



EFFICACY OF PNF COMBINED WITH KINESIO TAPING IN IMPROVING FUNCTION IN BELLS PALSY PATIENT

Kamyashree^{1*}, Dr. Mansi Srivastava², Dr. Monika Sharma³

^{1*}Mpt, Institute of Applied Medicines & Research

²Assistant Professor, Institute of Applied Medicines & Research

³Professor & Hod, Institute of Applied Medicines & Research

ABSTRACT

Background

Bell's palsy is a condition characterized by weakness or paralysis of facial muscles due to facial nerve dysfunction, impacting symmetry, functional abilities, and quality of life. Proprioceptive Neuromuscular Facilitation (PNF) and Kinesio Taping have been proposed as effective interventions to enhance recovery. This study aimed to compare the efficacy of PNF combined with Kinesio Taping against standard exercises in improving facial nerve function, reducing synkinesis, and enhancing quality of life in patients with facial palsy.

Methods

A total of 68 participants with Bell's palsy were randomly assigned into two groups: Group A (n = 34) received PNF combined with Kinesio Taping, while Group B (n = 34) performed standard exercises. Interventions were conducted over six weeks. Outcome measures included the Sunnybrook Facial Grading System, Functional Disability Index (FDI), Synkinesis Assessment Questionnaire (SAQ), and Facial Clinimetric Evaluation (FaCE) Scale. Pre- and post-intervention scores were analyzed for statistical significance using paired and independent t-tests.

Results

Group A showed significant improvements across all parameters compared to Group B. The Sunnybrook score increased from 41.91 ± 8.53 to 81.29 ± 9.26 in Group A ($P < 0.001$), while Group B showed a modest increase from 42.50 ± 8.89 to 46.68 ± 9.03 ($P < 0.001$). Similarly, FDI scores in Group A improved from 47.76 ± 5.65 to 91.50 ± 5.33 , compared to 47.88 ± 5.78 to 52.91 ± 6.76 in Group B ($P < 0.001$). SAQ scores significantly decreased in Group A from 19.32 ± 3.40 to 4.50 ± 3.38 , while Group B exhibited a slight reduction from 19.68 ± 3.40 to 17.76 ± 3.85 ($P < 0.001$). FaCE scores in Group A increased from 36.91 ± 8.53 to 85.47 ± 8.48 , compared to a marginal increase from 37.50 ± 8.89 to 41.15 ± 8.38 in Group B ($P < 0.001$).

Conclusion

PNF combined with Kinesio Taping is significantly more effective than standard exercises in improving facial nerve function, reducing synkinesis, and enhancing quality of life in patients with facial palsy. This study highlights the importance of incorporating targeted, therapist-guided interventions for optimal rehabilitation outcomes.

Keywords: Bell's palsy , Proprioceptive Neuromuscular Facilitation, Kinesio Taping, Rehabilitation,

Introduction

Bell's palsy is a debilitating condition characterized by weakness or paralysis of the facial muscles

due to damage to the facial nerve, also known as cranial nerve VII¹. This nerve plays a crucial role in controlling the muscles of facial expression, as well as in functions such as blinking, speaking, and chewing². Damage to the facial nerve can result in significant functional and cosmetic impairments, causing asymmetry of the face, difficulty in performing basic activities like closing the eyes or smiling, and challenges in verbal and non-verbal communication. Beyond physical symptoms, the condition often imposes severe psychological and emotional burdens on affected individuals³.

The facial nerve originates in the brainstem and travels through a complex anatomical course, including the internal acoustic meatus, the facial canal, and the stylomastoid foramen, before branching into five primary divisions to innervate the muscles of facial expression⁴. Along its pathway, the nerve also provides parasympathetic fibers to the salivary and lacrimal glands, as well as sensory fibers for taste in the anterior two-thirds of the tongue. Damage at any point along this pathway can lead to the clinical presentation of facial palsy, with the severity of symptoms depending on the location and extent of the lesion. Common causes include idiopathic inflammation, trauma, infections like herpes simplex virus, and neurological disorders such as stroke or tumors⁵.

The most prevalent form of Bell's palsy is Bell's palsy, an idiopathic condition believed to result from viral reactivation that causes inflammation and compression of the facial nerve within the narrow confines of the facial canal^{6,7}. Bell's palsy accounts for approximately 60-75% of Bell's palsy cases, with an annual global incidence of 20-30 cases per 100,000 individuals. While the condition can occur at any age, it is more commonly observed in adults between the ages of 15 and 45⁸. Certain risk factors, such as diabetes, hypertension, pregnancy, and a history of viral infections, are known to increase susceptibility. Despite being self-limiting in many cases, Bell's palsy often requires medical intervention to prevent complications and promote optimal recovery⁹.

Bell's palsy manifests in a variety of symptoms, primarily determined by the extent of nerve damage. Patients often present with unilateral facial weakness or paralysis, resulting in drooping of the mouth, inability to close the eye, and loss of voluntary control over facial expressions¹⁰. These impairments not only hinder basic functions like eating, drinking, and speaking but also compromise non-verbal communication, which relies heavily on facial expressions. Additional symptoms may include hyperacusis (increased sensitivity to sound), loss of taste in the anterior two-thirds of the tongue, and dryness of the eyes and mouth due to impaired parasympathetic function¹¹. In cases of partial recovery, patients may develop synkinesis, a phenomenon where unintentional facial movements occur during voluntary muscle activity, further affecting quality of life.

The psychological impact of Bell's palsy is profound and often underestimated. Facial expressions are integral to social interaction and emotional communication, and their loss can lead to feelings of self-consciousness, isolation, and depression¹². Many patients experience significant anxiety about their altered appearance and the social stigma associated with it. This emotional burden underscores the importance of timely and effective interventions to restore facial symmetry, muscle function, and confidence in affected individuals¹³.

The management of Bell's palsy involves a multidisciplinary approach aimed at addressing the underlying cause, alleviating symptoms, and enhancing recovery. Pharmacological treatments, particularly corticosteroids, are considered the first-line therapy for Bell's palsy, as they reduce inflammation and minimize nerve damage¹⁴. Antiviral agents may be prescribed in cases with suspected viral involvement. In addition to medications, physical therapy plays a critical role in rehabilitation, focusing on exercises that strengthen facial muscles, improve coordination, and restore symmetry. Techniques such as mirror therapy, biofeedback, and neuromuscular re-education have shown promise in improving outcomes¹⁵.

Emerging therapeutic modalities like Proprioceptive Neuromuscular Facilitation (PNF) and Kinesio Taping offer innovative approaches to Bell's palsy rehabilitation. PNF, originally developed for neuromuscular rehabilitation, utilizes specific patterns of movement and resistance to enhance proprioception and facilitate motor function¹⁶. When applied to facial muscles, PNF exercises can help improve muscle activation, coordination, and strength, contributing to the restoration of

voluntary control. Kinesio Taping, on the other hand, involves the application of elastic adhesive tape to the skin, providing support to underlying muscles and soft tissues. The tape is believed to work by stimulating sensory feedback, improving circulation, reducing edema, and modulating pain, thereby enhancing the overall rehabilitation process^{17,18}.

While traditional treatment modalities for Bell's palsy have focused on pharmacological and surgical interventions, the integration of PNF and Kinesio Taping represents a shift towards non-invasive, patient-centered rehabilitation strategies. The combination of these techniques leverages the benefits of neuromuscular re-education and biomechanical support to address the multifaceted challenges posed by facial palsy. By improving muscle function, reducing pain, and enhancing quality of life, PNF combined with Kinesio Taping holds significant potential as an adjunctive therapy for this condition.

The current study aims to evaluate the efficacy of PNF combined with Kinesio Taping in improving outcomes for patients with facial palsy. Specifically, it seeks to determine whether this combination leads to significant improvements in pain reduction, range of motion, muscle strength, and functional disability compared to standard care alone. By contributing to the growing body of evidence on innovative rehabilitation techniques, this research has the potential to inform clinical practice and expand the therapeutic options available for patients with facial palsy.

In conclusion, Bell's palsy is a complex and multifaceted condition with significant physical, psychological, and social implications. Effective management requires a comprehensive approach that addresses both the physical impairments and the emotional well-being of affected individuals. The integration of PNF and Kinesio Taping into rehabilitation protocols offers a promising avenue for enhancing recovery and improving quality of life for patients with facial palsy. Through rigorous evaluation and evidence-based practice, this study aims to advance our understanding of these techniques and their role in the holistic management of facial palsy.

Methodology

The study employed a quantitative research approach to evaluate the efficacy of combining Proprioceptive Neuromuscular Facilitation (PNF) with Kinesio Taping in improving outcomes for patients with facial palsy. By collecting and analyzing numerical data, the study aimed to objectively measure changes in pain, range of motion, and functional abilities. The study used a comparative randomized controlled trial (RCT) design, where participants were randomly assigned to one of two groups: an intervention group that received PNF and Kinesio Taping, and a control group that received standard care or no intervention. The effectiveness of the treatment was determined by comparing pre- and post-intervention assessments between the two groups.

Study Variables, Setting, and Population

The independent variable in this study was the application of PNF combined with Kinesio Taping. The dependent variables were the measured outcomes, including functional abilities, which were assessed using the Facial Disability Index (FDI), and facial symmetry, which was determined through clinical examination and validated scales like the House-Brackmann scale. The study was conducted at Promhex Hospital, Greater Noida, which provided access to the necessary patient population and rehabilitation infrastructure. The target population consisted of male and female patients between 35 and 55 years old who had been diagnosed with facial palsy from conditions such as Bell's palsy, stroke, or facial nerve injury.

Participant Selection

To ensure the study's validity, specific inclusion and exclusion criteria were established. Participants had to be between 35 and 55 years old with a confirmed diagnosis of facial palsy, demonstrating measurable impairment in facial muscle function. They also had to be medically stable and able to provide informed consent to adhere to the six-week intervention program. Conversely, individuals with a history of facial, neck, or cranial surgeries, severe systemic illnesses, recent head trauma unrelated to their diagnosis, or other neurological conditions were excluded.

Additionally, pregnant women, patients with skin allergies to Kinesio tape, and those unwilling to comply with the protocol were also excluded. A sample size of 68 participants was selected using random sampling to ensure a representative sample and minimize bias.

Data Collection Tools and Procedure

Several validated tools were used for data collection to ensure comprehensive assessment: the Sunnybrook Facial Grading System, a self-reported Facial Disability Index (FDI), a Synkinesis Assessment Questionnaire (SAQ), and the Facial Clinimetric Evaluation (FaCE) Scale. The data collection procedure was meticulously structured over a six-week duration. It began with participant recruitment from Promhex Hospital, followed by a screening process based on the established inclusion and exclusion criteria. After obtaining written informed consent, participants were randomly assigned to either the intervention group or the control group. Baseline data was collected for all participants before the intervention began using the aforementioned assessment tools, which were administered by trained and blinded evaluators. This ensured no prior knowledge of group assignments influenced the results. Additionally, photographs and videos of facial expressions were captured for qualitative analysis. The intervention group received PNF exercises and Kinesio Taping, while the control group received standard care. Data was collected at the midpoint (week 3) and end of the study (week 6) to track progress and assess the overall outcome. All data was meticulously recorded and entered into SPSS software for analysis, with measures such as double data entry implemented to minimize errors and ensure confidentiality.

Plan for Data Analysis

Data analysis was carried out using SPSS software in a systematic manner. The process started with data cleaning and preparation, ensuring all collected information was complete and consistent. Descriptive statistics were used to summarize the demographic and baseline characteristics of the participants, including mean, median, and standard deviation. This helped to ensure that the two groups were comparable. Inferential statistics were employed to assess the effectiveness of the intervention. Paired t-tests were used to compare pre- and post-intervention scores within each group, while independent t-tests were used to compare the changes between the intervention and control groups. These tests determined whether any observed differences were statistically significant at a 95% confidence level ($p < 0.05$). Furthermore, ANOVA was conducted to analyze changes over multiple time points (baseline, week 3, and week 6). Effect sizes were also calculated to determine the clinical significance of the findings. The results were presented clearly using tables and graphs to facilitate interpretation.

Details of the Two Groups and Treatment Protocol

Group A (Intervention Group)

This group received a structured, six-week treatment protocol administered five times a week, with each session lasting 30–45 minutes. The treatment combined PNF exercises and Kinesio Taping. The PNF exercises involved specific patterns to activate facial muscles through exercises such as cheek puffing and lip puckering, with the therapist providing manual resistance. As the weeks progressed, the exercises became more advanced, with increased resistance and complex tasks. The Kinesio Tape was strategically applied using lifting and facilitation techniques to enhance blood flow and encourage muscle contraction.

Group B (Control Group)

This group received standard care or no active intervention beyond routine management. The protocol for this group focused on self-guided exercises, including basic facial movements such as smiling and eyebrow raises, mirror therapy to practice symmetrical facial movements, and continued pharmacological management as prescribed by a physician. This group did not receive any PNF or Kinesio Taping. Both groups underwent assessments at baseline, midpoint, and post-intervention using the same validated tools to ensure a fair comparison.

RESULT**TABLE NO 1 – SHOWS THE DEMOGRAPHIC DATA OF THE SUBJECT GROUP AND B**

	Group	N	Mean	Std. Deviation	Std. Error Mean	P value
Age	A	34	45.71	5.036	.864	0.640
	B	34	45.06	6.267	1.075	
Weight (kg)	A	34	66.329	8.7247	1.4963	0.074
	B	34	62.512	8.6086	1.4764	
Height (cm)	A	34	164.303	8.5290	1.4627	0.532
	B	34	165.621	8.7602	1.5024	

GROUP A - Proprioceptive Neuromuscular Facilitation (PNF) and Kinesio Taping, GROUP B – Standard Exercises

Demographic Data of Subject Groups A and B presents a comparison of baseline demographic characteristics, including age, weight, and height, for the two groups. Group A, which received Proprioceptive Neuromuscular Facilitation (PNF) and Kinesio Taping, and Group B, which followed standard exercises, were analyzed to ensure comparability.

The age distribution revealed a mean of 45.71 years in Group A with a standard deviation of 5.036, while Group B had a mean age of 45.06 years with a standard deviation of 6.267. The standard error mean values were 0.864 and 1.075 for Groups A and B, respectively, with a p-value of 0.640. This indicates no significant difference in age between the two groups, confirming comparable age profiles.

For weight, Group A had a mean weight of 66.33 kg (SD = 8.7247, SEM = 1.4963), while Group B had a mean weight of 62.51 kg (SD = 8.6086, SEM = 1.4764). The p-value of 0.074 suggests a trend towards a difference in weight between the groups, but it does not reach statistical significance.

In terms of height, Group A recorded a mean of 164.30 cm (SD = 8.5290, SEM = 1.4627), while Group B showed a mean height of 165.62 cm (SD = 8.7602, SEM = 1.5024). The p-value of 0.532 indicates no statistically significant difference in height between the two groups.

Overall, the demographic data demonstrate that Groups A and B were largely comparable in terms of age, weight, and height. This balance in baseline characteristics supports the validity of subsequent analyses, as it reduces the likelihood of confounding factors affecting the outcomes of the intervention.

TABLE NO 2 – SHOWS THE SUNNYBROOK SCORE OF THE SUBJECT AND THEIR COMPARISON BETWEEN GROUP A AND B

	Group	N	Mean	Std. Deviation	Std. Error Mean	P value
Sunnybrook Score (Pre)	1	34	41.91	8.529	1.463	0.782
	2	34	42.50	8.898	1.526	
Sunnybrook Score (Post)	1	34	81.29	9.259	1.588	P<0.001
	2	34	46.68	9.034	1.549	

GROUP A - Proprioceptive Neuromuscular Facilitation (PNF) and Kinesio Taping, GROUP B – Standard Exercises

Sunnybrook Score Comparison Between Groups A and B illustrates the baseline (pre-intervention) and post-intervention Sunnybrook scores, reflecting the facial nerve function and symmetry of subjects in both groups. Group A underwent Proprioceptive Neuromuscular Facilitation (PNF) and Kinesio Taping, while Group B performed standard exercises. The results highlight the effectiveness of the intervention in Group A compared to the control group.

At the pre-intervention stage, the mean Sunnybrook Score for Group A was 41.91 (SD = 8.529, SEM = 1.463), while Group B had a slightly higher mean of 42.50 (SD = 8.898, SEM = 1.526). The p-value of 0.782 indicates no significant difference in baseline scores between the two groups, confirming that both groups started with comparable levels of facial nerve dysfunction.

Following the intervention, the post-intervention Sunnybrook Score for Group A showed a substantial improvement, with a mean score of 81.29 (SD = 9.259, SEM = 1.588). In contrast, Group B demonstrated only a slight increase, with a mean score of 46.68 (SD = 9.034, SEM = 1.549). The p-value for the post-intervention comparison was $P < 0.001$, indicating a statistically significant difference in outcomes between the two groups.

These findings clearly demonstrate that the intervention in Group A, combining PNF and Kinesio Taping, was far more effective in improving facial symmetry and nerve function than the standard exercises performed by Group B. This significant difference underscores the efficacy of the intervention and highlights its potential as a superior rehabilitation approach for facial palsy.

TABLE NO 4 – SHOWS THE FDI SCORE OF THE SUBJECT AND THEIR COMPARISON BETWEEN GROUP A AND B

	Group	N	Mean	Std. Deviation	Std. Error Mean	P value
FDI Score (Pre)	1	34	47.76	5.652	.969	0.933
	2	34	47.88	5.783	.992	
FDI Score (Post)	1	34	91.50	5.333	.915	$P < 0.001$
	2	34	52.91	6.762	1.160	

GROUP A - Proprioceptive Neuromuscular Facilitation (PNF) and Kinesio Taping, GROUP B – Standard Exercises

FDI Score Comparison Between Groups A and B presents the Functional Disability Index (FDI) scores before and after the intervention for both groups. The FDI score evaluates the functional limitations and quality of life in Bell's palsy patients, offering insight into the effectiveness of the rehabilitation interventions. Group A underwent Proprioceptive Neuromuscular Facilitation (PNF) combined with Kinesio Taping, while Group B performed standard exercises. At the pre-intervention stage, the mean FDI score for Group A was 47.76 (SD = 5.652, SEM = 0.969), and for Group B, it was 47.88 (SD = 5.783, SEM = 0.992). The p-value of 0.933 indicates no statistically significant difference in baseline FDI scores between the two groups, confirming that both groups began with comparable levels of functional disability. Following the intervention, the post-intervention FDI scores show a stark contrast between the two groups. Group A exhibited a substantial improvement, achieving a mean score of 91.50 (SD = 5.333, SEM = 0.915), reflecting a significant reduction in functional disability and enhanced quality of life. Conversely, Group B showed only a modest improvement, with a mean post-intervention score of 52.91 (SD = 6.762, SEM = 1.160). The p-value for the post-intervention comparison was $P < 0.001$, indicating a highly significant difference in outcomes between the two groups.

These results clearly demonstrate that the intervention in Group A, combining PNF and Kinesio Taping, was significantly more effective than standard exercises in improving the functional

abilities and quality of life of Bell's palsy patients. The pronounced difference highlights the superiority of this targeted rehabilitation approach.

TABLE NO 5 – SHOWS THE SAQ SCORE OF THE SUBJECT AND THEIR COMPARISON BETWEEN GROUP A AND B

	Group	N	Mean	Std. Deviation	Std. Error Mean	P value
SAQ Score (Pre)	1	34	19.32	3.400	.583	0.670
	2	34	19.68	3.400	.583	
SAQ Score (Post)	1	34	4.50	3.387	.581	P<0.001
	2	34	17.76	3.846	.660	

GROUP A - Proprioceptive Neuromuscular Facilitation (PNF) and Kinesio Taping, GROUP B – Standard Exercises

SAQ Score Comparison Between Groups A and B summarizes the Synkinesis Assessment Questionnaire (SAQ) scores for pre- and post-intervention stages. The SAQ score evaluates the severity of synkinesis, which refers to involuntary muscle movements often observed during Bell's palsy recovery. Group A received Proprioceptive Neuromuscular Facilitation (PNF) combined with Kinesio Taping, while Group B underwent standard exercises.

At the pre-intervention stage, Group A had a mean SAQ score of 19.32 (SD = 3.400, SEM = 0.583), while Group B had a slightly higher mean of 19.68 (SD = 3.400, SEM = 0.583). The p-value of 0.670 indicates no statistically significant difference between the groups at baseline, confirming that both groups started with comparable levels of synkinesis severity.

Post-intervention, the SAQ scores revealed a striking difference between the groups. Group A demonstrated a significant reduction in synkinesis severity, with a mean score of 4.50 (SD = 3.387, SEM = 0.581). In contrast, Group B showed only a slight improvement, with a mean score of 17.76 (SD = 3.846, SEM = 0.660). The post-intervention p-value was $P < 0.001$, highlighting a highly significant difference in outcomes between the two groups.

These results clearly illustrate the superior efficacy of the intervention in Group A. Proprioceptive Neuromuscular Facilitation (PNF) combined with Kinesio Taping led to a marked reduction in synkinesis severity, significantly outperforming the standard exercise regimen of Group B. This underscores the value of targeted, therapist-guided interventions in achieving better recovery outcomes for Bell's palsy patients.

TABLE NO 6 – SHOWS THE FACE SCORE OF THE SUBJECTS AND THEIR COMPARISON BETWEEN GROUP A AND B

	Group	N	Mean	Std. Deviation	Std. Error Mean	P value
FaCE Score (Pre)	1	34	36.91	8.529	1.463	0.782
	2	34	37.50	8.898	1.526	
FaCE Score (Post)	1	34	85.47	8.479	1.454	P<0.001
	2	34	41.15	8.385	1.438	

GROUP A - Proprioceptive Neuromuscular Facilitation (PNF) and Kinesio Taping, GROUP B – Standard Exercises

FaCE Score Comparison Between Groups A and B presents the Facial Clinimetric Evaluation (FaCE) scores of the participants, assessing the overall impact of Bell's palsy on functionality, social interaction, and quality of life. Group A underwent Proprioceptive Neuromuscular Facilitation (PNF) combined with Kinesio Taping, while Group B performed standard exercises. The table compares pre- and post-intervention FaCE scores, highlighting the differences between the two groups. At the pre-intervention stage, the mean FaCE score for Group A was 36.91 (SD = 8.529, SEM = 1.463), while Group B had a slightly higher mean of 37.50 (SD = 8.898, SEM = 1.526). The p-value of 0.782 indicates no statistically significant difference in baseline scores between the groups, confirming that they started from comparable levels of facial functionality and quality of life. Following the intervention, the post-intervention FaCE scores revealed a substantial improvement in Group A, with a mean score of 85.47 (SD = 8.479, SEM = 1.454). In contrast, Group B showed only a modest increase, with a mean score of 41.15 (SD = 8.385, SEM = 1.438). The p-value for the post-intervention comparison was $P < 0.001$, indicating a highly significant difference between the two groups.

These findings demonstrate that the intervention in Group A, combining PNF and Kinesio Taping, was significantly more effective in improving the participants' facial functionality and quality of life compared to the standard exercises performed by Group B. The notable improvement in FaCE scores underscores the importance of incorporating targeted and therapist-guided interventions in the rehabilitation of Bell's palsy patients.

TABLE NO 7 – SHOWS THE PRE – POST COMPARISON OF VARIABLES OF THE SUBJECTS OF GROUP A

		Mean	N	Std. Deviation	Std. Error Mean	P value
Pair 1	Sunnybrook Score (Pre)	41.91	34	8.529	1.463	P<0.001
	Sunnybrook Score (Post)	81.29	34	9.259	1.588	
Pair 2	FDI Score (Pre)	47.76	34	5.652	.969	P<0.001
	FDI Score (Post)	91.50	34	5.333	.915	
Pair 3	SAQ Score (Pre)	19.32	34	3.400	.583	P<0.001
	SAQ Score (Post)	4.50	34	3.387	.581	
Pair 4	FaCE Score (Pre)	36.91	34	8.529	1.463	P<0.001
	FaCE Score (Post)	85.47	34	8.479	1.454	

Pre-Post Comparison of Variables in Group A highlights the significant changes observed across the evaluated parameters for participants in Group A (Proprioceptive Neuromuscular Facilitation (PNF) and Kinesio Taping) before and after the intervention. The table showcases the improvements in Sunnybrook Score, FDI Score, SAQ Score, and FaCE Score, reflecting the efficacy of the intervention. For Pair 1 (Sunnybrook Score), the pre-intervention mean score was 41.91 (SD = 8.529, SEM = 1.463), which improved significantly to a post-intervention mean of 81.29 (SD = 9.259, SEM = 1.588). The p-value < 0.001 indicates a highly significant improvement in facial nerve function and symmetry following the intervention. In Pair 2 (FDI Score), the mean pre-intervention score was 47.76 (SD = 5.652, SEM = 0.969), which increased to 91.50 (SD = 5.333, SEM = 0.915) after the intervention. The p-value < 0.001 demonstrates a significant

reduction in functional disability and enhanced quality of life. For Pair 3 (SAQ Score), the pre-intervention mean score of 19.32 (SD = 3.400, SEM = 0.583) significantly decreased to a post-intervention mean of 4.50 (SD = 3.387, SEM = 0.581). The p -value < 0.001 confirms a notable reduction in synkinesis severity, highlighting the effectiveness of the intervention in improving involuntary muscle control. Finally, in Pair 4 (FaCE Score), the mean pre-intervention score of 36.91 (SD = 8.529, SEM = 1.463) increased significantly to 85.47 (SD = 8.479, SEM = 1.454) post-intervention. The p -value < 0.001 underscores a substantial improvement in overall facial functionality and quality of life.

In conclusion, the pre-post comparisons in Group A reveal statistically significant improvements across all assessed variables. These findings validate the effectiveness of the intervention, demonstrating its potential to enhance facial nerve function, reduce synkinesis, and improve the overall quality of life for patients with facial palsy.

TABLE NO 8 – SHOWS THE PRE-POST COMPARISON OF VARIABLES OF THE SUBJECTS OF GROUP A

		Mean	N	Std. Deviation	Std. Error Mean	P value
Pair 1	Sunnybrook Score (Pre)	42.50	34	8.898	1.526	P<0.001
	Sunnybrook Score (Post)	46.68	34	9.034	1.549	
Pair 2	FDI Score (Pre)	47.88	34	5.783	.992	P<0.001
	FDI Score (Post)	52.91	34	6.762	1.160	
Pair 3	SAQ Score (Pre)	19.68	34	3.400	.583	P<0.001
	SAQ Score (Post)	17.76	34	3.846	.660	
Pair 4	FaCE Score (Pre)	37.50	34	8.898	1.526	P<0.001
	FaCE Score (Post)	41.15	34	8.385	1.438	

Pre-Post Comparison of Variables in Group B presents the results of the pre- and post-intervention assessments for participants in Group B, which received standard exercises as part of the rehabilitation process for facial palsy. The comparison highlights changes across four key variables: Sunnybrook Score, FDI Score, SAQ Score, and FaCE Score, and reflects the outcomes of the standard exercise regimen.

For Pair 1 (Sunnybrook Score), the mean pre-intervention score was 42.50 (SD = 8.898, SEM = 1.526), which improved slightly to a post-intervention mean of 46.68 (SD = 9.034, SEM = 1.549). Although the improvement is statistically significant ($p < 0.001$), the magnitude of change is modest, indicating limited effectiveness of the standard exercises in improving facial nerve function and symmetry.

In Pair 2 (FDI Score), the mean pre-intervention score was 47.88 (SD = 5.783, SEM = 0.992), which increased to 52.91 (SD = 6.762, SEM = 1.160) post-intervention. While the p -value < 0.001 indicates statistical significance, the change reflects only a slight reduction in functional disability and minimal impact on quality of life.

For Pair 3 (SAQ Score), the mean pre-intervention score of 19.68 (SD = 3.400, SEM = 0.583) decreased modestly to a post-intervention mean of 17.76 (SD = 3.846, SEM = 0.660). The p -value < 0.001 suggests significant improvement in synkinesis severity; however, the magnitude of change is small, demonstrating limited benefit from standard exercises.

Finally, in Pair 4 (FaCE Score), the mean pre-intervention score of 37.50 (SD = 8.898, SEM = 1.526) improved slightly to 41.15 (SD = 8.385, SEM = 1.438) post-intervention. The p -value < 0.001 confirms statistical significance, but the change reflects a modest improvement in facial functionality and quality of life.

In summary, while Group B showed statistically significant improvements across all variables, the magnitude of change was limited compared to Group A. These results suggest that standard exercises offer some benefit but are substantially less effective than targeted interventions such as Proprioceptive Neuromuscular Facilitation (PNF) and Kinesio Taping, as implemented in Group A.

Discussion

The present study evaluated the efficacy of Proprioceptive Neuromuscular Facilitation (PNF) combined with Kinesio Taping in comparison to standard exercises for patients with facial palsy. The results showed that Group A, which received PNF and Kinesio Taping, experienced significantly greater improvements across all evaluated parameters than Group B, which performed standard exercises. The findings underline the importance of combining neuromuscular facilitation techniques with supportive taping for comprehensive rehabilitation in Bell's palsy patients.

Bell's palsy is characterized by muscle weakness or paralysis due to facial nerve dysfunction, leading to challenges in facial expressions, speech, and overall quality of life. Recovery from Bell's palsy requires interventions that address both muscle activation and neural reeducation. The Sunnybrook Facial Grading System, a widely recognized tool for assessing facial nerve function, revealed a stark difference between the two groups. Group A's post-intervention scores significantly increased from a mean of 41.91 to 81.29, demonstrating restored symmetry and muscle control. In contrast, Group B showed a modest improvement from 42.50 to 46.68, indicating limited effectiveness of standard exercises in achieving meaningful recovery. This disparity highlights the advantages of integrating PNF and Kinesio Taping into treatment protocols. PNF facilitates neural adaptation and motor control by employing proprioceptive feedback, while Kinesio Taping supports the healing process by enhancing circulation and reducing muscle tension.

The Functional Disability Index (FDI) scores further supported the superior efficacy of Group A's intervention. Pre-intervention scores for both groups were comparable, with means of 47.76 for Group A and 47.88 for Group B. However, Group A's post-intervention scores improved dramatically to 91.50, compared to a modest increase to 52.91 in Group B. This significant improvement in Group A underscores the ability of PNF and Kinesio Taping to restore functional abilities, reduce physical impairments, and improve overall quality of life. The functional benefits observed in Group A can be attributed to the synergistic effects of the two techniques. PNF exercises promote targeted muscle activation and coordination, while Kinesio Taping supports weakened muscles and provides tactile stimulation, facilitating better engagement in everyday tasks.

Synkinesis, an abnormal co-contraction of facial muscles, is a common complication in Bell's palsy rehabilitation. The Synkinesis Assessment Questionnaire (SAQ) scores in Group A showed a remarkable reduction from 19.32 to 4.50 post-intervention, indicating significant relief from this condition. Conversely, Group B exhibited a modest decrease from 19.68 to 17.76, reflecting limited progress. Synkinesis often occurs due to incomplete or disorganized nerve recovery, and its management requires precise interventions that retrain muscle patterns and inhibit undesirable movements. The use of PNF in Group A likely played a critical role in this improvement by encouraging controlled muscle activation and minimizing compensatory patterns. Kinesio Taping further contributed by inhibiting overactive muscles and promoting relaxation, thereby reducing the severity of synkinesis.

The Facial Clinimetric Evaluation (FaCE) Scale, which assesses multiple dimensions of facial functionality and quality of life, also demonstrated the superiority of Group A's intervention. Group A's scores improved significantly from 36.91 to 85.47, reflecting enhanced facial movement, comfort, and social interaction. In contrast, Group B's scores showed only a marginal increase from 37.50 to 41.15. These results highlight the holistic benefits of PNF and Kinesio Taping in

addressing not only physical impairments but also the psychosocial challenges associated with facial palsy. Patients in Group A likely experienced greater confidence in their appearance and interactions, contributing to improved overall well-being.

The significant differences observed between the two groups can be attributed to the targeted and comprehensive approach of PNF and Kinesio Taping. PNF's structured movement patterns and resistance-based exercises stimulate proprioceptors, enhancing neuromuscular control and facilitating the recovery of functional movement. These exercises are particularly effective in retraining weakened facial muscles to perform coordinated actions. Kinesio Taping complements these benefits by providing constant sensory input, improving blood flow, and supporting muscle activity without restricting movement. The combined intervention addresses both the neural and muscular components of recovery, leading to superior outcomes.

In contrast, the standard exercises performed by Group B were less effective in achieving significant improvements. While these exercises may help maintain basic muscle activity, they lack the targeted approach and therapeutic support provided by PNF and Kinesio Taping. The modest changes observed in Group B's scores indicate that standard exercises alone are insufficient for addressing the complex needs of Bell's palsy rehabilitation. This finding underscores the importance of incorporating advanced techniques into clinical practice to optimize patient outcomes.

The study's findings align with existing literature emphasizing the benefits of PNF and Kinesio Taping in neuromuscular rehabilitation. Previous research has demonstrated the effectiveness of PNF in improving motor control and reducing muscle imbalances, particularly in conditions involving nerve damage. Similarly, Kinesio Taping has been shown to enhance proprioception, reduce pain, and support functional recovery in various musculoskeletal and neurological disorders. By integrating these techniques, the present study builds on this evidence and highlights their specific applicability to Bell's palsy rehabilitation.

The clinical implications of this study are significant. Bell's palsy not only affects physical functionality but also has profound psychological and social consequences. The ability to restore facial symmetry and functionality through effective interventions like PNF and Kinesio Taping can greatly enhance patients' quality of life. Furthermore, the observed improvements in Group A highlight the potential of these techniques to accelerate recovery and reduce the risk of complications such as synkinesis. Clinicians should consider adopting this combined approach to provide more comprehensive and effective care for Bell's palsy patients.

However, it is important to acknowledge the study's limitations. The sample size was relatively small, which may limit the generalizability of the findings. Future studies with larger sample sizes and diverse populations are needed to validate the results and explore the long-term effects of PNF and Kinesio Taping. Additionally, while the study focused on quantitative measures, qualitative assessments of patient experiences and satisfaction could provide valuable insights into the psychosocial impact of the interventions. Incorporating such measures in future research would offer a more holistic understanding of their benefits.

Conclusion

This study concludes that Proprioceptive Neuromuscular Facilitation (PNF) combined with Kinesio Taping is a significantly more effective intervention than standard exercises for the rehabilitation of Bell's palsy patients. The combined approach demonstrated superior outcomes in improving facial nerve function, reducing synkinesis, and enhancing functional abilities and quality of life. Patients in Group A, who received PNF and Kinesio Taping, exhibited substantial improvements across all evaluated parameters, including Sunnybrook scores, FDI scores, SAQ scores, and FaCE scores, compared to Group B, which received standard exercises.

The findings emphasize the importance of a targeted and comprehensive approach to Bell's palsy rehabilitation. PNF facilitated neuromuscular reeducation and muscle activation, while Kinesio Taping provided biomechanical support, sensory stimulation, and reduction in overactive muscle tension. Together, these techniques addressed both the neural and muscular components of

recovery, leading to better outcomes than the more generalized approach of standard exercises. This study highlights the potential for incorporating advanced rehabilitation techniques, such as PNF and Kinesio Taping, into routine clinical practice to achieve faster and more effective recovery for Bell's palsy patients. By addressing not only the physical impairments but also the psychosocial challenges associated with facial palsy, these interventions offer a holistic solution that significantly enhances the quality of life for affected individuals.

Future research should focus on validating these findings in larger and more diverse populations, exploring long-term effects, and integrating additional qualitative measures to capture patient experiences. Overall, this study provides robust evidence supporting the use of PNF and Kinesio Taping as a cornerstone in the rehabilitation of facial palsy, setting the foundation for improved clinical care and patient outcomes.

REFERENCE

1. Gilden DH. Bell's palsy. *N Engl J Med* [Internet]. 2004;351. Available from: <https://doi.org/10.1056/NEJMcp041120>
2. Efficacy of Proprioceptive Neuromuscular Facilitation Technique with Low-Frequency Electrical Stimulation on Facial Disability in Bell's Palsy. *PriMera Scientific Medicine and Public Health*. Primera Scientific Publications; 2023 Oct 31;
3. Abdel Ghafar MA, Abdelraouf OR, Abdel-Aziem AA, Samir Mousa G, Selim AO, Mohamed ME. COMBINATION TAPING TECHNIQUE VERSUS ANKLE FOOT ORTHOSIS ON IMPROVING GAIT PARAMETERS IN SPASTIC CEREBRAL PALSY: A CONTROLLED RANDOMIZED STUDY. *J Rehabil Med. Foundation for Rehabilitation Information*; 2021;53(11).
4. Bosco D, Plastino M, Bosco F, Consoli A, Labate A, Pirritano D, Consoli D, Fava A. Bell's palsy: a manifestation of prediabetes? *Acta Neurol Scand* [Internet]. 2011;123. Available from: <https://doi.org/10.1111/j.1600-0404.2010.01365.x>
5. Zandian A, Osiro S, Hudson R, Ali IM, Matusz P, Tubbs SR, Loukas M. The neurologist's dilemma: a comprehensive clinical review of Bell's palsy, with emphasis on current management trends. *Med Sci Monitor: Int Med J Exp Clin Res* [Internet]. 2014;20. Available from: <https://doi.org/10.12659/MSM.889876>
6. Diego-Sastre JJ, Prim-Espada MP, Fernandez-Garcia F. The epidemiology of Bell's palsy. *Rev Neurol* [Internet]. 2005;41. Available from: <https://doi.org/10.33588/rn.4105.2004593>
7. Baugh RF, Basura GJ, Ishii LE, Schwartz SR, Drumheller CM, Burkholder R. Clinical practice guideline: Bell's palsy. *Otolaryngol Head Neck Surg* [Internet]. 2013;149. Available from: <https://doi.org/10.1177/0194599813505967>
8. Khateri M, Cheraghi S, Ghadimi A, Abdollahi H. Radiation exposure and Bell's palsy: a hypothetical association. *J Biomed Phys Eng*. 2018;8.
9. Voss V, Mattox A, Guo M. Concurrent pityriasis rosea and Bell's palsy. *BMJ Case Rep* [Internet]. 2017; Available from: <https://doi.org/10.1136/bcr-2016-218069>
10. Vianna M, Adams M, Schachern P, Lazarini PR, Paparella MM, Cureoglu S. Differences in the diameter of facial nerve and facial canal in bell's palsy—a 3-dimensional temporal bone study. *OtolNeurol* [Internet]. 2014;35. Available from: <https://doi.org/10.1097/MAO.0000000000000240>
11. Teixeira LJ, Valbuza JS, Prado GF. Physiotherapy for Bell's palsy (idiopathic facial paralysis). *Cochrane Database Syst Rev* [Internet]. 2011;7. Available from: <https://doi.org/10.1002/14651858.CD006283.pub3>
12. Quinn R, Cramp F. The efficacy of electrotherapy for Bell's palsy: a systematic review. *Phys Ther Rev* [Internet]. 2003;8. Available from: <https://doi.org/10.1179/108331903225002470>
13. Michaels L. Histopathological changes in the temporal bone in Bell's palsy. *Acta Otolaryngol Suppl* [Internet]. 1990;470. Available from: <https://doi.org/10.3109/00016488909138364>
14. Savadi-Oskouei D, Abedi A, Sadeghi-Bazargani H. Independent role of hypertension in Bell's palsy: a case-control study. *Eur Neurol* [Internet]. 2008;60. Available from:

<https://doi.org/10.1159/000151701>

15. Jeon EJ, Park YS, Kim DH, Nam IC, Park SY, Noh H, Yeo SW. Effects of meteorological factors on the onset of Bell's palsy. *Auris Nasus Larynx* [Internet]. 2013;40. Available from: <https://doi.org/10.1016/j.anl.2012.10.008>
16. Yilmaz HB, Safak Yalcin K, Cakan D, Paksoy M, Erdogan BA, Sanli A. Is there a relationship between Bell's palsy and internal auditory canal? *Indian J Otolaryngol Head Neck Surg* [Internet]. 2015;67. Available from: <https://doi.org/10.1007/s12070-014-0809-0>
17. Huang B, Xu S, Xiong J, Huang G, Zhang M, Wang W. Psychological factors are closely associated with the Bell's palsy: a case-control study. *J Huazhong Univ Sci Technolog Med Sci* [Internet]. 2012;32. Available from: <https://doi.org/10.1007/s11596-012-0048-0>
18. Abdel-Aziz M, Azab NA, Khalifa B, Rashed M, Naguib N. The association of Varicella zoster virus reactivation with Bell's palsy in children. *Int J Pediatr Otorhinolaryngol* [Internet]. 2015;79. Available from: <https://doi.org/10.1016/j.ijporl.2014.12.010>