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MUSIC MOVEMENT THERAPY FOR IMPROVING MUSCLE STRENGTH IN A NON- HEMORRHAGIC STROKE PATIENT: A CASE STUDY AT BAYU ASIH HOSPITAL

[1]Agus Mardiansyah, [1]Ratna Wulan Hardian N, [1]Emy Salmiyah

[1)]Budi Luhur Institute of Health Sciences

ABSTRACT

Stroke is a cerebrovascular disease that causes neurological and motor impairments, often leading to reduced muscle strength. Music Movement Therapy (MMT) is a non-pharmacological intervention combining music and range-of-motion (ROM) exercises, which may improve muscle strength and support rehabilitation in stroke patients. This case study was conducted from 13–19 March 2024 on a non-hemorrhagic stroke patient (Mrs. M) at the Teratai Room of Bayu Asih Hospital, Purwakarta. The patient received MMT sessions for 15 minutes daily over three consecutive days. Muscle strength was measured before and after the intervention using Manual Muscle Testing (MMT scale). Muscle strength improved from grade 2 (full joint motion without resistance) on day 1 to grade 4 (able to resist light to moderate resistance) on day 3 after the intervention. MMT effectively increased upper-extremity muscle strength in this non-hemorrhagic stroke patient. Health professionals may consider MMT as a complementary non-pharmacological intervention to enhance motor function in stroke rehabilitation.

Keywords: Music movement therapy, Non-hemorrhagic stroke, Muscle strength

Correspondence:
Ratna Wulan Hardian Noviani
Budi Luhur Institute of Health Sciences
Jl. Kerkof No. 243 Lewigajah Kota Cimahi
ratnawulanhardian@gmail.com

INTRODUCTION

Stroke is a leading cause of death and disability worldwide. According to the World Health Organization (WHO, 2022), approximately 13.7 million people suffer from a stroke annually, with 5.5 million deaths. Globally, around 5 million survivors live with long-term disability. In Indonesia, the Ministry of Health (Kemenkes RI, 2019) reported a stroke prevalence rate of 10.9%, with West Java province among the highest (11.4%). Data from RISKESDAS (2023) show that Purwakarta Regency has a significant burden of non-hemorrhagic stroke, with 174 cases recorded at Bayu Asih Hospital in 2024, most occurring in adults aged 45 years and older.

One of the most common post-stroke complications is motor impairment, including hemiparesis or hemiplegia, which significantly affects patients' independence in activities of daily living (Feigin et al., 2022). Muscle weakness due to neurological damage can lead to decreased mobility and an increased risk of long-term disability if not managed properly. Rehabilitation focusing on early mobilization and muscle strength improvement is therefore critical.

Music Movement Therapy (MMT), a combination of music and range-of-motion (ROM) exercises, is a promising non-pharmacological intervention. Music provides sensory stimulation that can improve mood and motivation, while ROM exercises promote circulation and muscle activation (Gultom & Indrawati, 2023). Previous studies have shown that MMT can support functional recovery in stroke patients; however, evidence from case studies in Indonesia remains limited.

This study aims to evaluate the effect of MMT on muscle strength in a non-hemorrhagic stroke patient at Bayu Asih Hospital, Purwakarta. The findings are expected to provide practical insight into the potential application of MMT as a complementary therapy in stroke rehabilitation.

METHODE

This study used a case study design involving a single non-hemorrhagic stroke patient (Mrs. M) treated in the Teratai Room of Bayu Asih Hospital, Purwakarta, from 13–15 March 2024. The intervention consisted of Music Movement Therapy (MMT) sessions delivered once daily for 30 minutes over three consecutive days.

Muscle strength was measured pre- and post-intervention using the Manual Muscle Testing (MMT) scale (range 0–5), which is a validated tool for assessing muscle strength (Warth & Millett, 2015). A score of 2 indicates the ability to move through full range of motion without resistance, while a score of 4 indicates the ability to move against gravity and moderate resistance.

The MMT intervention was carried out according to the hospital's Standard Operating Procedure (SOP), which combines upper-limb range-of-motion exercises with music as an external stimulus to enhance engagement and relaxation. Each session was guided by a trained nurse to ensure safety and proper technique.

Ethical approval was obtained from the Ethics Committee of STIKes Budi Luhur Cimahi (No. 092/D/KEPK-STIKes/III/2024). Informed consent was obtained from the participant. Patient confidentiality was maintained by using initials and omitting identifiable information.

RESULT

The patient's muscle strength was assessed using the Manual Muscle Testing (MMT) scale (0–5) before and after each Music Movement Therapy (MMT) session. Table 1 summarizes the findings.

Table 1: Results of the Application of Music Movement Therapy

No	Befor		After	
	Time	Muscle Strength	Time	Muscle Strength
1	15 March 2024 09.00	2	15 March 2024 09.20	3
2	16 March 2024 09.00	3	16 March 2024 09.20	4
3	17 March 2024 09.00	4	17 March 2024 09.20	4

Description of scores:

- Score 2: Able to move through full range of motion without gravity.
- Score 3: Able to move against gravity but without resistance.
- Score 4: Able to move against gravity and moderate resistance.

Summary:
On day 1, the muscle strength improved from score 2 to 3 after the intervention. On day 2, it improved further from score 3 to 4. By day 3, the muscle strength was maintained at score 4, indicating the patient was able to move against gravity with moderate resistance. Overall, the muscle strength increased two points on the MMT scale (from 2 to 4) after three consecutive days of intervention.

DISCUSSION

Increased muscle strength in non-hemorrhagic stroke patients occurs as a result of early mobilization such as Range of Motion (ROM). The benefits of range of motion include increasing blood circulation which carries nutrients for cell survival, especially muscle cells which are useful for carrying out activities, namely contraction and relaxation, so that it can minimize the occurrence of contractures. Muscle is a tissue that plays an important role in the movement system. Muscles consist of many fascicles, which are collections of muscle fibers that are wrapped and united, inside the fibers themselves there are membranes in the muscles (sarcolemma), myofibrils, sarcoplasmic reticulum, mitochondria. Myofibril tubules consist of two types, namely thin myofilaments (actin, troponin, tropomyosin) and thick myofilaments (myosin). The sarcoplasmic reticulum stores many calcium ions which play an important role in the contraction process. Mitochondria play a role in the process of making ATP for contraction. Muscle contraction occurs due to the mechanism of filament shift (actin filaments shift between myosin filaments). This causes increased muscle strength in non-hemorrhagic stroke patients.

On the first day, March 15, 2023 at 09.00 WIB, the author checked muscle strength first before implementing music movement therapy by using muscle strength measurements with a value of 2, moving through the full range of joint motion but unable to resist gravity, or only able to move in a horizontal plane, after the application of therapy, the same value was obtained as before the application, score 2. On the second day, March 16, 2024 at 09.00 WIB, a muscle strength check was carried out first by using the patient's muscle resistance, the patient's muscle strength was the same as before, namely a value of 2. After the application of music movement therapy, a value of 3 was obtained, namely moving through the full range of joint motion against gravity but unable to resist even light resistance. On the third day, March 17, 2024, at 09.00 WIB, muscle strength was checked before therapy with a value of 3, moving through the range of joint motion against gravity and being able to resist light to moderate resistance. After the application of music movement therapy, a value of 4 was obtained, which

means moving through the range of joint motion against gravity and being able to resist light to moderate resistance.

Someone who does continuous exercise will experience physiological changes in their body system such as lowering blood pressure, improving muscle tone, increasing joint mobilization and increasing muscle mass. Early mobilization such as ROM can cause muscle contractions that begin with the release of acetylcholine which causes action potentials or stimuli to spread throughout the surface of the muscle membrane. This causes calcium ions to be released in large quantities into the sarcoplasm. Calcium ions activate the power of actin filaments to pull the heads of myosin filaments, a pure active actin filament can actually bind strongly to the myosin filament if there are magnesium ions and ATP, but because of the presence of troponin-tropomyosin, this is inhibited. The presence of calcium ions inhibits the function of tropomyosin, troponin, and activates of actin, so that contraction can occur. Energy needed in the contraction process. This energy comes from the bond of Adenosine Triphosphate (ATP) which is split into ADP, to provide the necessary energy. At the beginning of the contraction cycle, ATP binds to the myosin head on the side of ATPase (the enzyme that hydrolyzes). ATPase split ATP into ADP (ATP ADP+ P+ Energy). This energy is used to activate myosin, so that it can bind to actin. This condition will persist until ATP attaches and weakens the actin-myosin bond. The myosin head is released and ready to attach to new actin. This cycle repeats as long as there is nerve stimulation and sufficient calcium, with contraction, the muscles produce movement in the bones where the muscles are attached so that it can minimize contractures. Early mobilization should be done in the morning because of high oxygen pressure and high blood acidity, and the ability of hemoglobin to bind oxygen increases, while at night the conditions of low oxygen pressure and low acidity cause the ability of hemoglobin to bind oxygen to decrease.

Music movement therapy is a range of motion exercise that uses music where music can relax or reduce the possibility of pain. Music can provide a stimulus that can improve mood, emotions control, faster recovery in stroke patients. Range of motion (ROM) exercises using the MMT method are an intervention to help patients restore their muscle strength so that they are able to fight gravity with full pressure. Things to note in providing this MMT intervention are that it is not allowed to be given to patients in the process of healing injuries, considering the patient's subsequent health condition (life threatening), suspected of being a disease process, and must be done according to the time for 30 minutes.

The results of this application are in accordance with the results of research conducted by Agus Hidayat et al in 2022 which stated that Music movement therapy which is a combination of music and range of motion can increase muscle strength. Music heard through the auditory cortex will stimulate motor nerve impulses known as the RAS (Reticular activating system) with the result that there is an increase in the ability of daily activities of stroke patients after being given MMT for 3 days and based on statistical tests it is known that there is an effect of music movement therapy on the ability of daily activities of stroke patients.

CONCLUSION

This case study demonstrated that Music Movement Therapy (MMT) improved upper-extremity muscle strength in a non-hemorrhagic stroke patient, with an increase from grade 2 to grade 4 on the Manual Muscle Testing (MMT) scale after three consecutive days of intervention. These findings indicate that MMT has the potential to serve as a supportive rehabilitative intervention to enhance motor function and facilitate independence in stroke patients.

RECOMMENDATIONS

1. Further research with a quantitative design, larger sample size, and longer follow-up is needed to confirm the effectiveness and sustainability of MMT in stroke rehabilitation.
2. Health facilities should consider integrating standardized SOPs for MMT into stroke rehabilitation programs as a complementary non-pharmacological therapy.
3. Training for nurses and physiotherapists is recommended to ensure the correct and safe implementation of MMT in clinical practice.

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