siti Aisah Hospital is one of the local government-owned hospitals located at Jalan Lapter Silampari No.20, Air Kuti Village, Lubuklinggau Timur 1 District.

Patients who suffer from stroke, usually experience many functional disorders, such as motor, psychological or behavioural disorders, where the most typical symptoms are hemiparesis, loss of

sensation of the face and extremities, speech difficulties and partial vision loss. Approximately 80% of survivors have motor impairments of the upper extremities that severely affect their ability to perform activities of daily living (ADLs), as well as social participation. The severity of upper limb paresis especially grip strength is an independent determinant of post-stroke basic activities of daily living (ADL) outcomes.

Patients who are suffering from stroke certainly have a variety of problems, one of which is body weakness (paresis), limitations in grasping so that it can affect individuals in carrying out daily activities. This will make stroke patients need help from family or other people in fulfilling their daily needs. Stroke patients will generally experience weakness in the muscles of the limbs, especially in the upper extremities of the patient. In addition to muscle weakness, muscle wasting can also occur due to decreased activity in the extremities, causing weakness in grasping. To prevent muscle atrophy caused by grasping weakness, therapy is carried out to increase the grasping strength of stroke patients.

Various kinds of exercises and techniques have been carried out in the field of nursing and have been developed to enrich and complement the science in overcoming physical and functional disorders including grasping strength functions that experience hemiparesis due to neurological lesions in the central nervous system in stroke patients, including by providing Constraint Induced Movement Therapy (CIMT) interventions. CIMT exercise is a rehabilitation exercise that can be done to prevent disability in patients suffering from stroke. CIMT aims to improve nerve function disorders by teaching patients to move their body parts that experience weakness (paresis).

Treatment related to muscle weakness grasping in patients at Siti Aisyah Hospital with physiotherapy collaboration therapy according to doctor's recommendations only and lack of therapeutic education that can be done by nurses. Stroke patients who should receive treatment for hemiperasis are at risk of further weakening grip strength due to lack of treatment related to grip strength, so a method is needed that can increase the grip strength of stroke patients, namely physical therapy that can increase grip muscle strength is occupational therapy in the type of Constraint Induced Movement Therapy (CIMT).

A large number of approaches for the improvement of grasping strength of stroke patients but CIMT (Constraint Induced Movement therapy) has proven to be a solution to regain upper extremity function of grasping strength especially in chronic stroke. It is a known fact that recovery of hand motor function is usually incomplete, 2/3 of patients still suffer from very severe motor impairment, which significantly impacts on individual disability and activities of daily living. CIMT is a therapeutic strategy of repetitive exercises on the paralysed arm and limiting the use of the non-paralysed arm. This is important to stimulate neuroplasticity activity. MRI imaging results prove that the size of the paralysed hand cortex representation expands after CIMT therapy (Kuthiala, 2020).

The results of an initial survey conducted by researchers at Siti Aisah Hospital on 27-10 April 2024 there were 21 respondents with stroke, obtained as many as 17 people with hemiparesis grasping strength in patients with stroke patients below 20 kg. Based on research by Yoza M.F., Nia K.M., Syafrisar M.A, (2023), showed that. The results of research on the effect of Constraint Induced Movement Therapy (CIMT) on the functional ability of the upper extremities of stroke patients have a positive impact in improving the functional status of the upper extremities in stroke patients with haemiparesis, with p value = 0.000. This exercise is relatively easy to perform using simple equipment. The implementation of rehabilitation carried out in the early stages provides good results.

The results of research conducted by Roboth et al (2020) on subacute stroke patients, found that CIMT therapy can significantly improve the functional ability of the upper extremities on the paresis side (P <0.0001). CIMT therapy was found to have a superior effect compared to mirror therapy after 30 days of treatment. There was a significant increase in upper limb functional ability between pre and post test results in the CIMT treatment group (Roboth, 2020).

RESEARCH METHODS

This study uses a type of quantitative research with a pre-experimental design approach. The method used was one group pre-test-post test, which is research conducted for one group (Supardi, 2013). In this study, the treatment or intervention given is the independent variable, namely Constraint Induced Movement Therapy (CIMT), while the variable assessed or measured is the dependent variable, namely the ability to grasp the upper extremities that experience weakness. The population obtained in this study were all stroke patients at Siti Aisyah Hospital, which in the last 4 months totalled 60 stroke patients consisting of 31 male patients and 29 female patients. Using a purposive sampling approach is a way of determining a sample based on the problems and objectives in the study.

e-ISSN 2985-4156
JOURNAL OF INTERNATIONAL PUBLIC HEALTH

RESULTS

Table 1 Average Grasping Strength Before Constraint Induced Movement Therapy in Stroke Patients at Siti Aisyah Hospital, Lubuklinggau City

Variable	Mean	Std. Deviation	Minimum Value of Gripping Strength in Stroke Patients	Maximum Value of Gripping Strength in Stroke Patients
Grasping Strength Before Constraint Induced Movement Therapy in Stroke Patients	9,150	5,5078	1,5	18,0

Based on table 1, it can be seen that the average grasping strength before Constraint Induced Movement Therapy in Stroke Patients obtained an average value of 9.150, with a standard deviation of 5.5078, the strength of grasping before Constraint Induced Movement Therapy in Stroke Patients obtained the results of grasping measurements before Constraint Induced Movement Therapy in stroke patients the highest was 18.0 and the lowest was 1.5.

Table 2 Average Grasping Strength after Constraint Induced Movement Therapy in Stroke Patients at Siti Aisyah Hospital Lubuklinggau City

Variabel	Mean	Std. Deviation	Minimum Value of Gripping Strength in Stroke Patients	Maximum Value of Gripping Strength in Stroke Patients
Gripping Strength After Constraint Induced Movement Therapy in Stroke Patients	12,950	6,1167	4,0	22,0

Based on table 2, it can be seen that the average upper grasping strength after Constraint Induced Movement Therapy in Stroke Patients obtained an average value of 12.950, with a standard deviation of 6.1167, the strength of grasping after Constraint Induced Movement Therapy in Stroke Patients obtained the measurement of grasping strength after Constraint Induced Movement Therapy in Stroke Patients the highest was 22.0 and the lowest was 4.0.

Table 3 Effect of Constraint Induced Movement Therapy (CIMT) on Gripping Strength in Stroke Patients At Siti Aisyah Hospital Lubuklinggau City

Grasping strength in stroke patients before and after Constraint Induced Movement Therapy	Mean	*p value*
	-3,8000	0,000

Based on table 5 above, the results of statistical tests obtained the strength of grasping in stroke patients with a p value of 4.0. grasping strength in stroke patients with a p value = 0.000, which means <0.05 (α) so it can be concluded that there is an effect of Constraint Induced Movement Therapy on grasping strength in stroke patients at Siti Aisyah Hospital, Lubuklinggau City, 2024

DISCUSSION

Grasping Strength Before Constraint Induced Movement Therapy in Stroke Patients

Based on the results of the study, it was found that the average grasping strength before Constraint .Induced Movement Therapy in Stroke Patients obtained an average value of 9.150, with a standard deviation of 5.5078, the grasping strength before Constraint Induced Movement Therapy in Stroke Patients obtained the highest grasping measurement before Constraint Movement Therapy in stroke patients was 18.0 and the lowest was 1.5.

Death of brain tissue due to stroke can cause muscle weakness in the affected limbs such as the fingers. This condition affects the patient's ability to move and quality of life. Muscle strength in the

limbs includes hand grip strength. Orem's self-care theory can be applied to musculoskeletal patients, especially stroke patients with musculoskeletal system disorders. Patients with musculoskeletal disorders will experience a long process in healing, so that the daily activities of stroke patients are limited. The role of nurses in applying Orem's self-care theory is to help improve the patient's ability to be independent which will improve the patient's quality of life.

Hemiparesis is the most common impact after stroke, affecting more than 80% of patients in the acute phase and 40% in the chronic phase. Rehabilitation techniques have been shown to be more successful in restoring lower extremity function than upper extremity. However, upper limb function is more important for independent living.

According to Elisabeth and Lestari (2017), joint motion exercises performed can cause stimulation that can activate neuromuscular chemical processes. Neuromuscular stimulation can increase the muscle fibres of the extremities through the formation of acetylcholine resulting in contraction, this process through mitochondrial metabolism in muscle cells so that it can produce energy used by the extremities to contract. CIMT is a rehabilitation therapy programme to improve upper limb motor abilities, which is carried out by means of restraints carried out on the healthy hand and the weak side is given a stimulus to move more actively (Nasb, 2019).

This therapy aims to improve the motor skills of the upper extremities on the side that has hemiparese in stroke patients. This therapy comes from the continuous learning process of the limbs so that the injured peripheral or central nervous system will form repetitive movements to complete the task. One of the benefits of CIMT is to generate neuroplasticity in stroke patients who experience weakness in the limbs, as well as increase the number of neurons in the body for limb movements that experience weakness in stroke patients (Elisabeth and Lestari, 2017).

Grasping Strength After Constraint Induced Movement Therapy in Stroke Patients

Based on the results of the study, it was found that the average upper grasping strength after Constraint Induced Movement Therapy in Stroke Patients obtained an average value of 12.950, with a standard deviation of 6.1167, the strength of grasping after Constraint Induced Movement Therapy in Stroke Patients obtained the measurement of grasping strength after Constraint Induced Movement Therapy in the highest stroke patients was 22.0 and the lowest was 4.0. Based on the research facts above, it is argued that after Constraint Induced Movement Therapy, the grasping strength of stroke patients is mostly in the good category and respondents are able to improve their grasping ability than before Constraint Induced Movement Therapy. This shows that the provision of CIMT can have a positive impact on increasing grasping strength in stroke patients.

Based on the results of research (Roboth et al, 2020) it can be concluded that the provision of Constraint Induced Movement Therapy therapy is effective in increasing grasping strength in stroke patients. Rehabilitation of stroke patients takes a relatively long time. Significant improvement in the lower extremities from before and after CIMT, because the range of motion and muscle tone of the upper extremities are used more often. Respondents experienced an increase in grasping strength so that they experienced increased strength and muscle contraction much better than the range of motion of the upper extremity joints in stroke survivors. A more significant increase in grasping strength because respondents were enthusiastic about doing CIMT exercises.

Constraint Induced Movement Therapy (CIMT) is a therapy whose purpose is to improve nerve function by motivating patients to move weak body parts. By doing CIMT exercises regularly, with good concentration, long duration and amount of exercise is one of the factors in getting changes in motor function. Grasping strength is one of the motor changes that are improved.

This is because the motor function of grasping strength is a daily activity, so lesions in the brain that result in limb weakness will greatly hinder and interfere with a person's daily abilities and activities. Movement in the hand can be stimulated with grasping function exercises carried out through three stages, namely opening the hand, closing the fingers to grasp the object and adjusting the grasping strength. Constraint Induced Movement Therapy (CIMT) applies techniques that aim to reintegrate the affected hand in the performance of Activities of Daily Living (ADLs). In some cases, the initial level of brain reorganisation occurs in parallel with increased spontaneous, more affected hand use, would suggest that changes in brain plasticity support the therapeutic effect. CIMT serves to mobilise the fingers of the grasping hand.

In a study conducted by Roboth et al (2020) on subacute stroke patients, it was found that CIMT therapy could significantly improve the functional ability of the upper extremity on the paresis side ($P < 0.0001$). From the results of reviewing the article, it is concluded that Constraint-Induced Movement Therapy can improve tone that is experiencing weakness and if done continuously can stimulate, stimulate the surrounding muscles to contract so that it can increase grip strength in stroke patients.

Effect of Constraint Induced Movement Therapy (CIMT) on Gripping Strength in Stroke Patients

Based on the results of univariate analysis, the statistical test results obtained differences in the average value of grasping strength in stroke patients before CIMT intervention, namely 9.150 and increased after CIMT intervention, namely 12.950. Based on bivariate analysis with a p value = 0.000, means <0.05 (α) so it can be concluded that there is an effect of Constraint Induced Movement Therapy on grasping strength in stroke patients at Siti Aisyah Hospital Lubuklinggau City. This shows that there is a difference in the average value of grasping strength between before and after Constraint Induced Movement Therapy.

The results of the study respondents aged 60 years and over as many as 6 elderly patients and 4 patients aged 50 years, respondents with male gender 6 and female 4 patients. Based on the measurement results men are the dominant respondents. The effect of grasping strength will vary depending on gender and age.CIMT exercises that are programmed and carried out continuously and regularly can provide optimal results, because the more often the joints are moved regularly with the right technique and slowly, it can increase grasping strength and nerve response in stroke patients in grasping strength which was initially lacking to increase.

Age is one of the risk factors for stroke that cannot be changed. Elderly age is an important predictor of functional and cognitive outcomes of chronic period stroke. The increasing age of a person in adulthood is followed by the destruction of body tissues which causes a decrease in muscle ability and other organ functions. The decline in the ability to perform activities and work ability decreases due to the gradual shrinkage of body tissues (Mulyadi, 2018).

According to researchers, several CIMT exercises that are often performed are efforts that can help stroke patients improve grasping strength to prevent disability and complications. Theory and results are continuous so that there is an effect of giving Constraint Induced Movement Therapy (CIMT) on grasping strength in stroke patients. In addition, the latest post-stroke clinical care guidelines describe CIMT therapy as an intervention that has evidence of benefit for stroke survivors with mild to moderate upper extremity haemiparesis.

The results of parallel research conducted by Palacky (2020) use the CIMT method using everyday equipment to improve functional ability and independence in the upper extremities in stroke patients. From the results of the research conducted, the provision of CIMT therapy for 1 hour for 3 consecutive days carried out on 11 respondents has increased, which is known that the mean value of grasping strength before CIMT is increased after CIMT can improve the ability to grasp to stroke patients with a p-value of 0,000. This means that there is a significant difference between the pre and post grasping strength of the intervention carried out for 1 hour each meeting.

CIMT is a therapy for stroke patients to restore their condition to a better state. with CIMT coupled with exercises whose intensity, concentration, duration & amount of exercise are important factors in making changes in motor function and brain organisation. CIMT evokes neuronal plasticity in stroke patients, increases the number of neurons associated with movement of the extremities that are hemiparesis in stroke and increases blood flow to the sensory and motor cortex so as to cause replacement of visible structures in cortical areas.

Research results Mulyadi, E., Wardy, A.. Sofiani, Y. (2018) entitled 'Comparison of the Effect of Range of Motion (ROM) Upper Extremity with Constraint Induced Movement Therapy (CIMT) on Grasping Strength in Post Stroke Patients at Rsi Assyifa Kota Sukabumi' CIMT, namely the pre-test value of ROM and CIMT actions obtained a p-value of 0.917 This indicates there is no significant difference in pre-test grasping strength before ROM and CIMT interventions. This indicates there is a significant difference in post-test grasping strength. For results with CIMT intervention, there is an effect of CIMT training on increasing grasping strength with a p-value of 0.015. In this study, age and gender affect the grasping strength of stroke patients. The decline that occurs with increasing age in muscle cells is determined by the maturity of the cells themselves in adulthood. These cells will relatively be able to survive or experience little change as long as a person is still doing exercise or physical activity. Compared to men, women lack a sturdy skeletal system that lacks strength. Meanwhile, weakness in some joints, especially the lack of strength of the joint capsule, can result in limited movement. According to research by Yoza M.F, Nia K.M., Syafrisar M.A. (2023) 'The Effect of Constraint Induced Movement Therapy on the Functional Ability of Upper Extremities in Stroke Patients' One of the latest nursing interventions proven to provide great benefits in restoring movement and functional abilities in post-stroke patients is constraint induced movement therapy (CIMT).The purpose of this study was to determine the effect of applying the Constraint Induced Movement Therapy (CIMT) method with everyday equipment in improving functional ability and independence of the upper limbs in stroke patients.Family support is needed in the application of CIMT so that the motor stimuli of the upper limbs of stroke patients are increased.The results of the

paired t test analysis showed that there was an effect between Constraint Induced Movement Therapy on the functional abilities of the upper limbs of stroke patients (p value = 0.000).

From the discussion of the results of the study, the grasping strength of stroke patients varies depending on age, gender, family support and patient motivation or available support systems and patient activity coping skills are needed in carrying out this therapy in order to influence the application of CIMT in patients.Age has a very strong relationship with complaints of grasping strength, where when individuals reach old age the average strength decreases by 20%.The influence of age can be related to the improvement of neurological function in stroke patients, possibly related to some of the damage experienced. The results of parallel research conducted by Palacky (2020) use the CIMT method using everyday equipment to improve functional ability and independence in the upper extremities in stroke patients.From the results of the research conducted, the provision of CIMT therapy for 1 hour for 3 consecutive days carried out on 11 respondents has increased, which is known that the mean value of grasping strength before CIMT is increased after CIMT can improve the ability to grasp to stroke patients with a p-value of 0,000.

This means that there is a significant difference between the pre and post grasping strength of the intervention carried out for 1 hour each meeting. CIMT is a therapy for stroke patients to restore their condition to a better state. with CIMT coupled with exercises whose intensity, concentration, duration & amount of exercise are important factors in making changes in motor function and brain organisation. CIMT evokes neuronal plasticity in stroke patients, increases the number of neurons associated with movement of the extremities that are hemiparesis in stroke and increases blood flow to the sensory and motor cortex so as to cause replacement of visible structures in cortical areas. Research results Mulyadi, E., Wardy, A..Sofiani, Y. (2018) entitled 'Comparison of the Effect of Range of Motion (ROM) Upper Extremity with Constraint Induced Movement Therapy (CIMT) on Grasping Strength in Post Stroke Patients at Rsi Assyifa Kota Sukabumi' CIMT, namely the pre-test value of ROM and CIMT actions obtained a p-value of 0.917 This indicates there is no significant difference in pre-test grasping strength before ROM and CIMT interventions.This indicates there is a significant difference in post-test grasping strength.For results with CIMT intervention, there is an effect of CIMT training on increasing grasping strength with a p-value of 0.015.In this study, age and gender affect the grasping strength of stroke patients.The decline that occurs with increasing age in muscle cells is determined by the maturity of the cells themselves in adulthood.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

1. The average grasping strength before Constraint Induced Movement Therapy in Stroke Patients at Siti Aisyah Hospital Lubuklinggau City in 2024 is 9.150.
2. The average grasping strength after Constraint Induced Movement Therapy in Stroke Patients at Siti Aisyah Hospital Lubuklinggau City in 2024 is 12.950.
3. There is an effect of Constraint Induced Movement Therapy on Gripping Strength in Stroke Patients at Siti Aisyah Hospital, Lubuklinggau City in 2024 using the paired t-test statistical test obtained a p value of 0.000 ($p < \alpha$ 0.05).

Recomendation

Practical advice for the Siti Aisyah Hospital Lubuklinggau City, especially the inpatient room with stroke patients can make Constraint Induced Movement Therapy as a non-pharmacological therapy to increase grip muscle strength in stroke patients who experience muscle weakness. Suggestions for nurses should nurses be able to motivate stroke patients to do CIMT exercises and are expected to be used to provide CIMT to stroke patients who experience grasping weakness. Suggestions for patients so that they can continue to carry out Constraint Induced Movement Therapy in accordance with the SOP independently.

REFERENCES

Aris Santjaka. (2011). Statistik Untuk Penelitian Kesehatan . Nuha Medika.

Budi, U., & Pirdaus, D. (2012). Pengaruh Constraint Induced Movement Therapy Terhadap Kemampuan Koordinasi Ekstremitas Atas Pasca Stroke. 5(1), 36–44.

Cintia Tri W., Sulastyawati, Lingling M.P.(2023). ROM And CIMT Treatment Effects To Stroke Patients's Upper Extremity Functional Ability. DOI: http://dx.doi.org/10.21927/jnki.2020.8(3).223-231

Carey, L., Walsh, A., Adikari, A., Goodin, P., Alahakoon, D., Boyd, L. (2019). Finding the intersection of neuroplasticity, stroke recovery, and learning: Scope and contributions to stroke rehabilitation. (10) 78-83

Chrisna, F. F., & Martini, S. (2016). Hubungan antara sindroma metabolik dengan kejadian stroke. Jurnal Berkala Epidemiologi, 4(1), 25–36. Diakses dari https://doi.org/10.20473/jbe.v4i1.25-36

County, C., & Sciences, H. (2018). E Ccentric E Xercise B Outs S Eparated By. Indonesia Jurnal Perawat, 3(1), 36–43.

Darotin, R., Nurdiana, & Nasution, T. H. (2017). Analisis Faktor Prediktor Mortalitas Stroke Hemoragik di Rumah Sakit Daerah dr Soebandi Jember. NurseLine Journal, 2(2), 9. Diakses dari http://repository.ub.ac.id/2144/

Dinas Kesehatan Sumatera Selatan (2018). Profil Kesehatan Provinsi Smatera Selatan Tahun 2018.

Elisabeth, Lestari, A. (2017). Pengaruh Modifikasi Constraint Induced Movement Therapy Dan ROM terhadap kemampuan motorik pada pasien stroke non hemoragik di rumah sakit panti wilasa Citarum Semarang. Jurnal Keperawatan. Diakses dari http://ejournal.stikestelogorejo.ac.id/index.php/ilmukeperawatan/article/vi ew/654

Hidayati, S. (2018). Analisis Praktik Klinik Keperawatan pada Pasien Stroke Non Hemoragik dengan Pemberian Constraint Induced Movement Therapy ROM Terhadap Kemampuan Motorik di Ruang Stroke Center RSUD Abdul Wahab Sjahranie Samarinda. 23-26

Kurniawan Hendri, K. (2019). Efek Sinergi Neurorehabilitasi Dengan Aerobic Exercise Intensitas Sedang Dan Manajemen Stres Terhadap Heart Rate Variability (Hrv), Level Depresi Dan Trunk Control Pasien Pasca Stroke. 100–106. Diaksesdari http://jurnal.poltekkes-solo.ac.id/index.php/Int/article/view/130

M, Iin Ira Kartika. (2017). Buku Ajar Dasar-Dasar Riset Keperawatan Dan Pengolahan Data Statistik. Cv.Trans Info Media.

Mulyadi, E., Wardy, A.. Sofiani, Y. (2018). Perbandingan Pengaruh Range Of Motion (Rom) Upper Extremity Dengan Constraint Induced Movement Therapy (Cimt) Terhadap Kekuatan Menggenggam Pada Pasien Post Stroke Di Rsi Assyifa Kota Sukabumi 3 (7), 46-49

Nursalam. (2017). Metodologi Penelitian Ilmu Keperawatan: Pendekatan Praktis (Pani Puji Lestari (ed.); 4th ed.). Salemba Medika.

Perdana, Y., & Hutabarat, E. (2021). Prevalence of insomnia based on insomnia severity index and Athens insomnia scale in stroke patients with COVID-19 at Dr. Moewardi hospital surakarta. International Journal of Stroke. 3 (17-20).

Riset Kesehatan Dasar. (2018). Hasil Utama Riset Kesehatan Dasar (RISKESDAS). Journal of Physics A: Mathematical and Theoretical, 44(8), 1–200. Diakses dari https://doi.org/10.1088/1751- 8113/44/8/085201

Roboth, T., Sengkey, L., & Marpaung, E. (2020). Modifikasi Constraint Induced Movement Therapy Dibanding Terapi Cermin Terhadap Peningkatan Kemampuan Fungsional Ekstremitas Atas Pasien Stroke Subakut. 2, 1–10. Diakses dari https://ejournal.unsrat.ac.id/index.php/jmr/article/view/28619/27952

Rumentalia, S., Khasifah,.M., Damanik,H.L.,(2021). Kekuatan Genggaman Tangan Pada Pasien Post Stroke Hand Grip Strength Of Post Stroke Patient Jurnal Surya Medika (JSM), Vol 6 No 2 Februari 2021, Page 1 – 4

Sutin, Uten, Srimuang Paluangrit, Supika D., Wandee Sutthinarakorn, And Vanida Prasert. (2022). “Problems And Needs When Caring For Stroke Patient At Homes.” International Journal Of Public Health Science (Ijphs) 11 (2): 695–705. Https://Doi.Org/10.11591/Ijphs.V11i2.21013.

Sudibyo Supardi & Rustika. (2013). Buku Ajar Metodologi Riset Keperawatan.Cv.Trans Info Media.

Salam,M.S.,Pristianto A.,(2023). Pengaruh Constraint Induced Movement Thraphy Terhadap Fungsional Ekstremitas Atas Pada Kasus Stroke : Criticl Review.4(2):98-108 .DOI : https://10.23917/fisiomu.v4i2.22131

Roboth, T., Sengkey, L., & Marpaung, E. (2020). Modifikasi Constraint Induced Movement Therapy Dibanding Terapi Cermin Terhadap Peningkatan Kemampuan Fungsional Ekstremitas Atas Pasien Stroke Subakut. 2, 1– 10.

Rocha, L. S. O., Gama, G. C. B., Rocha, R. S. B., Rocha, L. de B., Dias, C. P., Santos, L. L. S., Santos, M. C. de S., Montebelo, M. I. de L., & Teodori, R. M. (2021). Constraint Induced Movement Therapy Increases Functionality and Quality of Life after Stroke. Journal of Stroke and Cerebrovascular Diseases, 30(6), 1–9.

Yoza M.F, Nia K.M., Syafrisar M.A. (2023). The Effect of Constraint Induced Movement Therapy on the Functional Ability of Upper Extremities in Stroke Patients. Riwayat: Educational Journal of History and Humanities, 6 (4), 2967-2972. DOI: https://doi.org/10.24815/jr.v6i4.35967

Yu, C., Wang, W., Zhang, Y., Wang, Y., Hou, W., Liu, S., Gao, C., Wang, C., Mo, L., & Wu, J. (2017). The effects of modified constraint-induced movement therapy in acute subcortical cerebral infarction. Frontiers in Human Neuroscience, 11 (May), 1–9. Diakses dari https://doi.org/10.3389/fnhum.2017.00265

Wulandari, C. T., Palupi, L. M., Malang, P. K., Dowo, O., Malang, K., & Timur,J. (2020). ROM And CIMT Treatment Effects To Stroke Patients's Upper Extremity Functional Ability. 8(3), 223231. Diakses dari http://dx.doi.org/10.21927/jnki.2024.4(3)