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ORIGINAL ARTICLE

Effectiveness of Motor Imagery Training to Improve Gait Abilities of Patients with Sub-Acute Stroke

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ABSTRACT

Aim: To determine the effectiveness of motor imagery training to improve the lower extremity function and gait in subjects with sub-acute stroke.

Methods: Forty four patients with subacute stroke with gait impairment were randomly assigned to one of two groups: motor imagery training group or muscle relaxation group. At the beginning and after six weeks of therapy, the ability to use motor imagery and lower limb performance were assessed.

Results: There were substantial differences of scores between both groups, with the motor imagery group progressing more than the muscle relaxation group.

Conclusion: Motor imagery may have a beneficial and effective task-specific effect on gait function in sub-acute stroke patients.

Keywords: motor imagery; gait rehabilitation; sub-acute stroke patients

INTRODUCTION

Motor imagery (MI) is a mental process in which a person imagines themselves performing a movement without actually doing so. It's a dynamic process in which the internal representation of a certain motor activity is activated but no motor output is generated[1]. After cancer, stroke is the second leading cause of mortality[2]. Patients who have had a stroke have functional restrictions and disability. Strokes can result in patients losing their balance and gait abilities due to a combination of motor, sensory, cognitive, and emotional deficits[3]. The reasons of functional limitations and disabilities vary depending on the affected site and the severity of the damage. Patients' independence is harmed by this aberrant gait pattern, which limits their engagement in society. One of the most essential goals of rehabilitation is to restore normal gait ability, and several strategies have been employed to achieve this goal[4].

Several papers on mental practice for stroke rehabilitation have been published, with mental practice combined with motor imagery training emerging as a promising strategy. MI is a rehabilitation technique that combines the use of motor imagery content with motion process repetition. The cognitive task of visualizing the completion of a specific movement or action without physically performing it is known as motor imagery[5]. There have been a few studies of sub-acute stroke patients that have simply looked at gait function improvement.

As a result, the purpose of this study was to confirm the impact of MI on gait improvement in sub-acute stroke patients.

METHODOLOGY

A randomized controlled trial was carried out in the Outpatient Department of Physical Therapy, Services Hospital, Lahore. This study comprised patients with sub-acute stroke who were undergoing rehabilitation at Services Hospital within the one-month study period. Patients who had their first stroke less than a year before entering the trial and had no known musculoskeletal issues that would impede their ability to safely walk frequently met the inclusion criteria.

Each patient was given a thorough case history and a full physical examination by the researcher. Patients were randomly allocated to one of two groups: the experimental group (gait training with motor imagery training) or the control group (gait training). For six weeks, subjects in the experimental group received thirty minutes of motor imagery and thirty minutes of gait training three times a week. Only the first 30 minutes of gait training were completed by the subjects in the control group.

For data entry, compilation, and analysis, the SPSS computer software version 22 was utilized. The mean and standard deviation of quantitative variables were determined. The chi-square test was used for qualitative data, whereas the z-test was used for quantitative variables. Significant was defined as a P value of 0.05%.

RESULTS

For this study, a total of 44 participants with gait impairment were enlisted. During the research, no one was dropped. The findings were based on 44 stroke patients and 28 healthy controls. Table 1 shows the characteristics of individual participants. There were no significant variations in demographic or clinical factors between the two groups.

Motor Imagery Questionnaire-Revised second version visual subscale (MIQ-RSvis) and Motor Imagery Questionnaire-Revised second version kinesthetic subscale (MIQ-RSkin) levels were substantially higher in the control group than in the experiment group, according to the results of Mann-Whitney U tests (Table 2). Wilcoxon Signed-Rank tests were utilized to assess the impacts of the therapy that considered the assessments before and after the therapy.

Table 1: Participants' characteristics

	MIT group		MR group		p-value	Control group
Characteristic	n = 20		n = 24		(MIT vs MR)	n = 28
Sex: male/female	16/5		14/9		0.46	16/14
Age in years, mean (SD)	50.3	(12.8)	53.7	(12.1)	0.38	47.3 (12.3)
Disease duration mean (SD)	4.6	(3.2)	3.6	(2.0)	0.15	NA
Hemiplegic side					0.38	
Right	11		10			NA
Left	10		13			NA
Cause of hemiplegia					0.82	
Ischemia	13		15			NA
Hemorrhage	8		8			NA
LE-FM, mean (SD)	19.2	(5.7)	19.8	(5.6)	0.72	NA

Table 2: Therapy effects between the Motor Imagery and Control Group

	Motor Imagery Group (n=21)		Muscle Relaxation group(n=23)	
	Inclusion	After 6 weeks	Inclusion	After 6 weeks
Motor Imagery Questionnaire-Revised second version visual subscale	35 (16)	40 (8)	37 (17)	33 (21)
Motor Imagery Questionnaire-Revised second version kinesthetic subscale	28 (13)	35 (9)	30 (15)	30 (22)
Imagery walking time/actual walking time ratio	1.12 (1.17)	1.12 (0.64)	0.84 (0.83)	1.0 (0.45)
Fugl-Meyer assessment	17.0 (11.0)	21.5 (12.0)	18.5 (9.0)	22.5 (10.0)

Motor Imagery questionnaire scores improved dramatically following therapy, with the treatment group improving significantly more than the muscle relaxation group. The imagery walking time/actual walking time ratio did not change statistically significantly after the therapy. Following the therapy, both motor imagery group and muscle relaxation group ten meters walk scores and Fugl-Meyer test of lower limb levels improved significantly. There was also a substantial difference among both groups group, indicating that the motor imagery group walked for much less time than the muscle relaxation group.

DISCUSSION

The ability to use motor imagery (MI) can be significantly harmed after a stroke[1]. Even in individuals with impaired imaging due to stroke, Confal-onieri et al. found that MI stimulates sensorimotor and premotor regions[6]. Both study groups discovered a strong link between imaging and actual walking. On the imagery setting, stroke patients were much slower, but their real walking speed was also reduced to the same level, indicating that their MI performance was maintained. These findings are similar to those of Mal et al., who discovered that the temporal connection of a complex loco motor task was partially preserved following stroke. Patients were able to envision walking in a place and environment where they were not actually present due to the close link between actual and imagined movement[7].

In the sub-acute phase following a stroke, we tested the hypothesis that a combination of physical exercise and motor imagery training is more beneficial than physical practice alone in gait recovery[8]. We discovered a substantial effect on gait velocity, which was determined by the 10-meter walk test, with the MIT group improving faster than the muscle relaxation group after 6 weeks. Despite the fact that gait velocity does not reflect movement quality, it is a reliable and specific metric that is sensitive to changes in walking ability[9].

Multiple studies in stroke patients have found that mental imagery has a considerable favorable influence on motor performance. Dun et al. looked at the viability of a home-based motor imagery training programme for gait rehabilitation in chronic stroke patients and found that it had a substantial impact on gait performance[10,11]. To illustrate the effect of MI in chronic stroke, Cho et al. paired treadmill training sessions with motor imagery training. Gait rehabilitation combined with motor imagery training (MIT) enhanced balance and gait capacity more than just gait training[12,13].

The fact that this study only included a small number of patients is also a drawback. It's crucial to note that the stroke patients in the study were all quite young. Detailed descriptions of motor imagery training elements in recovery are currently sparse, and more study is needed.

CONCLUSION

The use of integrated motor imagery (MI) improved walking abilities and was shown to improve gait efficacy. The use of a combination of physical and mental imagery for gait and ambulation may result in more effective progress than motor imagery alone. Patients in the sub-acute phase following a stroke attack show an intact temporal link between real and imagined walking movements, according to this study. These findings support previous research on motor imagery training as an adjuvant to physical practice in gait rehabilitation in chronic stroke patients.

Conflict of interest: Nil

Ethical Consideration: The ethical committee of Services Hospital Lahore gave their formal clearance. Every attempt was taken to guarantee that all research ethical criteria were met. All study participants were instructed about research activities and the need of maintaining the confidentiality of the data obtained. Each participant signed a written consent form.

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