



TO COMPARE THE EFFECTIVENESS OF MIRROR BOOK THERAPY AND MOTOR IMAGERY ON VOLUNTARY MOVEMENT, ASYMMETRY OF FACE IN BELL'S PALSY

Vipin Varghese	MPT Neuro Physiotherapy
Dr Thummala S Pavani	PT, PhD, Professor, MPT Research Coordinator, Florence College of Physiotherapy, Bangalore
Dr S Srikanth Reddy	(PT), Principal, LVTG College of Physiotherapy, Kurnool.

KEYWORDS :

Bell's palsy is an acute, idiopathic peripheral neuropathy that affects the facial nerve (Cranial Nerve -VII), resulting in sudden weakness or paralysis of the muscles responsible for facial expression. Beyond its motor function, the facial nerve also carries parasympathetic fibres to the lacrimal and salivary glands, as well as sensory fibres that transmit taste sensations from the anterior two-thirds of the tongue.¹

Bell's palsy occurs equally in men and women, with the highest incidence reported between the ages of 15 and 45. The estimated annual incidence ranges from 15 to 30 cases per 100,000 individuals. Bell's palsy is characterized by the sudden onset of unilateral facial paralysis involving both the upper and lower facial muscles, with symptoms usually reaching maximum severity within 48 hours. Common manifestations include facial weakness, inability to close the eye, drooping of the mouth, and pain behind the ear.²

Mirror Book Therapy (MBT) is a non-invasive rehabilitation technique that uses visual feedback and neuroplasticity to improve motor recovery and reduce abnormal movement patterns. MBT uses a mirror or mirror book placed along the midline to reflect the unaffected side, creating the illusion of symmetrical movement on the affected side and promoting more normal motor control.³

The repetitive practice of observing these movements is believed to recalibrate neural pathways, reduce synkinesis pattern, and promote voluntary control of facial muscles. The rationale behind MBT in Bell's palsy is rooted in the ability of the brain's motor cortex to adapt and reorganize in response to sensory and motor inputs. In Bell's palsy, facial asymmetry and disrupted neuromuscular coordination often led to compensatory strategies and maladaptive plasticity, contributing to persistent deficits such as synkinesis and reduced voluntary movement.⁴

This study examines Mirror Book Therapy and Motor Imagery as non-invasive, neuroplasticity-based interventions for Bell's palsy. While conventional physiotherapy supports peripheral recovery, MBT uses visual feedback from the unaffected side to promote symmetrical movement, and MI involves mental rehearsal of facial movements to enhance motor control. This study aims to compare MBT and MI in improving voluntary facial movement and facial symmetry in Bell's palsy to support evidence-based rehabilitation.

Objectives of the Study

To evaluate the effectiveness of mirror book therapy on voluntary movement, asymmetry of face in bell's palsy. To evaluate the effectiveness of Motor Imagery on voluntary movement, asymmetry of face in bell's palsy. To compare the effectiveness of Mirror Book Therapy and Motor Imagery on voluntary movement, asymmetry of face in bell's palsy.

METHODOLOGY

Study Design- Pre-Post comparative study

Study Subject: subjects with Bell's Palsy

Study Duration: 6 months

Sampling Method: Convenience sampling

To calculate the sample size for a prevalence study based on the previous research study with an expected proportion of 0.02 (20%) of injury, $n = 30$. So, it is approximately 30 participants required to estimate the proportion with a margin of error of 0.05 and a 95% confidence level with 10% drop out the required sample size – 27, With 20% drop out the required sample size – 21

Inclusion Criteria

Patient diagnosed with unilateral Bell's palsy and referred for physiotherapy after two weeks of onset. Age group between 18-60 years^{2,9}. First episode of Bell's Palsy.⁶

Exclusion Criteria

- History of recurrent Bell's Palsy or other neurological disorders affecting the face⁹. Severe cognitive impairments or psychiatric conditions^{2,9}. Patients diagnosed with bilateral facial palsy². Patients who underwent recent facial bone fracture or surgery².
- Ethical clearance was obtained from the Ethical Committee of Florence College of Physiotherapy, Bangalore. Thirty-eight participants clinically diagnosed with Bell's palsy were recruited from hospitals in and around Bangalore

PROCEDURE

Group 'A' Motor Imagery with Interrupted Galvanic Stimulation

Group A intervention programme consisted of IGS, administered initially as three sets of 30 muscle contractions for a duration of 30 minutes. This was followed by 30 minutes of Motor Imagery training. The intervention was provided four times per week for a period of four weeks.

IGS was administered in 3 sets of 30 muscle contractions, with a total stimulation duration of 30 minutes per session. Adequate rest intervals were provided between contractions and between sets to minimize muscle fatigue. The presence of effective muscle contraction and associated facial movement was continuously monitored throughout the treatment session to ensure appropriate stimulation followed by session.



Figure 4.1: IGS in Group A

The participant was seated comfortably with the eyes closed. The motor imagery session began with deep breathing exercises to promote relaxation and improve mental focus.

Group 'B'- Mirror Book Therapy with IGS

For Group B, the intervention programme consisted of IGS, administered initially as three sets of 30 muscle contractions for a duration of 30 minutes. This was followed by 30 minutes of Mirror Book Therapy. The intervention was provided 4 times per week for a period of 4 weeks.

IGS was administered in three sets of 30 muscle contractions, with a duration of 30 minutes per session. Each contraction was delivered using IDC to elicit a visible and comfortable muscle response.

After IGS session, patient has been taken to Mirror Book Therapy Room, for Mirror book Therapy session. During each session, the participant was seated upright, maintaining good and proper posture. The mirror book (Two mirrors of size 25 X 18 cm each) was positioned at the participant's eye level. The mirror book was opened to a right angle, with the nose touching the outer edge of the mirror.



Figure 4.4 – MBT in Group –B

Changes in voluntary facial movement and facial symmetry following Mirror Book Therapy and Motor Imagery were evaluated using the Sunnybrook Facial Grading System (SFGS) and the House-Brackmann Facial Grading System.

Statistical Analysis

The collected data were tabulated and analysed using both descriptive and inferential statistics. All the parameters were assessed using statistical package for social science (SPSS) version 24, with a significance level of p value less than 0.05 and a 95% confidence interval set for all analysis.

Table-5.1 Comparison of SFGS Score Between Group – A and Group- B in Pre and Post Test

Test	Group - A		Group - B		t - Test	df	Significance
	Mean	S.D	Mean	S.D			
Pre Test	9.78	2.71	10.57	2.87	.870	36	.390*
Post Test	17.47	2.89	19.42	3.33	1.92	36	.001**

Table -5.2 Comparison of HBFG Score Between Group – A and Group- B in Pre and Post Test

Test	Group - A		Group - B		t - Test	df	Significance
	Mean	S.D	Mean	S.D			
Pre Test	5.15	.764	5.00	.666	-.678	36	.502*
Post Test	4.00	.816	2.84	.764	-.451	36	.001**

Table -5.3 Comparison of SFGS Score within Group – A and Group- B Between Pretest and Post test

Groups	Pre Test		Post Test		t - Test	Significance
	Mean	S.D	Mean	S.D		
Group- A	9.78	2.71	17.47	2.89	-10.36	.001**
Group- B	10.57	2.87	19.42	3.33	-10.33	.001**

Group- A	9.78	2.71	17.47	2.89	-10.36	.001**
Group- B	10.57	2.87	19.42	3.33	-10.33	.001**

The above table reveals the Mean, Standard Deviation (S.D), t-value and p-value between pre-test and post-test within Group – A & Group – B. There is a statistically significant difference between the pre-test and post-test values within Group A and Group B at P ≤ 0.05.

Figure 5.7 Comparison of SFGS Score within Group – A and Group- B Between Pre- test and Post- test

Table 5.4- Comparison of HBFG Score within Group – A and Group- B Between Pre-test and Post-test

Groups	Pre Test		Post Test		t - Test	Significance
	Mean	S.D	Mean	S.D		
Group- A	5.15	.764	4.00	.816	8.38	.001**
Group- B	5.00	.666	2.84	.764	10.47	.001**

DISCUSSION

Bell's palsy is the most common acute idiopathic peripheral facial nerve palsy, characterized by sudden-onset unilateral facial paralysis affecting the muscles responsible for facial expression. The study clearly suggests that a combined rehabilitation approach using Mirror Book Therapy with interrupted galvanic stimulation significantly enhances voluntary facial movement and reduces facial asymmetry compared to MI with IGS alone. Patients in Group B demonstrated statistically significant improvements in Sunnybrook Facial Grading System and House–Brackmann Facial Grading System scores compared to Group A.

Post-treatment comparisons revealed a significantly greater improvements in voluntary facial movement and resting symmetry in Group B than in Group A (SFGS: 19.42 ± 3.33 vs 17.47 ± 2.89, p ≤ 0.05; HBFGS: 2.84 ± 0.764 vs 4.00 ± 0.816, p ≤ 0.05), confirming that mirror book therapy combined with IGC produces superior improvements in voluntary facial movement and facial symmetry outcomes compared to motor imagery with interrupted galvanic stimulation.

CONCLUSION

Statistical analysis revealed a significantly greater improvement in Sunnybrook Facial Grading System scores and House–Brackmann Facial Grading System scores in the MBT + IGS group compared to the MI + IGS group. In conclusion, the study supports that incorporating Mirror Book Therapy alongside interrupted galvanic stimulation is a more effective rehabilitation strategy than Motor Imagery with interrupted galvanic stimulation for improving voluntary facial movement and reducing facial asymmetry in patients with Bell's palsy.

Limitations

Long term effect of the mirror book therapy and motor imagery could not be evaluated. Although 38 participants were included, a larger sample size could have provided greater statistical power and improved the generalizability of the findings. Future research should include long-term follow-up to evaluate the sustainability of improvements in voluntary facial movement and prevention of synkinesis.

REFERENCES

1. Tiemstra JD, Khatkhate N. Bell's palsy: diagnosis and management. Am Fam Physician. 2007 Oct 1;76(7):997-1002.
2. Zhang W, Xu L, Luo T, Wu F, Zhao B, Li X. The etiology of Bell's palsy: a review. J Neurol. 2020; 267:1896-1905. doi:10.1007/s00415-019-09282-4.
3. Ho ML, Juliano A, Eisenberg RL, Moonis G. Anatomy and pathology of the facial nerve. AJR Am J Roentgenol. 2015;204: W612-W619. doi:10.2214/AJR.14.13444
4. Tanna N, Kapoor VK. Facial nerve anatomy [Internet]. Medscape; 2024 [cited 2026 May 18]. Available from: emedicine.medscape.com
5. Myckatyn TM, Mackinnon SE. A review of facial nerve anatomy. Semin Plast Surg. 2004;18(1):5-12.
6. Fakoya AO, Hohman MH, Westbrook KE, Varacallo M. Anatomy, head and neck: facial muscles [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 [cited 2026 May 18]. Available from: Europe PMC. PMID: 29630261,

7. Taylor DC. Bell's palsy [Internet]. Medscape; 2021 [cited 2026 May 18]. Available from: emedicine.medscape.com/article/1146903
8. Pourmomeny AA, Asadi S. Management of synkinesis and asymmetry in facial nerve palsy: a review article. *Iran J Otorhinolaryngol*. 2014 Oct;26(77):251-256.
9. Rim HS, Byun JY, Kim SH, Yeo SG. Optimal Bell's palsy treatment: steroids, antivirals, and a timely and personalized approach. *J Clin Med*. 2024;13(1):51. doi:10.3390/jcm13010051.
10. Castaldo M, Sellitto G, Ruotolo I, Berardi A, Galeoto G. The use of mirror therapy in peripheral seventh nerve palsy: a systematic review. *Brain Sci*. 2024;14(6):530. doi:10.3390/brainsci14060530
11. Paolucci T, Cardarola A, Colonnelli P, Ferracuti G, Gonnella R, Murgia M, et al. Give me a kiss! An integrative rehabilitative training program with motor imagery and mirror therapy for recovery of facial palsy. *Eur J Phys Rehabil Med*. 2020 Feb;56(1):58-67. doi:10.23736/S1973-9087.19.05757-5.
12. Landge P, Shah D. Effectiveness of motor imagery and mirror book therapy for the recovery in patients with acute Bell's palsy: a pilot study. *Int J Physiother Res*. 2023;11(4):4584-4588. doi:10.16965/ijpr.2023.138.
13. Bukhari SN, Majeed S, Noor S, Khan T. Effects of mirror therapy on Bell's palsy. *JRCRS*. 2020;8(1):37-40. doi:10.5455/JRCRS.2020080108
14. Gil-Martínez A, Lerma-Lara S, Aceval A, Pages-Scasso R, Hernando-Jorge A, Campos-Vegas A, et al. Influence of mirror therapy (Specular Face software) on electromyographic behavior of the facial muscles for facial palsy. *Brain Sci*. 2021;11:930. doi:10.3390/brainsci11070930.
15. Wu JJ, Lu YC, Zheng MX, Hua XY, Shan CL, Ding W, et al. Structural remodelling in related brain regions in patients with facial synkinesis. *Neural Regen Res*. 2021;16(12):2529. doi:10.4103/1673-5374.313055.
16. A Musiol A, Paluch H, Samoń-Drzewicka A, Marcinkowska-Gapi ska A. Clinical applications and efficacy of mirror neuron function. *J Med Sci*. 2024;93(2). doi:10.20883/medical. e931
17. Barth JM, Stezar GL, Acierno GC, Kim TJ, Reilly MJ. Mirror book therapy for the treatment of idiopathic facial palsy. *Ear Nose Throat J*. 2020. doi:10.1177/0145561320913211.