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**Chhaya Seth**
MPT Scholar, Department of Rehabilitation Sciences, Manikya Lal Verma Shramjeevi Evening College, Janardan Rai Nagar Rajasthan Vidyapeeth (Deemed to be Unversity), Udaipur, Rajasthan, India

**Satya Bhushan Nagar**
Dean, Department of Rehabilitation Sciences, Manikya Lal Verma Shramjeevi Evening College, Janardan Rai Nagar Rajasthan Vidyapeeth (Deemed to be Unversity), Udaipur, Rajasthan, India

**Corresponding Author:**
**Chhaya Seth**
MPT Scholar, Department of Rehabilitation Sciences, Manikya Lal Verma Shramjeevi Evening College, Janardan Rai Nagar Rajasthan Vidyapeeth (Deemed to be Unversity), Udaipur, Rajasthan, India

# Effect of mirror therapy on gait in stroke patients

**Chhaya Seth and Satya Bhushan Nagar**

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**Abstract**
**Background:** Stroke becomes one of the reasons of adult disability and mortality globally, with profound effects on mobility, independence, and life quality. Lower-extremity in stroke are significantly reduces gait stability, slows walking speed. Mirror therapy and neuromuscular electrical stimulation (NMES) have demonstrated encouraging outcomes in gait post-stroke rehabilitation.
**Aims and Objectives:** Compare and evaluation of the effectiveness of mirror therapy and conventional therapy with neuromuscular electrical stimulation on gait in subacute stroke patients.
**Methodology:** The 30 patients with subacute stroke aged between 50 – 70 years were selected and included in the study as per inclusion and exclusion criteria. They randomly divided into two groups, namely group A and group B. Pre-test data of lower extremity motor functional performance of both groups was recorded using the dynamic gait index (DGI). Group A was treated with mirror therapy while group B given conventional physiotherapy with neuromuscular electrical stimulation. The data was obtained from all the groups at beginning of the study as pre-test and at the end of twelve weeks as post-test. Mean, standard deviation, paired and unpaired "t" test was used for data analysis.
**Result:** The mean improvement in dynamic gait scores of Dynamic Gait Index (DGI) was 9.87 in group A and 5.86 in group B. It was resulted that mirror therapy showed significant effect in improving DGI scores over conventional therapy with neuromuscular electrical stimulation in stroke patients.
**Conclusion:** It was concluded that both mirror therapy and conventional therapy with neuromuscular electrical stimulation were effective but mirror therapy were more effective over conventional therapy with neuromuscular electrical stimulation on improving gait of post-stroke hemiplegic patients.

**Keywords:** Stroke, Gait, Mirror therapy, Conventional Physiotherapy, Neuromuscular electrical stimulation

## Introduction

Stroke frequently impairs postural control and functional mobility. Hemiparesis is the most prevalent motor deficit and affects limbs. Most of people affected from stroke present with one side of body weakness [1].

Lower-limb motor function is frequently compromised, producing considerable restrictions in mobility, independence, and overall well-being. Hemiparesis of the lower limb is a common outcome that adversely affects balance, gait patterns, and general mobility [1].

Lower-extremity hemiparesis commonly follows stroke and significantly reduces gait stability, slows walking speed, and impairs activities such as standing, transfers, and negotiating uneven surfaces [3]. Such impairments not only limit functional mobility but also raise the risk of falls, further diminishing stroke survivors' quality of life and autonomy [4].

Research shows over 80% of stroke survivors experience walking difficulties soon after the event, with as many as 25% remaining unable to ambulate independently long term. Among those who regain walking, persistent gait abnormalities, shortened stride, reduced foot clearance, and limited endurance are frequent [5].

Lower-extremity rehabilitation is essential for re-establishing independence. Treatment typically emphasizes muscle strengthening, spasticity management, task-specific gait training, and balance re-education [6].

Originally introduced by Ramachandran and Rogers-Ramachandran, mirror therapy reflects the movements of the normal limb to create the impression that the affected limb is moving normally [7]. This visual feedback is believed to support cortical reorganization, improve motor recovery, and increase functional use of the paretic limb [8].

Neuromuscular Electrical Stimulation (NMES) can exert an orthotic effect on walking by enhancing activation of the tibialis anterior during gait, crucial for dorsiflexion and foot

clearance. The stimulation is proposed to provide sensory input to the CNS, promoting cortical reorganization and aiding recovery [9].

Although mirror therapy and conventional therapy with NMES have each been investigated and found to support motor recovery, direct comparative research examining these approaches alongside standard rehabilitation is limited. Thus, the study aims to investigate the efficacy of mirror therapy versus conventional therapy augmented with NMES on gait in stroke survivours, to determine whether either approach alone or combined with usual rehabilitation can meaningfully enhance recovery and improve functional mobility after stroke.

## Methodology

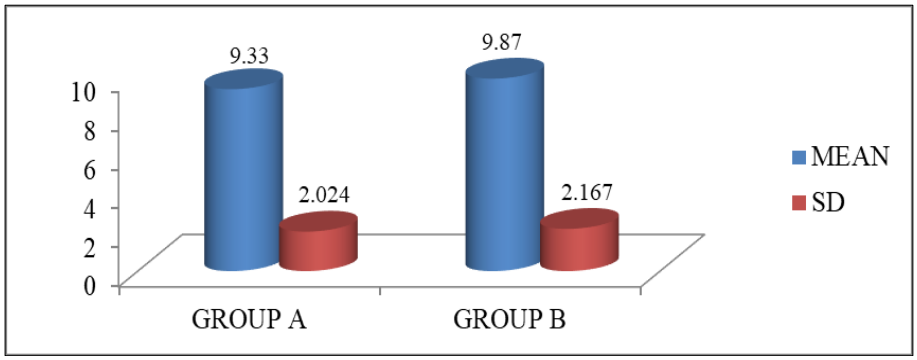
Thirty subacute stroke patients aged 50–70 years selected as per inclusion and exclusion criteria were randomly enrolled in Group A and B. Group A treated with mirror therapy while Group B received conventional therapy combined with NMES. Both groups underwent 45 minutes of their allocated intervention per session, 5 days in a week. Additionally, Group B received 15 minutes of NMES per session. Total study duration was 12 weeks. Dynamic Gait Index (DGI) [10, 11] was used as an outcome measure. Pre-test outcome measures were recorded on beginning of the study and post-test data collected after 12 weeks.

## Results

### 1. Analysis Of Pre-Test Values of Gait Scores Using Dynamic Gait Index (DGI) Between Groups

**Table 1:** Between-Group Comparison of Pre-Test Dynamic Gait Index (DGI) Scores

| Group | Mean | N | SD | SEM | Mean Diff | SD Diff | T | P |
|---|---|---|---|---|---|---|---|---|
| A | 9.33 | 15 | 2.024 | 0.52 | 0.54 | 0.143 | 0.6967 | 0.4917 |
| B | 9.87 | 15 | 2.167 | 0.56 | | | | |




**Graph: 1** Comparison of Pre-Test Dynamic Gait Index (DGI) Scores Between Group A and Group B

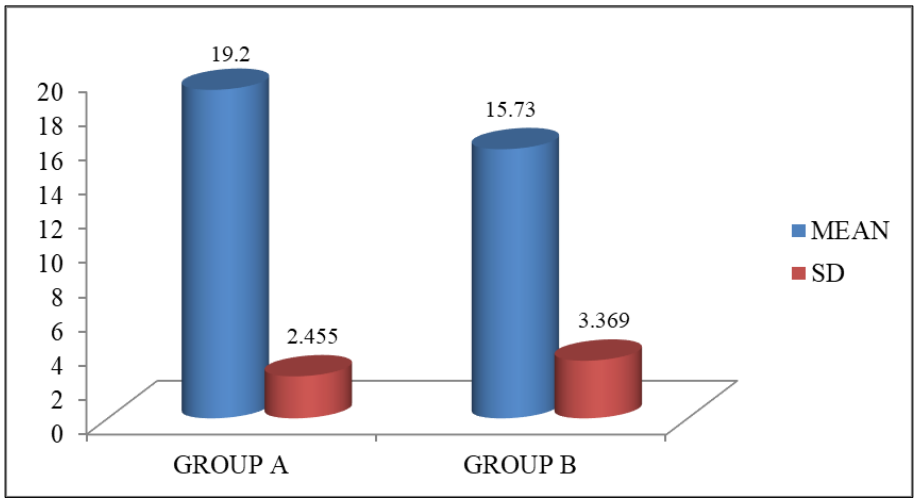
## Interpretation

Baseline DGI scores did not differ significantly between groups (mean difference 0.54; t = 0.6967; p = 0.4917), indicating comparability at study start.

### 2. Analysis of post-test values of gait scores using dynamic gait index (DGI) between groups

**Table 2:** Between-Group Comparison of Post-Test Dynamic Gait Index (DGI) Scores

| Group | Mean | N | SD | SEM | Mean Diff | SD Diff | T | P |
|---|---|---|---|---|---|---|---|---|
| A | 19.20 | 15 | 2.455 | 0.63 | 3.47 | 0.914 | 3.220 | 0.0032 |
| B | 15.73 | 15 | 3.369 | 0.87 | | | | |



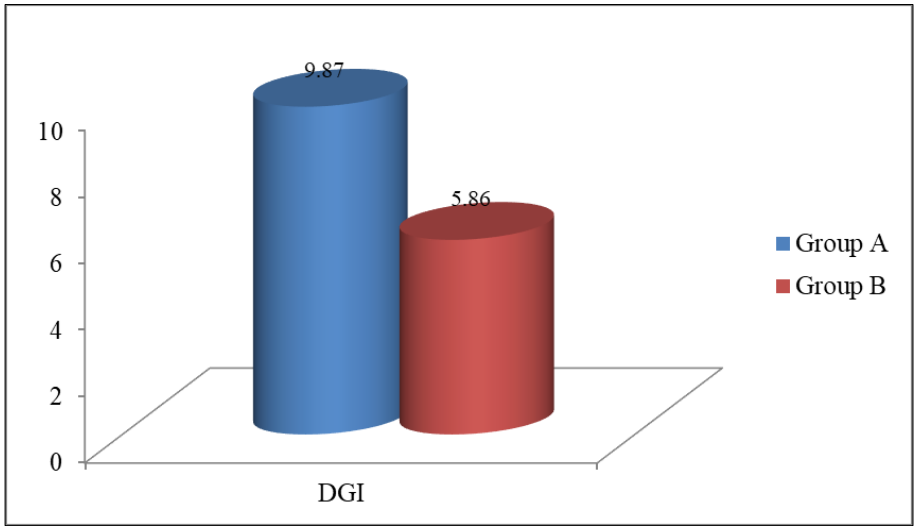

**Graph: 2** Comparison of Post-Test Dynamic Gait Index (DGI) Scores Between Group A and Group B

**Interpretation**
Post-test DGI means were 19.20 for Group A and 15.73 for Group B. The between-group difference (3.47) was statistically significant (t = 3.220; p = 0.0032), indicating mirror therapy led to greater improvements in dynamic gait performance than conventional therapy with NMES.

### 3. Mean Improvement In Dynamic Gait Index Scores Between Group A And Group B

**Table: 3** Mean Improvement in Dynamic Gait Index (DGI) Scores

| | Group | N | Mean |
|---|---|---|---|
| DGI | A | 15 | 9.87 |
| | B | 15 | 5.86 |




**Graph: 3** Comparison of Mean Improvement in Dynamic Gait Index (DGI) Scores Between Group A and Group B

**Interpretation**
Mean improvement in DGI was 9.87 for Group A and 5.86 for Group B, indicating greater gait improvement for the mirror therapy compared to conventional therapy with NMES.

**Discussion**
At baseline, there were no significant differences between groups in DGI (9.33 vs. 9.87; p = 0.4917), indicating comparability. Post-intervention, both groups improved, but Group A achieved higher mean DGI (19.20 vs. 15.73). Between-group comparisons showed significant advantages for mirror therapy in gait performance. (t = 3.220, p = 0.0032). The superior outcomes in the mirror therapy group may be due to observing the unaffected limb's reflection likely provides enriched sensory input that stimulates neuroplasticity and motor relearning, counteracting learned non-use. These results align with previous work (Broderick *et al*., 2018) [16] reporting mirror therapy enhances balance, walking velocity, ankle dorsiflexion and step length. Allen *et al*. (2011) [17] observed increased stride length and swing-phase ratio after mirror therapy; Sutbeyaz *et al*. (2007) [18] stated significant improvements in lower extremity motor function and ambulation with mirror therapy. Kuan *et al*. (1999) [19] found reductions in step width associated with improved stability post-intervention. Patel *et al*. (2009) [20] and Buccino *et al*. (2006) [21] provided evidence that mirror neurons are activated by observing actions, implying observed movement can be processed similarly to executed movement, facilitating motor relearning.
Mirror therapy is cost-effective, safe, and practical, and can be administered at home, whereas NMES requires equipment and supervision, limiting accessibility in low-resource settings. Kharka and Singh (2021) [22] confirmed both mirror therapy and NMES are effective for upper-extremity recovery, but highlighted mirror therapy's advantages in accessibility. Sackley and Lincoln (1997) [23] emphasized that visual-feedback training enhances proprioceptive recovery more effectively than verbal instruction or tactile stimulation, supporting mirror therapy's multimodal benefits.

**Conclusion**
The study's findings indicate both mirror therapy and conventional therapy with NMES showed improvement in gait performance in subacute stroke patients. Mirror therapy achieved the greatest benefit in gait performance than conventional therapy with NMES.

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