

Extended 12-Week Analysis of Early Graded Proprioceptive Neuromuscular Facilitation versus Conventional Occupational Therapy in Facial Nerve Palsy: A Randomized Controlled Trial

Dr. Shweta Elwaka

MOTh Neuroscience Postgraduate Student, Department of Occupational Therapy, OT School & Centre LTMMC&GH Mumbai, India

Abstract: **Purpose:** This study evaluates the therapeutic value of extending facial rehabilitation from 8 to 12 weeks. It serves as an extended longitudinal analysis of a randomized cohort to compare the definitive 12-week clinical endpoints of early graded Proprioceptive Neuromuscular Facilitation (PNF) versus conventional Occupational Therapy (OT) in patients with peripheral facial nerve palsy (FNP). **Methods:** A cohort of 60 patients with unilateral lower motor neuron FNP stratified by aetiology into post-operative surgical trauma (n=31) and idiopathic Bell's Palsy (n=29) received either conventional OT (Group A) or graded PNF (Group B) three times weekly. Primary 8-week outcomes were previously published. This paper analyses the final, extended 12-week objective and psychosocial recovery profiles using the House-Brackmann Facial Nerve Grading System (HBFGS), Sunnybrook Facial Grading System (SBFGS), and the Facial Disability Index (FDI). **Results:** At 12 weeks, patients receiving graded PNF showed significantly greater recovery than those on conventional OT, with superior outcomes in facial nerve grading ($p = 0.004$), facial symmetry ($p = 0.013$), and physical function ($p = 0.034$). Social function improved in both groups, but inter-group differences were not statistically significant ($p = 0.089$). **Conclusion:** Graded PNF proved more effective than conventional OT for long-term rehabilitation in facial nerve palsy, supporting its adoption as a clinical standard to optimize functional recovery and psychosocial well-being.

Keywords: Facial nerve palsy, Proprioceptive neuromuscular facilitation, Occupational therapy, Longitudinal extension study, Facial rehabilitation, Kabat rehabilitation.

1. Introduction

Facial nerve palsy (FNP) involves paresis or paralysis from dysfunction of the seventh cranial nerve. [1,2,3,4] Often exemplified by Bell's palsy, which causes significant speech, blinking, facial expression, and mastication difficulties. [1,2,3,4] Conservative treatment typically includes muscle re-education, though improvements are slow. [9,10] Proprioceptive neuromuscular facilitation (PNF) has shown promise by enhancing recovery through movement patterns and cues. [11,12,13,14] Previous published short-term studies indicated that PNF accelerated recovery in an 8-week period (Elwaka et al., 2025; DOI: 10.36106/gjra/8705527). [15]. This study aims to assess long-term outcomes over a dedicated 12-week period, focusing on functional stability, symmetry, and psychosocial adjustments

2. Aim and Objectives

2.1 Aim

The aim of this study is to compare the effectiveness of early graded Proprioceptive Neuromuscular Facilitation (PNF) and conventional occupational therapy over a 12-week period in improving facial muscle function, symmetry, and functional outcomes in patients with facial nerve palsy.

2.2 Objectives

a) Primary Objective

To evaluate and compare the long-term clinical effectiveness of a Conventional Occupational Therapy program versus an Early Graded Proprioceptive Neuromuscular Facilitation

(PNF) program at an extended 12-week endpoint in patients with lower motor neuron facial nerve palsy.

b) Secondary Objectives

- To isolate the definitive 12-week differences between conventional OT and early graded PNF on objective facial symmetry and voluntary motor tracking using the Sunnybrook Facial Nerve Grading Scale.
- To analyze patient-reported facial disability, specifically tracking physical impairment and psychosocial outcomes, at the 12-week completion mark using the Facial Disability Index (FDI).

3. Hypothesis

Null hypothesis-

- HO₁- An extended 12-week protocol of an early graded PNF program is equally effective as conventional occupational therapy in improving gross facial nerve grading.
- HO₂- There is no significant difference between conventional OT and early graded PNF regarding long-term volitional facial symmetry at 12 weeks.
- HO₃- Extended care with an early graded PNF program shows identical outcomes to conventional OT regarding patient-reported physical and social disability subscales at 12 weeks.

Alternative hypothesis-

- H₁- An extended 12-week program of early graded PNF yields a statistically significant difference in gross facial nerve recovery compared to conventional OT.

Volume 15 Issue 10, October 2026

Fully Refereed | Open Access | Double Blind Peer Reviewed Journal

www.ijsr.net

- H₂- There is a statistically significant superior difference in long-term volitional facial symmetry at 12 weeks in favor of the early graded PNF group.
- H₃- An extended 12-week early graded PNF protocol produces a statistically significant superior improvement in patient-reported physical and social function subscales on the FDI compared to conventional OT.

4. Materials & Methods

Study design:

This study was conducted as a randomized controlled trial (RCT) with a 12-week follow-up period. The research protocol was reviewed and approved by the Institutional Ethics Committee. All participants provided written informed consent before the commencement of any therapeutic interventions. The study was conducted in tertiary care hospital in Mumbai, Maharashtra, India.

Sample size:

Considering the effect size of 0.8, alpha error of 0.05, power of the study as 80%, the sample size estimated was 27 patients per group. By considering 10% dropouts, the sample size was fixed at 30 patients per group.

Inclusion criteria

- Age 15–60 years
- First episode of facial nerve palsy
- Lower motor neuron facial nerve palsy (LMN)
- Onset ≥ 3 days
- House-Brackmann grade ≥ 3

Exclusion Criteria

- Facial palsy due to trauma
- Neurological or autoimmune disorders
- Stroke
- Multiple cranial nerve involvement

Outcome Measures

Assessments were performed at baseline, 4 weeks, 8 weeks, and 12 weeks using:

- 1) **House-Brackmann Facial Nerve Grading System (HBFGS):** A six-point scale from Grade I to VI. ^[16]
- 2) **Sunnybrook Facial Grading System (SBFGS):** A composite score from 0 to 100. ^[17,18,19]
- 3) **Facial Disability Index (FDI):** Assessing Physical and Social Function subscales. ^[10]

Intervention Protocols

Splint for facial paralysis: In treating any paralyzed portion of the body every effort is made to maintain maximum function. A malleable hook splint was utilized for both groups within the first 3 days of treatment to maintain proper positioning, optimize muscle tone, and support localized circulation ^[20]

The conventional therapy protocol (Group A) focused on facial isolated muscle re-education, and mirror feedback. The PNF protocol (Group B) utilized Kabat patterns performed along diagonal axes, rhythmic initiation, and slow reversals with graded resistance. Both groups received therapy 3 sessions/week for 12 weeks.

Group A (Conventional OT): Received standard facial occupational therapy interventions, including isolated muscle exercises.

- Facial exercises
- Mirror feedback
- Muscle re-education

Group B (Graded PNF): Received a structured, progressive PNF program targeting the facial diagonal patterns.

- Diagonal facial patterns
- Rhythmic initiation
- Slow reversals
- Graded resistance

5. Statistical Analysis & Result

Initially, 68 patients were screened using the House-Brackmann Facial Nerve Grading System (HBFGS), out of which 60 met the inclusion criteria (15 to 60 years of age) and were enrolled in the study.

In group A there were 30 patients in which 14 were females (6 Bell's palsy & 8 post operative), 16 males (9 Bell's palsy & 7 postoperative). In Group B there were 30 patients in which 14 females (6 Bell's palsy & 8 post operative), 16 males (8 Bell's palsy & 8 postoperative) ^[15]

While 55 out of 60 participants successfully completed the initial 8-week phase, 1 participant dropped (group B post operative) out during the extended window, resulting in 54 participants completing the full 12-week protocol. Evaluations were conducted at baseline, 4 weeks, 8 weeks, and 12 weeks using the HBFGS, Sunnybrook Facial Grading System (SBFGS), and Facial Disability Index (FDI).

Table 1: Comparative Longitudinal Analysis of extended window

Outcome Metric	Groups	12 Weeks (Mean $\pm$ SD)	Within-Group Progress (p-value: 8 vs 12 Weeks)
HBFGS	Group A	3.26 $\pm$ 1.4	p = 0.031
	Group B	2.11 $\pm$ 1.4	p = 0.010
Inter-Group Significance	Between-Group p	p = 0.004*	
Sunnybrook Composite Score	Group A	57.67 $\pm$ 28.20	p = 0.001
	Group B	72.37 $\pm$ 26.65	p = 0.170
Inter-Group Significance	Between-Group p	p = 0.013*	
FDI: Physical Function	Group A	70.00 $\pm$ 20.18	p = 0.012
	Group B	81.81 $\pm$ 21.10	p = 0.024
Inter-Group Significance	Between-Group p	p = 0.034*	
FDI: Social Function	Group A	70.75 $\pm$ 20.96	p = 0.001
	Group B	85.47 $\pm$ 19.88	p = 0.018
Inter-Group Significance	Between-Group p	p = 0.089	

At the extended 12-week endpoint (p < 0.05), Graded PNF (Group B) demonstrated clear clinical superiority over conventional occupational therapy (Group A) across all physical recovery measures. The PNF cohort achieved significantly better terminal outcomes in gross facial nerve recovery on the HBFGS (2.11 $\pm$ 1.40 vs. 3.26 $\pm$ 1.40, p = 0.004),

overall facial symmetry on the SBFGS (72.37 ± 26.65 vs. 57.67 ± 28.20 , $p = 0.013$), and self-reported physical function on the FDI (81.81 ± 21.10 vs. 70.00 ± 20.18 , $p = 0.034$). During the extended window (Weeks 8 to 12), Group A showed significant late-stage gains across all four scales ($p < 0.05$). Conversely, Group B sustained significant late-stage progress in HBFGS ($p = 0.010$), FDI Physical ($p = 0.024$), and FDI Social Function ($p = 0.018$), while displaying high-level stability on the SBFGS ($p = 0.170$), reflecting a statistical ceiling effect from early motor gains. Physical function demonstrated greater inter-group separation than social function at 12 weeks, as FDI Social Function did not reach statistical significance between groups (85.47 ± 19.88 vs. 70.75 ± 20.96 , $p = 0.089$).

6. Discussion

The expanded investigation confirms that Graded PNF therapy shows better long-term benefits. While both therapies offered initial relief, the diagonal synergy training in PNF significantly improved motor re-education at 8 and 12 weeks. The use of irradiation and multi-sensory stimulation indicating that the symmetry restored through PNF reduces social anxiety and stigma.

The results of this study are consistent with previous literature. Giorgio Lo Giudice et al. (2022) reported that early Kabat rehabilitation significantly accelerated recovery in postoperative facial nerve palsy patients.^[21] Our previous study Dr. Elwaka et al. (2025) highlighted that incorporating PNF into early rehabilitation protocols yields superior improvements in facial motor function.^[15] A case study by Pooja Kumari Digra et al. (2020) also demonstrated marked improvement in facial muscle strength and symmetry following PNF intervention in Bells palsy patients.^[22]

Based on the statistically significant differences observed across all outcome measures, all alternative hypotheses (H_1 , H_2 , and H_3) are accepted. Accepted alternative hypotheses indicate that the early graded PNF program is more effective than conventional occupational therapy for improving nerve damage, enhancing facial movement, and reducing facial disability in patients with facial nerve palsy. The study advocates for integrating early graded PNF into standard rehabilitation protocols to achieve better functional and psychosocial recovery.

7. Conclusion

In conclusion, this randomized controlled trial establishes that Graded PNF is the superior modality for the long-term management of Facial Nerve Palsy with a small sample size and longitudinal evidence, Early Graded PNF program should be considered the clinical standard alongside Conventional Occupational therapy for optimizing both functional reanimation and psychosocial well-being.

8. Future Research

Future studies should include a large sample size and participants from multiple hospital settings to improve the generalizability of the findings.

Declaration by Authors

Ethical Approval: Approved

Acknowledgement: To all the subjects who participated in this study

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest

References

- [1] V. Singh, *Textbook of Clinical Neuroanatomy*, 3rd ed. India: Elsevier Health Sciences, 2017, pp. 1–350.
- [2] B. D. Chaurasia, *Human Anatomy*, vols. 3–4, rev. ed. India: CBS Publishers & Distributors, 2019, pp. 1–600.
- [3] M. L. Ho, A. Juliano, R. L. Eisenberg, et al., “Anatomy and pathology of the facial nerve,” *American Journal of Roentgenology*, vol. 204, no. 6, pp. W612–W619, 2015.
- [4] R. S. Snell, *Clinical Neuroanatomy*, 8th ed. USA: Wolters Kluwer, 2019, pp. 1–500.
- [5] M. H. Hohman, M. J. Warner, and M. Varacallo, “Bell palsy,” in *StatPearls* [Internet]. Treasure Island, FL: StatPearls Publishing, 2024. [Online]. Available: <https://www.ncbi.nlm.nih.gov/books/NBK482290/>. [Accessed: May 24, 2025].
- [6] C. Clarke, *Neurology: A Clinical Handbook*. UK: Wiley, 2022, pp. 1–400.
- [7] StatPearls, “Bell palsy,” *StatPearls* [Internet]. Treasure Island, FL: StatPearls Publishing, 2024. [Online]. Available: <https://www.ncbi.nlm.nih.gov/books/NBK482290/>. [Accessed: May 24, 2025].
- [8] E. Peitersen, “Bell’s palsy: The spontaneous course of 2500 peripheral facial nerve palsies,” *Acta Oto-Laryngologica*, vol. 122, no. 7, pp. 4–30, 2002.
- [9] N. Ali and M. S. Alam, “Effect of occupational therapy-based intervention to improve facial functions, quality of life and reduce depression in a young male with Bell’s palsy,” *International Journal of Creative Research Thoughts*, vol. 8, no. 5, 2020.
- [10] J. M. VanSwearingen and J. S. Brach, “The Facial Disability Index: Reliability and validity of a disability assessment instrument for disorders of the facial neuromuscular system,” *Physical Therapy*, vol. 76, no. 12, pp. 1288–1298, 1996.
- [11] L. J. Teixeira, J. S. Valbuza, and G. F. Prado, “Physical therapy for Bell’s palsy: Systematic review and meta-analysis,” *BMJ*, vol. 343, Art. no. d6511, 2011.
- [12] J. R. Cardoso, E. C. Teixeira, M. D. Moreira, et al., “Effects of exercises on Bell’s palsy: Systematic review of randomized controlled trials,” *Otolaryngology–Head and Neck Surgery*, vol. 139, no. 5, pp. 557–563, 2008.
- [13] K. B. Hindle, T. J. Whitcomb, W. O. Briggs, et al., “Proprioceptive neuromuscular facilitation (PNF): Its mechanisms and effects on range of motion and muscular function,” *Journal of Human Kinetics*, vol. 31, pp. 105–113, 2012.
- [14] M. C. Silva, M. T. Oliveira, I. F. Azevedo-Santos, et al., “Effect of proprioceptive neuromuscular facilitation in the treatment of dysfunctions in facial paralysis: A

- systematic literature review,” *Brazilian Journal of Physical Therapy*, vol. 26, no. 6, Art. no. 100454, 2022.
- [15] S. Elwaka, A. Pai, et al., “Efficacy of early graded proprioceptive neuromuscular facilitation as compared to conventional occupational therapy in patients with facial nerve palsy: A randomized controlled trial,” *Global Journal for Research Analysis* [Internet], Dec. 15, 2025. [Online]. Available: <https://doi.org/10.36106/gjra/8705527>. [Accessed: Dec. 20, 2025].
- [16] S. D. Reitzen, J. S. Babb, and A. K. Lalwani, “Significance and reliability of the House-Brackmann grading system for regional facial nerve function,” *Otolaryngology–Head and Neck Surgery*, vol. 140, no. 2, pp. 154–158, 2009.
- [17] J. G. Neely, N. G. Cherian, C. B. Dickerson, et al., “Sunnybrook facial grading system: Reliability and criteria for grading,” *The Laryngoscope*, vol. 120, no. 5, pp. 1038–1045, 2010.
- [18] S. E. Coulson, G. R. Croxson, R. D. Adams, et al., “Reliability of the Sunnybrook Facial Grading System in assessing facial paralysis,” *Otolaryngology–Head and Neck Surgery*, vol. 132, no. 4, pp. 543–548, 2005.
- [19] B. Ross, G. Fradet, and J. M. Nedzelski, “Development of a sensitive clinical facial grading system,” *Otolaryngology–Head and Neck Surgery*, vol. 114, no. 3, pp. 380–386, 1996.
- [20] M. Shyni, “Efficacy of facial splint in improving facial symmetry in the management of Bell’s palsy among community dwellers,” *International Journal of Development Research*, 2021, pp. 48509–48512.
- [21] C. E. Boschetti, G. Lo Giudice, C. Spuntarelli, C. Apice, R. Rauso, M. Santagata, et al., “Kabat rehabilitation in facial nerve palsy after parotid gland tumor surgery: A case-control study,” *Diagnostics*, vol. 12, no. 3, Art. no. 565, 2022.
- [22] P. Kumari, “Proprioceptive neuromuscular facilitation in LMN facial palsy: A case report,” *Indian Journal of Physiotherapy and Occupational Therapy*, vol. 14, no. 3, pp. 171–174, 2020.
- [23] “Peripheral facial paralysis cases,” *International Journal of Research in Medical Sciences*, vol. 10, no. 3, pp. 644–649, 2022.
- [24] F. Tuncay, P. Borman, B. Taşer, et al., “Role of electrical stimulation added to conventional therapy in patients with idiopathic facial (Bell) palsy,” *American Journal of Physical Medicine & Rehabilitation*, vol. 94, no. 3, pp. 222–228, 2015.
- [25] M. Barbara, S. Monini, A. Buffoni, et al., “Early rehabilitation of facial nerve deficit after acoustic neuroma surgery,” *Acta Oto-Laryngologica*, vol. 123, no. 8, pp. 932–935, 2003.
- [26] S. Monini, C. M. Iacolucci, M. Di Traglia, et al., “Role of Kabat rehabilitation in facial nerve palsy: A randomised study on severe cases of Bell’s palsy,” *Acta Otorhinolaryngologica Italica*, vol. 36, no. 4, pp. 282–288, 2016.
- [27] S. A. Hamed, L. S. Mahmoud, M. M. ElMeligie, et al., “Electrophysiological responses to Kabat motor control re-education on Bell’s palsy: A randomized controlled study,” *Journal of Musculoskeletal & Neuronal Interactions*, vol. 23, no. 1, pp. 90–97, 2023.
- [28] S. P. Adhikari, M. Chaudhary, and R. Dev, “Kabat interventions integrated with facial expressive and functional exercises for better and speedy recovery in Bell’s palsy: A pre-post design,” *Journal of Chitwan Medical College*, vol. 10, no. 4, pp. 71–76, 2020.
- [29] M. Qamar, K. Khanzada, and M. Ijaz Gondal, et al., “Comparison of efficacy of Kabat rehabilitation and facial exercises along with nerve stimulation in patients with Bell’s palsy,” *BLDE University Journal of Health Sciences*, vol. 3, no. 1, p. 31, 2018.
- [30] G. Tharani, Y. Gopinath, L. V. Raja, et al., “Comparison of PNF versus conventional exercises for facial symmetry and facial function in Bell’s palsy,” *International Journal of Current Advanced Research*, 2018, pp. 9350–9354.
- [31] M. Pradeep, “Effectiveness of proprioceptive neuromuscular facilitation and neuromuscular re-education for reducing facial disability and synkinesis in patients with Bell’s palsy,” M.S. thesis, Tamil Nadu Dr. M.G.R. Medical University, Tamil Nadu, India, 2019.
- [32] H. Goyal and S. Koley, “Comparison of proprioceptive neuromuscular facilitation and neuromuscular re-education with conventional treatment and home based exercise plan along with facial nerve stimulation for reducing facial disability in patients with Bell’s palsy,” *International Journal of Medical Science and Diagnostic Research*, vol. 5, no. 6, 2021.
- [33] G. W. Cronin and R. L. Steenerson, “The effectiveness of neuromuscular facial retraining combined with electromyography in facial paralysis rehabilitation,” *Otolaryngology–Head and Neck Surgery*, vol. 128, no. 4, pp. 534–538, 2003.