

Efficacy of Motor Imagery on Lower Extremity Functioning and Gait in Chronic Stroke Patients: Systematic review

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Abstract

Background: Numerous stroke rehabilitation techniques have been developed in recent years. In order to learn or improve a motor movement or ability, a subject will frequently enter a dynamic condition known as mental practise (MP). Although MP(mental practise) induces brain activation patterns that are comparable to those of movement, functional imaging has yet to prove the clinical efficacy of such treatments in rehabilitation and functional recovery.

Methodology: Systematic review of all clinical studies about motor imagery in stroke rehabilitation that were published between 2008 and 2022 in the major scientific databases. We chose three clinical trials evaluating various motor imaging techniques in chronic hemiparesis patients.

Conclusion: When combined with traditional physical therapy, mental practice is helpful for the functional rehabilitation of the lower limbs as well as for the restoration of everyday activities and skills. More research is required to identify the ideal treatment protocol and patient profile due to the variety of the studies in terms of the intervention protocol, particular imagery technique, practise duration, patient characteristics, etc.

Keywords: Chronic hemiparesis, Gait, Mental practice. (MP), Motor imagery (MI), Stroke rehabilitation.

Introduction

Motor imagery (MI), according to Jeannerod (1994, 1995), is the outcome of conscious access to the substance of a movement's aim, which is typically carried out during a movement instinctively as you get ready to move⁴. Motor readiness has shared mechanisms and is functionally similar this could be the cause of men's-Motor performance is improved by employing mental practise with MI training. (evaluation of Feltz and Landers in athletes, 1983). Therefore, a significant overlap between active brain

areas for ME(movement execution) and imaging is not surprising.^{4,7} Interestingly, a precise representation of a desired action present even if the limb performing the action is absent as it has been seen in patients who have undergone traumatic de-afferentation of half a limb (Schilder , 1935) or limb amputation following a total thoracic spinal cord injury (SCI,(1990) Decety and Boisson.

MI training consists of the imaginary representation of a movement without actually physically performing the movement. This

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ability to imagine a movement, both visually and somesthetically, is used for learning motor skills. This activates neural circuits that involve the primary motor cortex, the cerebellum and the basal ganglia (structures also involved during real movement), and induces functional redistribution and modulation of neuronal circuits. In addition, the motor programming theory suggests that one of the fundamental components for an effective movement to occur is the ability to perform mental representations of that movement. This is because these representations serve as an internal model for facilitating planning action processes¹.

In clinical practise, clinical research, and public health, stroke is not generally defined. The abrupt onset of localised neurological symptoms has historically served as the clinical definition of stroke. neurological issues that last for more than 24 hours (or result in)causes early mortality) and are brought on by part's acute vascular injury of the mind. One of the vascular causes is insufficient blood flow supply to a portion of the spinal cord or brain (ischemic stroke ,venous or arterial) and spontaneous bleeding into a portion of the surface of the brain (primary intracerebral haemorrhage) or the brain of the mind (subarachnoid haemorrhage)⁸. Technology advancements have prompted an updated definition ,stroke as a sudden onset of specific brain disorders, retina or spinal cord imaging for any time period (CT scans, for example). All patients with sudden onset of neurological symptoms, especially those with stroke risk factors, should be suspected of having a stroke. A timely and precise diagnosis of stroke permits cause-specific early therapies, which may increase survival, facilitate functional recovery, and reduce the likelihood of an early stroke recurrence. Some stroke patients will exhibit unusual stroke symptoms, such as loss of neurological function or gradual development of symptoms. Function lacks a definite anatomical localization. A helpful screening exam in the community is the FAST (Facial drooping, Arm weakness, Speech problems and Test (or Time)) score. While emergency room physicians may employ the FAST or ROSIER scales, stroke specialists will carry out a more thorough evaluation, and systematic neurovascular assessment⁸.

Methodology

A thorough search was conducted in the Cochrane Library, PubMed and PEDro databases, using the papers published between 2008 and 2022 and languages as the only criteria limited to English. The phrases and words that were 1) "Physical therapy" and "stroke rehabilitation" 2)"MI," and "mental rehabilitation," and 3)"mental stroke rehabilitation" and "practise"; 4) "MI" OR "mental "MI" and "hemiparesis"; 5) "practise" and "stroke"; 6) "mental practise and hemiparesis 7) Chronic Stroke Citation monitoring was employed to supplement the literature search with the relevant trials stumbled upon throughout the search Premium Label Cut your writing time.

Jadad scale

A Method for assessing the quality of controlled clinical trials

Basic Jadad Score is assessed based on the answer to the following 5 questions.

The maximum score is 5. (table 1)

Question Yes / No

1. Was the study described as random? 1/0
2. Was the randomization scheme described and appropriate? 1/0
3. Was the study described as double-blind? 1/0
4. Was the method of double blinding appropriate? (Were both the patient and the assessor appropriately blinded?) 1/0
5. Was there a description of dropouts and withdrawals? 1/ 0

Quality Assessment Based on Jadad Score Range of Score Quality

0-2 Low

3-5 High

Study selection

By reading the titles and abstracts of the found publications, researcher independently reviewed the search results. The researcher then carefully examined the entire texts of the shortlisted articles,

and ultimately chose those that matched the following inclusion and exclusion criteria ,

Inclusion criteria

1) regulated and clinical studies with randomization; 2) therapies utilising MI for the restoration of functionality of gait and lower extremity functioning following a stroke; 3) samples consented to by a population over the age of 18; 4) situated by individuals with hemiparesis following a stroke ,no matter how the disease originated or when evolution began. Articles that did not meet the criteria for this systematic review were lowering exclusion standards. In the "Title" section, we typed the terms "mental practise" or "mental imagery" or "motor imagery" or "Locomotor imagery training."

Exclusions criteria

Studies in which patients with CVA did not use mental imagery were disregarded. studies of images for goals other than helping people regain or learn how to use their motor skills Patients with stroke were not included. Articles devoted to the using cutting-edge new technology to implement the technique exclusion criteria included studies with fewer than 10 patients, or clinical trials without randomization. We removed articles for which full text versions weren't available.

Result

A total of 309 articles were deemed valid following a database search. The application of inclusion and exclusion criteria showed that there were 3 papers available for inclusion after excluding studies that were duplicated across multiple databases. One of the most frequent consequences is lower extremity dyskinesia. Limit the patient's daily living activities severely. A motor imagery exercise a safe and economical method that can be used in conjunction with physical therapy stroke patients' rehabilitation. There is proof that motor imagery training helps with upper-limb rehabilitation after a stroke. There is little proof that motor imagery training improves the lower limb motor capabilities of chronic stroke patients. Training in motor imagery may be included into traditional therapy among persons who have received rehabilitation from specially trained

physiotherapist with appropriate motor instruction in imagery, but significant resources are required. Additional research is required to alter and improve the current programme and should be directed into making motor imagery training available to more stroke sufferers.

In Mental practice, the majority of studies on metal practise have evaluated its performance in relearning tasks carried out using its arms. However, its use in relearning gait has also been proven useful, albeit in a limited way. Verma et al evaluated a training program's effectiveness that includes a gait rehabilitation circuit with a task-oriented mental pictures A statistically significant improvement was discovered. Most outcome measures include independent and improved functional gait earlier than in the control group. Improvements persisted for at least six weeks thereafter therapy.

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Analysis of Result

A total of 3 studies that examine the effectiveness of efficacy of mental exercise or imagery. Trial lengths for homogeneous action protocols ranged from 2 to 10 weeks, with the majority of studies lasting 6 weeks. The number of patients in a sample ranged from 10 to 30. The most common type of intervention is physiotherapy or occupational therapy, which integrates mental practise or visualisation with traditional rehabilitation. In some circumstances, mental imagery is used in conjunction with other specialised treatments like task-oriented circuit

training, constraint-induced movement therapy, or treadmill gait training. However, it is rarely utilised as a stand-alone method because research on its efficacy is typically conducted as an adjuvant to such as treadmill gait training, task-oriented circuit training, or constraint-induced movement therapy. Given that its usefulness is typically investigated as an adjunct to conventional training, it is rarely employed as therapy on its own. Although the majority of trials examined in our study included an initial period of relaxation during which the patient is able to focus and pay attention to the ensuing task.

Table 1:

Jadad Scale	Study & Characteristic	Variables	Procedure
5/5	Author- Ayelet Dunsky Type- Half crossover randomized study Duration- 4 weeks Diagnosis- Chronic hemiplegia No. of participants in study- Conventional - 11 Experimental - 11	FESS (fall efficacy Swedish version) 10m walk test Step activity monitor	Study group- 3 min of relaxation prior and after treatment and 3 min of motor imagery done between. (both kinaesthetic and visual) Conventional group- reaching and bimanual tasks done.
3/5	Author - Xiao Yin, et.al Type- RCT Duration- 6 weeks Diagnosis- Chronic hemiplegia No of participant- 32 patients	Fugl meyer Berg balance scale FIM (functional independent measure)	3 min of contract relax prior to treatment 15 min of detailed imagination of simple locomotor activity Final 2 minutes- refocusing on what we have done.
2/5	Author - Gyuchang Lee Type- Experimental study Duration -8 weeks Diagnosis- Chronic hemiplegia No of participant - conventional -11 Experimental - 13	Electrical walk way system (measure spatial and temporal parameters)	Conventional group- Only treadmill training for 30 min / session , 3 session / week for 8 weeks Experimental group - Treadmill training with motor imagery for 30 min / session, 3 session / week for 8 weeks.

After the conclusion of this stage, the patient is asked to carry out a task mentally (generally using first-person imagery). This could be an exercise that was physically performed at the previous rehabilitation session, or it could be a different exercise that will be practised later. Sessions of mental training typically last for 30 minutes on average. In certain studies, patients are given a video explanation of the method. Sometimes the patient's mental practise session is guided entirely by an audio cassette.

All of the patients in each of these investigations had hemiparesis or hemiplegia, however the degree of impairment varied greatly from patient to patient. Studies on hemiplegia following chronic stroke, which is the most common, were also covered in papers. many surveys, including the Fugl-Meyer Scale for Lower Extremity Functioning, the Tinetti Balance Scale, the Electrical Walk Way System for Gait Analysis, and the 10m Walk Test. After the mental exercises were finished, verification techniques were employed to clock each evoked gesture and compare it to the real time it took to accomplish it. As an alternative, some patients were questioned about the order of actions required to complete the job.

Conclusion

Our analysis led us to the conclusion that patients can relearn skills and apply the gains they make to new situations when motor imaging is used in conjunction with traditional therapy. By enhancing its functionality and utilisation in daily activities, it also alters the paretic arm's quality and range of motion. Mental practise enhances spatio-temporal gait characteristics as well, especially when combined with certain methods since it lowers the fear of falling and encourages gait retraining earlier in the process. Last but not least, using mental practise as an adjunct to traditional therapy in patients with retained imagery skills is viable when implementing a mental practise strategy. Increases in session time should be made gradually. A safe and inexpensive approach called mental practise can help people with

subsequent hemiplegia from stroke function better. To determine the best candidates for this therapy, the sort of intervention, the amount of training, and other factors, more research is required.

Conflict of Interest: Nil

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