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Original Article

MOTOR IMAGERY TRAINING FOR MOTOR RECOVERY IN LEFT HEMIPARESIS POST-STROKE: A SHORT-TERM CASE STUDY

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ABSTRACT

Background: Stroke remains one of the leading causes of long-term disability worldwide, with hemiparesis being the most common motor deficit. Hemiparesis on the dominant side, such as sinistra hemiparesis, greatly impairs daily function. Motor Imagery Training (MIT) is a cognitive-based therapeutic approach that stimulates motor-related cortical areas through mental rehearsal of movement, offering a non-invasive, low-cost intervention to promote neuroplasticity during stroke rehabilitation.

Objectives: This case study aims to evaluate the short-term effects of a 4-day Motor Imagery Training intervention on a post-stroke patient with hemiparesis sinistra, focusing on motor function improvement and cognitive engagement.

Methods: Mrs SA, a 66-year-old female with a history of uncontrolled hypertension and prior stroke, presented with left-side weakness, facial asymmetry. The patient underwent MIT sessions for four consecutive days (30 minutes/day), guided by auditory scripts and visual imagery techniques targeting upper limb function. Motor performance was evaluated using the Fugl-Meyer Assessment for Upper Extremity (FMA-UE) and the Medical Research Council (MRC) scale.

Results: After four MIT sessions, the patient demonstrated improved motor strength (MRC 4-/5), increased FMA-UE score from 29 to 36, and enhanced focus and engagement. Subjectively, the patient reported increased motivation and perceived movement initiation. These findings suggest early cortical activation and functional gains, even within a limited intervention period.

Conclusion: This case supports existing evidence on the effectiveness of MIT in promoting neurofunctional recovery in stroke rehabilitation. Despite its brief duration, MIT contributed meaningfully to motor recovery and psychological readiness. Motor imagery is feasible for early rehabilitation and can be tailored to settings with limited resources.

Keywords: Cognitive Rehabilitation, Hemiparesis Sinistra, Motor Imagery, Neuroplasticity, Stroke Recovery.

INTRODUCTION

Stroke is the leading cause of long-term disability worldwide and represents a significant burden on individuals, families, and healthcare systems. In Indonesia, the incidence of stroke is substantial, and the prevalence of stroke-related disability continues to rise annually. Clinical manifestations of stroke vary widely, but one of the most common is motor impairment, particularly hemiparesis, which is characterized by weakness on one side of the body. Both dextral and sinistral hemiparesis are particularly disruptive because the hands and feet are essential for daily functioning, making the impact on daily activities even more severe.

The case presented in this study involves a 62-year-old woman who experienced a stroke on June 2, 2025. The patient presented with the primary complaints of weakness in the left extremity, facial asymmetry with a left-sided tilt, nausea and vomiting (twice), and severe dizziness accompanied by a headache. Her medical history revealed uncontrolled hypertension and a prior stroke one year earlier. Clinical examination showed a blood pressure of 134/66 mmHg, a pulse of 95 beats per minute, a temperature of 38.4°C, a respiratory rate of 20 breaths per minute, and oxygen saturation ranging from 94% to 95%. Neurological examination indicated facial nerve paresis (N.VII) and motor weakness in the left extremity, with muscle strength rated at 3/3/3/3. The patient's consciousness was intact, with a Glasgow Coma Scale (GCS) score of 15 (E4V5M6).

In the course of her rehabilitation, the patient underwent Motor Imagery Training (MIT) for 4 days as part of a subacute post-stroke rehabilitation program. MIT is a form of cognitive therapy that involves mentally imagining physical movements without any direct motor activity. This intervention aims to activate motor pathways in the brain, enhance neuroplasticity, and strengthen synaptic connections that may have been damaged by the stroke. MIT is particularly useful in patients with limited mobility, who are unable to engage in active physical exercise.

Alongside advances in neurorehabilitation, Evidence-Based Nursing (EBN) is crucial in selecting the most effective and appropriate interventions for patients. A systematic study by Kim et al. (2025) demonstrated that motor imagery-based interventions significantly improved upper limb function, cortical reorganization, and attentional control in stroke patients. The study confirmed the efficacy of MIT both as a standalone therapy and when combined with technologies such as brain-computer interfaces (BCI) or transcranial magnetic stimulation (TMS), in accelerating motor recovery.

In clinical practice, especially in settings with limited access to advanced technology, MIT can still be effectively applied through verbal instructions, motion observation, and visualization exercises. This case study aims to provide an empirical account of the benefits of a 4-day MIT approach in improving motor function in a stroke patient with left-sided hemiparesis, while also demonstrating the application of EBN in rehabilitative nursing practice.

METHODS

Study Design

This study employed a short-term single case study design to explore the effects of Motor Imagery Training (MIT) on motor recovery in a post-stroke patient with left hemiparesis. The design focused on observing functional changes over four consecutive days of intervention during the subacute rehabilitation phase. A case study approach was selected due to its suitability for in-depth evaluation of individualized therapeutic responses in clinical rehabilitation settings.

Settings

The intervention was conducted in the neurology ward of a hospital in Surabaya, East Java, Indonesia. The MIT sessions took place in a quiet and comfortable inpatient room with controlled lighting and minimal distractions, ensuring optimal concentration and relaxation during the therapy.

Research Subject

The subject was a 66-year-old female (Mrs. SA) with a medical history of uncontrolled hypertension and a prior stroke. She was admitted on 2 June 2025 with symptoms of left-sided hemiparesis and facial asymmetry. With a moderate stroke classified by an NIHSS score of 12, the patient was cognitively intact (GCS 15), cooperative, and physically unable to engage in active exercise, making her an ideal candidate for cognitive-based interventions such as MIT.

Instruments

Data were collected using both objective and subjective measurement tools, including: 1) Medical Research Council (MRC) Scale to assess muscle strength of the affected limbs; 2) Fugl-Meyer Assessment for Upper Extremity (FMA-UE) to evaluate upper limb motor performance; 3) Therapeutic response checklist for verbal and non-verbal cues; and 4) Daily observation sheet to monitor engagement, concentration, and perceived movement.

Data Collection

Intervention data were collected pre- and post-intervention over four days (3–6 June 2025). Each daily session lasted approximately 30 minutes and was guided by a rehabilitation nurse using standardized auditory scripts and relaxation music. Patient responses, including muscle strength, functional task performance, and motivational indicators, were recorded immediately following each session.

Data Analysis

Descriptive analysis was used to compare the patient's progress across intervention days. Improvements in motor function were quantified using score changes in the MRC and FMA-UE scales. Qualitative analysis of patient feedback, engagement levels, and verbal expressions was performed to assess cognitive and emotional responses.

Ethical Considerations

Ethical clearance was obtained from the institutional review board of the Faculty of Nursing and Midwifery, Nahdlatul Ulama University Surabaya. The patient provided written informed consent to participate in the study and to publish anonymized findings. Privacy, confidentiality, and the right to withdraw at any stage were ensured throughout the intervention.

RESULTS

The implementation of Motor Imagery Training (MIT) over four days yielded positive changes in the patient's motor function, cognitive engagement, and psychological readiness for rehabilitation. Objectively, improvements were observed in both upper and lower limb muscle strength on the affected (left) side. According to the Medical Research Council (MRC) scale, muscle strength increased from 3/5 to 4-/5 in both the left hand and left leg. Similarly, the patient's score on the Fugl-Meyer Assessment for Upper Extremity (FMA-UE) improved from 29 on Day 1 to 36 on Day 4. This seven-point increase is considered clinically significant, especially over such a short duration, as it surpasses the minimum threshold of five points commonly used to indicate meaningful functional progress in stroke rehabilitation studies.

Cognitively and behaviorally, the patient showed increased participation and concentration throughout the sessions. From the second day of intervention onward, the patient reported a growing awareness of movement sensations in the left hand and expressed a strong desire to move it voluntarily. Statements such as “I can imagine lifting a spoon and it feels like I can almost actually do it” indicated enhanced motor imagery ability and internal motor activation. The patient was increasingly cooperative, attentive during exercises, and able to follow verbal instructions with greater ease. These observations were further supported by the nurse’s daily monitoring of engagement, focus, and emotional responses.

Psychologically, the intervention also had a calming and motivating effect. The patient reported feeling more relaxed and confident after each session. Notably, there was a visible shift in affect and attitude toward recovery, with the patient demonstrating a more proactive and hopeful outlook. This psychological readiness is critical in stroke rehabilitation and complements the physiological benefits of MIT by reinforcing the patient’s intrinsic motivation to engage in further therapy.

In summary, despite its brief duration, the MIT intervention resulted in measurable and meaningful improvements in motor performance and psychosocial readiness. These outcomes support the feasibility and effectiveness of motor imagery as a cognitive-based rehabilitative approach, particularly in low-resource settings and during the subacute phase of stroke recovery.

DISCUSSION

This short-term case study demonstrates the potential of Motor Imagery Training (MIT) as a viable, non-invasive rehabilitation strategy for improving motor function in post-stroke patients, even within a limited intervention window. The patient, a 66-year-old woman with moderate left-sided hemiparesis, exhibited measurable improvements in both upper and lower limb motor strength, as well as enhanced cognitive engagement and psychological readiness following a four-day MIT intervention. These findings align with existing literature that emphasizes the neurophysiological basis and clinical efficacy of MIT in facilitating motor recovery after stroke.

Motor imagery operates through the activation of cortical motor networks, particularly the primary motor cortex, premotor area, and supplementary motor area—regions that are typically engaged during actual physical movement. Studies using functional neuroimaging have confirmed that mental rehearsal of movement can stimulate these areas, promoting neuroplasticity and synaptic reorganization even in the absence of physical activity (Choi & Park, 2024; Kusano et al., 2024). In this case, the patient’s seven-point improvement on the Fugl-Meyer Assessment for Upper Extremity (FMA-UE) suggests early cortical reactivation and functional reorganization, consistent with research showing that MIT can be effective within a short period when applied systematically (Kim et al., 2025).

The subjective responses observed during the intervention—such as improved focus, increased motivation, and the ability to visualize movement—further highlight the dual cognitive and emotional benefits of MIT. The patient's self-reported sensation of movement and willingness to participate actively in the therapy sessions reflect heightened motor awareness and psychological resilience. This is consistent with findings from Lambert et al.

(2023), who noted that motor imagery not only enhances physical recovery but also contributes to emotional well-being and self-efficacy in stroke survivors.

From an evidence-based nursing (EBN) perspective, this case reinforces the value of integrating MIT into routine clinical care, particularly in environments where advanced rehabilitation technologies such as virtual reality (VR) or brain-computer interfaces (BCI) are unavailable. The intervention required minimal resources—a verbal script, quiet environment, and guided facilitation by a trained nurse—yet produced significant outcomes. This aligns with the EBN framework, which emphasizes interventions grounded in best available evidence, clinical expertise, and patient-centered care.

Despite its promising outcomes, this study is not without limitations. The intervention period was brief, and follow-up assessments were not conducted to determine long-term effects. Additionally, the evaluation focused primarily on motor outcomes, without incorporating neurophysiological assessments such as EEG or fMRI to verify cortical activation. Nevertheless, the observed functional gains suggest that MIT can serve as an effective early-stage rehabilitation strategy, particularly when conventional physical therapy is not yet feasible.

In conclusion, this case highlights the feasibility, accessibility, and multidimensional benefits of MIT in post-stroke rehabilitation. The positive short-term outcomes support the broader adoption of MIT in clinical and community-based settings and point to the need for further studies examining its long-term impact, scalability, and integration with other therapeutic modalities such as task-based training or neuromodulation techniques.

CONCLUSION

This case study confirms that Motor Imagery Training (MIT) can serve as an effective and accessible early intervention for stroke patients with hemiparesis. Over four days, the patient demonstrated notable improvements in motor function, cognitive engagement, and emotional readiness for rehabilitation. The increase in muscle strength and FMA-UE scores, along with enhanced motivation and focus, underscores the clinical relevance of MIT as a cognitive strategy to promote neuroplasticity and functional recovery. These findings validate the use of MIT within the principles of evidence-based nursing, especially in settings with limited resources and restricted physical mobility.

SUGGESTION

Future research should focus on assessing the long-term effects of MIT in diverse stroke populations, including variations in age, stroke severity, and comorbidities. Studies should also explore the integration of MIT with other rehabilitation modalities such as task-specific training, functional electrical stimulation (FES), and virtual reality (VR) to optimize patient outcomes. Furthermore, standardized protocols and training modules for nurses and caregivers are recommended to support the wider adoption of MIT in both clinical and community settings. Developing mobile-based applications or home-based MIT programs may also enhance adherence and scalability.

LIMITATIONS

This study was limited by its short duration and single-subject design, which restricts generalizability. The absence of neurophysiological assessments, such as EEG or functional MRI, prevents direct measurement of cortical activation and neural adaptation. Additionally, psychological outcomes were assessed through subjective observation rather than standardized scales. Despite these limitations, the findings demonstrate that MIT can produce meaningful early outcomes and merit further investigation through larger-scale, controlled trials.

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