Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

Journal of University Studies for Inclusive Research

Vol.2, Issue 10 (2022), 7871 -7888

USRIJ Pvt. Ltd.,

The effectiveness of physical and occupational therapy and motor skills exercises in strengthening muscles and coordination between them after a stroke

Kareem AYESH Alharbi
Occupational therapy Technician
Harbi-am@moh.gov.sa

Murad Ahmed Bin Sawad
Physical therapist
Mbinsawad@moh.gov.sa

Amer Mohammed Alanazi
Senior occupational Therapist.
ammoalanazi@moh.gov.sa

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

Abstract

Stroke is a medical syndrome that has a negative impact on body health and the ability of post-stroke survivors to complete daily tasks. As a result, it is critical to assist them through rehabilitation and use effective techniques including physical, occupational, and motor skills exercises to strengthen their muscles and allow them to live as normal as possible. To determine the effectiveness of physical, occupational therapy, and motor skills exercises in strengthening muscles and coordination between them after a stroke, descriptive and literature review for the most related studies were carried out. Majority of research confirmed that physical therapy has a critical impact on strengthen the lower limb muscles, while the occupational therapy has a massive impact on enhancing upper extremity muscles. Whereas the motor skill exercises strengthening the muscles of the affected parts in general. In conclusion, it is recommended to begin using these therapies and exercise techniques within the first month of having a stroke in order to improve the muscles and their coordination.

Keywords: *Stroke, Physical therapy, Occupational therapy, Motor skills exercises.*

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

1. Introduction

Stroke can have an emotional, mental, cognitive, social, and physical impact on the lives of those who survive it (Chae & Chang, 2016). A number of factors, including a large artery blockage, cardio-embolism, microvascular occlusion, and other etiologies, causes this syndrome. It also causes brain tissue damage due to a lack of blood supply (Edmans, 2010).

This medical syndrome can result in a variety of negative consequences and issues, including loss of body movement, paralysis, and weakness on one side of the body. In addition, it may cause a loss of control of body movements like body posture, walking and balance (National institute of neurological disorders and stroke, 2020).

Occupational, physical, and motor exercises are techniques for helping stroke patients to become independent as much as possible (House & Lawrence, 2017). It is critical to shed light on the significant role of the therapist at all stages of stroke interference (García-Pérez et al., 2021).

In light of previous data, it is important to help and support post- stroke patients to live a normal life as much as possible. So according to that it was critical to investigate the effectiveness of physical and occupational therapy and motor skills exercises in strengthening muscles and coordination between them after a stroke.

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

1.1 Research Problem

Stroke is the second leading cause of death worldwide, with up to 50% of chronic stroke survivors remaining disabled. In addition, it is the primary cause of ongoing `disabilities all over the world (Mahmoud et al., 2021).

The consequences of stroke are caused by the changes in central nervous system and peripheral skeletal muscle; In addition, stroke-related disabilities are primarily caused by impaired motor function (Azzollin et al., 2021).

(Sions et al., 2012) Stated that strokes have a negative impact on skeletal muscles. Furthermore, despite the age of the individual, the muscle after stroke exhibits many similarities to aging muscle. Therefore, tackling with muscles changes could reduce activity limitations and engage after it. Furthermore, Mahmoud et al., (2021) stated that the majority of post-stroke patients have some difficulties in upper body function and fine motor ability.

Post-stroke patients face difficulties and challenges according to their inability to care for themselves or keep their everyday activities. As a result, assisting them in becoming more self-sufficient is critical by rehabilitation using physical, occupational and motor skills exercises (Mahmoud et al., 2021).

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

According to prior data, it was important to investigate the effectiveness of physical and occupational therapy and motor skills exercises in strengthening muscles and coordination between them after a stroke.

In addition many researchers have studied the effect of one of previously mentioned exercises on the post- stroke patients such as the role of physiotherapy on quality of life in stroke survivors – a systematic review (Kanase, et al., 2020) and the occupational therapy process for patients after stroke in Thailand (Olsson & Lundborg, 2014) or the early occupational therapy intervention in the hospital discharge after stroke (García-Pérez et al., 2021).

However the review of the effectiveness of physical and occupational therapy and motor skills exercises in strengthening muscles and coordination between them after a stroke did not receive the attention from researchers, which left a research gap in previous studies.

1.2 Research Questions

There are four main questions related to the problem of this study, which are:

- How effective is physical therapy for muscle strengthening and coordination after a stroke?
- How effective is occupational therapy for muscle strengthening and coordination after a stroke?

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

- How effective are motor skills exercises for muscle strengthening and coordination after a stroke?
- How effective physical, occupational therapy and motor skills exercises for muscle strengthening and coordination after a stroke?

1.3 Aim and objectives

The primary aim of this study is to investigate the effectiveness of physical and occupational therapy and motor skills exercises in strengthening muscles and coordination between them after a stroke. According to the study's main goal, the four objectives of this paper are as follows:

- Investigate the effectiveness of physical therapy in strengthening muscles and coordination between them after a stroke.
- Demonstrate the effectiveness of occupational therapy in strengthening muscles and coordination between them after a stroke
- Study the effectiveness of motor skills exercises in strengthening muscles and coordination between them after a stroke
- Determine the effectiveness of physical, occupational therapy, and motor skills exercises in strengthening muscles and coordination between them after a stroke.

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

2 Methodology

The methodology of this study is descriptive, with an overview ofthe most re lated previous studies and research done to reveal the results.

3 Physical therapy

Physical therapy (PT) is a service provided to people by trained and educated individuals known as physical therapists in order to keep, enhance, and restore maximum mobility and physical functioning throughout life (World physiotherapy, 2019; Kumar, 2010).

This type of therapy used when mobility and function are jeopardized due to aging, injury, or illness caused by certain diseases (Kumar, 2010). PT is a type of therapy that aims to improve functional, independence, and individual function limitations caused by diseases that cause functional deficits (Gunel et al., 2019).

Chest physiotherapy, orthopedic, pediatric, geriatric, and sports physiotherapy are all types of physiotherapy. While conventional exercises are one of the physical therapy techniques which exercise therapy considered as one of them (Sarla, 2020).

The exercise therapy consists of passive, assisted, active, risted and assisted – resisted active movements which can be performed on land or water. These exercises

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

are so effective for acute and chronic stroke patients and have a massive impact on the upper limb and the quality of their life's (Kanase et al., 2020).

Physical therapy has a significant impact on improving impairments and disabilities, which aids in the enhancement of life quality (Kanase et al., 2020). Peppen et al (2004) stated that the impact of physical therapy differs between small and large size for oriented exercise training especially when applied intensively and early after the stroke. According to (Kanase et al., 2020) exercise therapy which can be done on water or floor is so effective for the upper limb muscles for stroke patients.

In the study of (Sions et al., 2012), they mentioned the benefits of resistance training on skeletal muscles, highlighting that the resistance training program increased participants' mild thigh muscle cross area and decreased mid-thigh intramuscular fat for both limbs.

4 Occupational therapy

This type of therapy begins with an investigation and data collection about the stroke patient's needs and activity obstacles via observation or interview (Radomsk & Latham, 2014; Olsson & Lundborg, 2014). Mirror therapy and constraint - induced movement therapy (CIMT) are some occupational therapy techniques, which are used in the rehabilitation for post- stroke patients (Petruševičienė et al., 2017).

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

Occupational therapy (OT) is a set of cognitive, physical, and medical actions performed by experts to assist patients in their recovery from illness or injury. (Söderback, 2009). The process of occupational therapy consists of three steps, which are investigation, intervention and evaluation. This type of therapy is realized as a part of rehabilitation for stroke patients (Olsson & Lundborg, 2014). It actually helps the post- stroke survivors to manage their daily tasks like showering and getting dressed or even getting back to work. In addition, OT helps in thinking, rememorize, and hand or arm problems (Stroke Foundation, 2020).

OT is a therapy for both physical and cognitive difficulties due to stroke (Olsson & Lundborg, 2014). It actually focuses on the upper most limbs functions, which are related to daily life such as grabbing things. In addition, occupational therapy strengthens the trunk muscles, making the movement of arms easier, and improving accomplishing daily activities (Boo et al., 2016).

In a study to investigate the effect of different occupational therapy techniques on post-stroke patients, it included 36 participate of 36 ischemic stroke patients. The participants were randomly divided into two groups, each group consisting of 18 patients. Fist group underwent induced movement therapy while the other one underwent mirror therapy. The findings of this study revealed a major improvement in the function of the affected limb; in addition, the study finds that the mirror therapy was more effective than the CIMT in restoring the function of the affected arm. (Petruševičienė, et al., 2017) .

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

5 Motor skills exercises

Motor exercises can help with neuroplasticity for functional loss after a stroke. Therefore, Intensive movement training should be included in the rehabilitation programs in order to promote neural plasticity and motor recovery (Takeuchi & Izumi, 2013).

Range of motion had been an exercise done alone and without additional help to keep or enhance the excellence of joint movement and muscular endurance. Passive ROM increases joint mobility and improves muscle strength, tone, tolerance, and decreases the risk of losing the bone mass (Agusrianto & Rentesigi,2020; Srinayanti et al., 2021).

There are two kinds of ROM: passive ROM and active ROM. It is critical to understand that the difference between them is that the active one is completed without the assistance of others, whereas the passive one is accomplished with the help and support of others (Srinayanti et al., 2021).

According to a review, study which reviewed 14 journals that discussed the immobilizations, which occur in stroke patients. All reviewed journals gave results that confirms that range of motion both active, passive, and active-assistive increases the muscles strength, beside the upper extremity motion (Sudiana & Sajidin, 2018).

A systematic search was carried out in three databases: PubMed, Plos One, Ebsco, and Google Scholar, using the key words "stroke," "range of motion," and "muscles strengthen." there have been 417 articles discovered, but only eight of them

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

met the requirements. A statistical analysis of these articles revealed that performing ROM exercises is effective in strengthening muscles. In case, it is done 1-2 times per day for 6 days at a time of 15-20 minutes per session (Abdillah et al., 2022).

Another descriptive study with a literary review relied on six international journals: PubMed, JSTOR, Wiley Online Library, Sage Journal, ScienceDirect, and Taylor & Francis Online. In addition, a search was carried out on one global journal dataset known as Google Scholar. The articles that met the selection criteria, such as publication dates varying from 2005 to 2021, in English, Indonesian, and other language families that can be transcribed and opened full access text, were chosen. Following the selection procedure, nine articles that met the inclusion criteria were obtained, with 197 respondents randomly assigned and divided into 58 control groups, 55 intervention groups, and 84 combined groups. The results of this study confirmed that ROM are effective in strengthen the muscles after stroke (Srinayanti et al., 2021).

6 Stroke and muscles

World health organization defined stroke as a medical condition relates to vascular origin characterized by rapid symptoms a focal or global chaos in brain features that lasts more than 24 hours or causes death (Edmans, 2010; WHO, 1978). It is the third leading cause of death worldwide, just after heart disease and cancer.

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

In addition, it is critical to shed light on the long-term effect of stroke, which is disability. One of the common problems following strokes is physical disability (Edmans, 2010).

After a stroke, the muscle undergoes three changes: a smaller pen nation angle, a decrease in fiber length, and a decrease in muscle mass (Gray, Rice, & Garland, 2012). This means that the muscles will be weak, making moving around or moving the limbs difficult (Stroke Association, 2013).

According to the Stroke Association (2013), 80% of stroke survivors have movement problems ranging from mild weakness such as being unable to move one or part limb to chronic such as being paralysis.

7 Effectiveness of physical, occupational therapy and motor skills exercises in strengthen the muscles and coordination between them after stroke

Occupational and physical therapies play an important role in improving the muscles of the arm and hand. According to a case report, a 77-year-old man suffered a left-hemisphere stroke with right hemiparesis. After spending 10 days in the hospital, he entered a rehabilitation center.

The treatment procedure there included one hour of daily physical therapy, one hour of daily occupational therapy, and one hour of speech therapy three times per week for three weeks. It is critical to emphasize that physical and occupational therapies coped with everyday routines. To be more specific, occupational therapy concentrates on upper limb functions that require the use of a person's hands, such

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

as dressing and feeding. The occupational one focused on human movement, climbing stairs, balancing, and transfer.

There was a critical improvement of hand functions absorved in proximal and distal skills. In addition there was improvement in handwriting skills and decrease in impairment level of the upper extremity (Israely et al., 2017).

Two groups were involved in a randomized controlled trial study. The first group was experimental and consisted of 33 imdivisual, while the second consisted of 19 individuals. It is critical to indicate that the participants are over the age of 18 and have a diagnosis of ischemic stroke. The results were collected after three measurement times: before intervention, one month after intervention, and three months after intervention. Passive range of motions exercises were applied on the experimental group during 48 hours of admittance as 6 to 8 times and 30 minutes. strength grading scale (oxford scale) was used to evaluate motor function, and SPSS was used to analyze and compare the results. The results revealed a significant improvement in motor function for the experimental group's upper and lower limbs between the first and third months. While the control group results indicate only an improvement in upper limb muscle strength in the first and third months when compared to pre-intervention measurements. (Hosseini et al., 2019)

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

8 Conclusion

The main aim of the study is to investigate the effectiveness of physical and occupational therapy and motor skills exercises in strengthening muscles and coordination between them after a stroke. In addition, this paper reviewed the impact of each mentioned technique in strengthening the muscles and ***enhancing*** the coordination among them. The majority of studies showed that physical therapy is effective for improving motor performance for the lower and upper limbs. While the Occupational therapy assists stroke survivors in managing their routine activities more smoothly. Actually, OT focuses on strengthening the upper limb and trunk muscles, as well as improving arm movement. Furthermore, it is extremely effective at enhancing them and improving muscle coordination. Finally, Motor skills exercises have a significant impact on strengthening muscles of the effect part in general.

First month after stroke is considered a critical period where many plastic changes occur which promotes motor recovery. In fact, motor performance significantly improved in the first month after the stroke. As a result, it is critical and recommended to begin rehabilitation as quickly as possible, using occupational, physical, and motor skills exercises. These methods are remarkably effective at strengthening muscles and fostering collaboration among them.

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

Further to that, using them together would have a beneficial impact on motor performance.

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

9 References

Abdillah, A., Istiqomah, I. N., Kurnianto, S., & Khovifah, N. (2022). The Effectiveness of Range of Motion (ROM) on Increasing Muscle Strength in Stroke Patients: Literature Review. *Nursing and health sciences journal, 2*(2), 137-142.

Agusrianto, & Rentesigi, 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.

Aljadi, S. H., Alotaibi, N. M., Alrowayeh, H. N., & Alshatti, T. A. (2017). Benefits and Challenges of Supervising Physical Therapy Students in the State of Kuwait. *Journal of Allied Health, 46*(4), 243 - 249.

Azzollini, V., Dalise2, S., & Chisari, C. (2021). how does stroke affect skeletal muscle? state of the art and rehabilitation prespective. *Frontiers in Neurology, 12*, 1 - 7.

Boo, J.-A., Moon, S.-H., Lee, S.-M., Cho, J.-H., & S.-E. P. (2016). Effect of whole-body vibration exercise in a sitting position prior to therapy on muscle tone and upper extremity function in stroke patients. *The journal of physical therapy science, 28*(2), 558 - 562.

Chae, G.-S., & Chang, M. (2016). The correlation between occupational performance and well-being in stroke patients. *The journal of physical therapy sience, 28*(6), 1712 - 1715.

Edmans, J. (2010). *Occupational Therapy* (second ed.). (M. Mew, Ed.) United Kingdom: Blackwell Publishing Ltd.

García-Pérez, P., Rodríguez-Martínez, M. d., Lara, J. P., & Cruz-Cosme, C. d. (2021). Early occupational therapy Intervention in the hospital discharge after stroke. *International journal of environment reasearch and public health, 18* , 1 - 11.

Gray, V., Rice, C. L., & Garland, S. J. (2012). Factors that influence muscle weakness following stroke and their clinical implications: a critical review. *Physiotherapy Canada, 64*(4), 415 - 426.

Gunel, M. K., Ozal, C., & Turker, D. (2019). *Different Areas of Physiotherapy.* Intechopen.

Hosseini, Z.-S., Peyrovi, H., & Gohar, M. (2019). The Effect of Early Passive Range of Motion Exercise on Motor Function of People with Stroke: a Randomized Controlled Trial. *Journal of Caring Sciences, 8*(1), 39-44.

House, E., & Lawrence, K. (2017). *Occupational and Physical Therapy's Role.* Michigan: University Of Michigan hospital .

Israely, S., Leisman, G., & Carmeli, E. (2017). *Improvement in arm and hand function after a stroke with task-oriented training* . Britain united kingdom : British medical journal - case report .

Kanase, S., Varadharajulu, G., Salunkhe, P. V., & Burungale, M. (2020). Role of physiotherapy on quality of life in stroke survivors – a systematic review. *Indian Journal of Forensic Medicine & Toxicology, 14*(2), 227 - 230.

Kumar, S. P. (2010). Physical therapy: past, present and future- a paradigm shift. *Journal of Physical Therapy, 1*(2), 58 - 67.

Mahmoud, S. S., Cao, Z., Fu, J., Gu, X., & Fang, Q. (2021). Occupational Therapy Assessment for Upper Limb Rehabilitation: A Multisensor-Based Approach. *Frontiers in digital health 3, 3* , 1 - 15.

National institute of neurological disorders and stroke. (2020). *Post-stroke rehabilitation.* Bethesda, Maryland: National institute of neurological disorders and stroke.

Olsson, L., & Lundborg, M. (2014). *Occupational Therapy Process for Patients.* Örebro, sweden: Örebro University.

Peppen, R. V., Kwakkel, G., Wood-Dauphinee, S., Hendriks, H., Dekker, J., & Wees, P. V. (2004). The impact of physical therapy on functionaloutcomes after stroke: what's the evidence? *Clinical Rehabilitation, 18*(8), 833-862.

Petruševičienė, D., Virvičiūtė, D., Savickas, R., Lendraitienė, E., Mingaila, S., & Vasilavicius, P. (2017). The effect of different occupational therapy techniques on post-stroke patients. *Česká a Slovenská neurologie a neurochirurgie, 8/113*(4), 464-469.

Radomsk, M. V., & Latham, C. A. (2014). *Occupational therapy for physical* . Philadelphia: Lippincott Williams and Wilkins.

Sarla, G. S. (2020). Physiotherapy: Modalities and patient profile. *Narayana Medical Journal, 9* (1), 31 - 36.

Journal of University Studies for inclusive Research (USRIJ)
مجلة الدراسات الجامعية للبحوث الشاملة
ISSN: 2707-7675

Sions, J. M., Tyrell, C. M., Knarr, B. A., Jancosko, A., & Binder-Macleod, S. A. (2012). Age- and Stroke-Related Skeletal Muscle Changes. *Journal of Geriatric Physical Therapy, 35*(3), 155 - 161.

Söderback, I. (2009). *International handbook of occupational therapy interventions.* New York : Spring.

Srinayanti, Y., Widianti, W., Andriani, D., Firdaus, F. A., & Setiawan, H. (2021). Range of motion exercise to Improve muscle strength among stroke patients: A literature review. *International Journal of Nursing and Health Services (IJNHS), 4*(3), 332 - 343.

Stroke Association. (2013). *Physical effects of stroke.* UK: Stroke Association.

Stroke Foundation. (2020). *Clinical guidelines for stroke management.* Australia: Stroke Foundation.

Sudiana, K., & Sajidin, M. (2018). Active, Passive, and active-assistive range of motion (ROM) exercise to improve muscle strength in post stroke clients: A systematic review . *Proceedings of the 9th International Nursing Conference* (pp. 329-337). SCITEPRESS – Science and Technology Publications.

Takeuchi, N., & Izumi, S.-I. (2013). Rehabilitation with poststroke motor recovery: a review with a focus on neural plasticity. *Stroke research and treatment, 2013*(12), 1 - 13.

WHO. (1978). *Cerebrovascular Disorders: A Clinical and Research Classification.* Geneva: World health organization .

World physiotherapy. (2019). *Description of physical therapy.* UK: World physiotherapy.