Research Paper:

Effects of Mime Therapy With Sensory Exercises on Facial Symmetry, Strength, Functional Abilities, and the Recovery Rate in Bell's Palsy Patients

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Background and Objectives: Bell palsy is the sudden lower motor neuron paralysis of the facial nerve, characterized by acute unilateral peripheral facial muscle weakness. Physiotherapy has been proven to be beneficial in the rehabilitation of patients with Bell palsy and is important to prevent permanent contractures of the paralyzed facial muscles. A physiotherapy technique includes electrical stimulation and mime therapy to help in restoring lost muscle functions. Also, sensory exercises include varied normality solutions administered. This study aimed to find the effects of mime therapy with sensory exercises on facial symmetry and functional abilities among Bell palsy patients.

Methods: A total number of 30 participants were recruited for an interventional study and conveniently assigned into three groups (n=10), where group A received electrical stimulation with facial exercises, group B received electrical stimulation with mime therapy, and group C received a combination of electrical stimulation, mime therapy, and sensory exercises. Each group received 18 sessions; each session was for 60 minutes per day, six days per week, for three weeks. Then, all the participants were assessed using the Sunnybrook facial grading system and the facial disability index.

Results: Intragroup analysis showed a significant difference within all three groups (P<0.05). Besides, the intergroup comparison showed maximum recovery in group C followed by groups B and A.

Conclusion: A combination of mime therapy and electrical stimulation along with sensory exercises provides the most beneficial intervention to improve facial function and reduce facial synkinesis in Bell palsy individuals. Hence, sensory exercises are recommended as an adjunct to electrical stimulation and mime therapy for the line of treatment for individuals with Bell palsy.

Keywords: Bell's palsy, Electrical stimulation, Sensory exercises, Mime therapy
Introduction

Bell palsy is a sudden lower motor neuron paralysis of the facial nerve and results in an asymmetry in the corner of the mouth, inability to close the eye, disappearance of the nasolabial fold, and loss of the wrinkling of the skin of the forehead on the same side [1]. The annual incidence of Bell palsy is 15 to 30 per 100 000 population with no annual variation [2]. Seasonal differences in the incidence were noted with fewer cases during summer [3]. In 2016, the incidence rate of Bell palsy was 107 per 100,000 population. It was slightly but not significantly higher among women and rural communities. Besides, the highest age-specific rate was 40 to 49 years of age. Unilateral facial palsy accounts for 60% to 70% of all peripheral nerve damage cases [4, 5].

The patients develop unilateral facial weakness, numbness or pain around the ear, eyelid closure resulting in dry eyes, reduction in the taste, and hypersensitivity to sound within three days. Symptoms typically peak from 1 to 2 weeks and then gradually resolve over three weeks to three months or more [6-8]. A comparative study proved that electrical stimulation is more effective in improving functional facial exercises, compared with hot packs [9]. Electrotherapeutic modalities include electrical stimulation, electromyography feedback, ultrasound, laser, and short-wave diathermy [10, 11]. Besides, mime therapy was created to help patients who experience limited or restricted facial movement or the loss of facial muscle control [12]. Mime therapy is a combination of mime and physiotherapy and aims to promote the symmetry of the face at rest and control synkinesis during movement [13]. Studies showed that mime therapy improved facial symmetry and functions more than conventional therapy and home exercise programs, in people with acute Bell palsy [12-15].

Various sensory stimuli like warm liquids help in relaxing the oral musculature, whereas sweet or sour stimuli stimulate salivary glands. According to the Rood approach, the varied intensity of stimuli can gauge to facilitate the Central Nervous System (CNS) response through special senses [16-18]. Gustatory stimuli refer to a chemical capability of activating taste cells. Several references have shown that different sensory stimuli like salt, lemon, coffee, etc. activate gustatory stimuli that help in improving facial blood circulation [19].

Different taste sensory stimuli with specific concentrations can also cause different facial expressions in an individual. Our study approach focuses on the comparison of effectiveness between conventional therapy, mime therapy, and sensory reeducation. Studies related to a particular topic of interest have been negligible in India. There is a need for literature that provides us with evidence for certain interventions that lead to improvement in the facial symmetry, expressions, and response to stimuli post-facial nerve palsy. A small number of studies have been performed on these domains, hence, this study aims to examine the effectiveness of mime therapy with sensory exercises and conventional therapy on facial symmetry and functional abilities in Bell palsy patients.

Materials and Methods

Ethical approval was obtained for the interventional study from the institutional ethical review board committee (N-EC/2019/SC/04/69). Also, each participant signed a written informed consent before the commencement of the comparative experimental study.

The sample size with 10 people in each group was calculated using the G×Power software, keeping the confidence level of 95% and error of 5%. Initially, 78 participants were screened for Bell palsy condition from three tertiary care health setups, and 36 participants met the inclusion and exclusion criteria. However, six participants were denied due to the unavailability of a transport facil-
ity. Thus, 30 participants with Bell palsy were recruited from the outpatient and inpatient departments of two tertiary health care setups in Navi Mumbai, India. Participants were assigned into three treatment groups (n=10) using the simple random lottery method. At the treatment phase, group A received electrical stimulation with conventional therapy, group B received electrical stimulation with mime therapy, and group C received electrical stimulation with mime therapy and sensory exercises.

The inclusion criteria were the diagnosed acute cases of unilateral Bell palsy, the age range of 18 to 59 years, all genders, and intact taste sensation. Whereas the chronic Bell palsy duration of more than three months, upper motor neuron lesion facial palsy, dental metal prosthesis, and uncooperative participants were excluded.

**Intervention**

All the participants were assessed on days 1 and 18, using the Sunnybrook facial grading system and the facial disability index by a principal investigator who was blinded to the participant treatment allocation curve. The facial disability index included a self-reported questionnaire, whereas the Sunnybrook facial grading system was assessed by the principal investigator. Each session was held for 60 minutes per day, six days per week, for three weeks. Procedures were explained before the protocol and delivered by the second investigator. All three groups received electrical stimulation in common.

**Group A** participants received electrical stimulation with conventional therapy.

Electrical stimulation: All protective and precautionary measures were taken care of before electrical stimulation. Before starting electrical stimulation as treatment, we plotted the strength-duration curve, which helped us to decide on the stimulation intensity of the interrupted galvanic current. The conductive carbon-impregnated silicon rubber type of electrode with spreadable conductive jelly was applied over the cervical area (C7). Pen-electrode was used to stimulate the different motor points of facial muscles. After treatment, the gel was washed off from the electrode so that it was used for the next time [20-24]. The interrupted galvanic current was used at 100 ms of pulses duration, and intensity was increased to evoke muscle contraction; three sets of 30 minimal contractions were given [25]. The following muscles motor points were stimulated; frontalis, corrugator supercilii, orbicularis oculi, nasalis, risorius, orbicularis oris, the depressors of the lower lip, and the elevators of the upper lip. Then, conventional facial exercises were performed in front of a mirror and included (1) passive raising an eyebrow; (2) passively eyebrows to be bought closer to each other; (3) passive opening and closing the eyes; (4) passive mouth blowing movement; and (5) passive smiling for 10 repetitions, three times a day [6].

**Group B** participants received electrical stimulation with mime therapy. The electrical stimulation protocol remained the same. Mime therapy exercises were performed in front of a mirror. To begin with, the effleurage and kneading massage technique was applied over the entire face and neck daily, followed by the passive stretching exercise of the affected side. The last exercises included varied forms of expressions like surprise, sad, happy, anger, etc, which was followed by eye and lip closure exercises, lip movements on vocal with variations in amplitude and speed [13].

**Group C** participants received electrical stimulation with mime therapy and sensory exercises. Electrical stimulation and mime therapy protocol remained the same. To start with the sensory exercise, patients were instructed about the exercise like administration of few drops of prepared solution, and participants were free to react to it. Later, they were rinsed with water after every administration of the 0-solution. Three strong solutions were prepared to outburst the taste buds, including bitter (coffee), sour (lemon), and salty (common salt). The solution was administered using a dropper of 1 ml over the protruded tongue of patients. Patients have to taste and swallow and respond openly according to the solution administered. These exercises were given after the completion of mime therapy. All three solutions were administered randomly, and facial responses were noted. All three groups received 18 sessions of therapy protocol. Moreover, every third session group C received sensory exercise (a total of six sessions). Each session included the administration of three solutions in random order.

**Outcome measures**

**Sunnybrook Facial Grading System (SFGS):** Facial symmetry was measured using the 13-item SFGS. The system includes three components: (1) resting symmetry, (2) the symmetry of voluntary movements, and (3) synkinesis [13, 14]. The SFGS has high reliability and repeatability which is good to excellent [20, 21]. The variability of SFGS composite scores was the greatest and predominately seen during the voluntary movement of eyebrow-raising and lip-puckering [22].

**Facial Disability Index (FDI):** The FDI helps to measure the difficulties of the face in activities of daily living,
such as eating, drinking, and communicating. It represents the relationship between impairments, disability, and psychosocial status and also focuses on the disability of individuals with disorders of the facial motor system [26].

Statistical analysis

The obtained data were analyzed using the SPSS v. 24. First, the normality of the data was computed using the Shapiro-Wilk test. For normally distributed data, the paired t test was carried out and for data that did not follow a normal distribution, the Wilcoxon signed-rank test was used for analysis. The significance level was considered as 0.05.

Results

There were 30 Bell palsy patients, including 11 males and 19 females who were enrolled in the study. Besides, 17 patients had left side affected and 13 had right side affected; all patients completed 18 therapy sessions (Table 1).

The intragroup pre-post comparison of electrical stimulation with conventional therapy showed statistically significant improvements in FDI physical component (Mean±SD diff: 23.55±2.5; t=-6.28; and P=0.001), SFGS resting symmetry (Mean±SD diff: 6±3.76; t=3.67; and P=0.001), SFGS voluntary movement (Mean±SD diff: 43.8±6.65; t=10.84; and P=0.05), and SFGS composite score (Mean±SD diff: 51±8.8; t=10.16; and P=0.001) (Table 2).

The intragroup pre-post comparison of electrical stimulation with mime therapy showed statistically significant improvements in FDI physical component (Mean±SD diff: 25.3±5.48; t=-6.14; and P=0.001), FDI social component (Mean±SD diff: 1.2±1; t=-1.15; and P=0.02), SFGS resting symmetry (Mean±SD diff: 11±0.23; t=8.82; and P=0.001), SFGS voluntary movement (Mean±SD diff: 50.4±15.14; t=8.20; and P=0.05), and SFGS composite score (Mean±SD diff: 61.4±16.24; t=9.19; and P=0.001) (Table 3).

The intragroup pre-post comparison of electrical stimulation with mime therapy and sensory exercise showed statistically significant improvements in FDI physical component (Mean±SD diff: 24.5±2.9; t=-2.39; and P=0.04), FDI social component (Mean±SD diff: 5.6±3.69; t=-2.94; and P=0.01), SFGS resting symmetry (Mean±SD diff: 6.5±0.38; t=2.51, and P=0.03), SFGS voluntary movement (Mean±SD diff: 44±5.35; t=3.74; and P=0.001), and SFGS composite score (Mean±SD diff: 50.5±5.7; t=3.57; P=0.001) (Table 4).

The intragroup pre-post comparison of electrical stimulation with mime therapy and sensory exercise showed statistically significant improvements in FDI physical component (Mean±SD diff: 24.5±2.9; t=-2.39; and P=0.04), FDI social component (Mean±SD diff: 5.6±3.69; t=-2.94; and P=0.01), SFGS resting symmetry (Mean±SD diff: 6.5±0.38; t=2.51, and P=0.03), SFGS voluntary movement (Mean±SD diff: 44±5.35; t=3.74; and P=0.001), and SFGS composite score (Mean±SD diff: 50.5±5.7; t=3.57; P=0.001) (Table 4).

Intergroup analysis showed statistically significant improvements between groups in FDI physical component (x=10.408 and P=0.005), FDI social component (F=10.015 and P=0.001), SFGS resting symmetry (F=2.36 and P=0.051), SFGS voluntary movement (F=13.49 and P=0.0001), and composite score (F=11.70 and P=0.0001) (Table 5).

Furthermore, post hoc tests showed a statistical difference among all three groups: group A (electrical stimulation with conventional therapy), group B (electrical stimulation with mime therapy), and group C (electrical stimulation with mime therapy and sensory exercise). Compared with other groups, group B showed a significant difference in the FDI social

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Table 1. Demographic data of the patients

| Variables                      | Group A | Group B | Group C |
|-------------------------------|---------|---------|---------|
| Age, years (Mean±SD)          | 39.2±8.21 | 32.5±9.21 | 34.5±10.99 |
| Duration, days (Mean±SD)      | 26.5±3.59 | 27.9±3.24 | 27.9±3.81 |
| Gender (No.)                  | Male (11) | 4 | 4 | 3 |
|                               | Female (19) | 6 | 6 | 7 |
| Total (30)                    | 10 | 10 | 10 |
| Clinical attribute:           |         |         |         |
| Affected side (No.)           | Left (17) | 3 | 6 | 8 |
|                               | Right (13) | 7 | 4 | 2 |
| Total session completed (No.) | 18 | 18 | 18 |

SD: Standard deviation; * Group A: Electrical stimulation with conventional therapy; ** Group B: Electrical stimulation with mime therapy; *** Group C: Electrical stimulation with mime therapy and sensory exercise.
Table 2. Intragroup comparison of FDI and SFGS scores of patients in group A

| Group A                  | Pre  | Post  | Mean Diff±SD | T      | P      |
|-------------------------|------|-------|--------------|--------|--------|
| FDI: Physical component | 78.75±19.44 | 102.30±16.84 | 23.55±2.5 | -6.28 | 0.0001 |
| FDI: Social component   | 46.80±13.20 | 47.60±17.32  | 0.8±4.12   | -0.09 | 0.92   |
| SFGS: Resting symmetry  | 14.00±2.10 | 8.00±5.86    | 6±3.76     | 3.67  | 0.0001 |
| SFGS: Symmetry of voluntary movement | 27.60±9.32 | 71.20±15.97  | 43.6±6.65  | -10.84| 0.0001 |
| SFGS: Composite score   | 13.60±10.49 | 65.20±19.29  | 51±8.8     | -10.16| 0.0001 |

*The values are reported as Mean±SD.

Table 3. Intragroup comparison of FDI and SFGS scores of patients in Group B

| Group B                   | Pre  | Post  | Mean Diff±SD | T      | P      |
|--------------------------|------|-------|--------------|--------|--------|
| FDI: Physical component  | 75.90±14.15 | 101.20±8.67 | 25.3±5.48   | -6.14 | 0.0001 |
| FDI: Social component    | 37.60±3.86  | 38.80±4.23 | 1.2±1.0     | -1.15 | 0.02   |
| SFGS: Resting symmetry   | 12.50±3.53 | 86.10±11.58 | 73.6±10.23  | 8.82  | 0.0001 |
| SFGS: Symmetry of voluntary movement | 37.20±25.01 | 87.60±9.87  | 50.4±15.14  | -8.20 | 0.0001 |
| SFGS: Composite score    | 37.60±3.86 | 86.10±11.58 | 61.4±16.24  | -9.19 | 0.0001 |

*The values are reported as Mean±SD.

Table 4. Intragroup comparison of FDI and SFGS scores of patients in group C

| Group C                   | Pre  | Post  | Mean Diff±SD | T      | P      |
|---------------------------|------|-------|--------------|--------|--------|
| FDI: Physical component   | 78.65±23.91 | 103.00±23.62 | 24.3±2.9   | -2.39 | 0.04   |
| FDI: Social component     | 35.60±6.38 | 41.20±2.69  | 5.6±3.69    | -2.94 | 0.01   |
| SFGS: Resting symmetry    | 10.50±4.97 | 4.00±4.59   | 6.5±0.38    | 2.51  | 0.03   |
| SFGS: Symmetry of voluntary movement | 36.40±21.61 | 80.40±16.26 | 44±5.35    | -3.74 | 0.0001 |
| SFGS: Composite score     | 25.90±25.80 | 76.40±20.01 | 50.5±5.7   | -3.57 | 0.0001 |

*The values are reported as Mean±SD.
component and all three domains of SFGS, compared with groups B and A (Table 6).

**Discussion**

The present study aimed to evaluate the effectiveness of mime therapy with conventional therapy and sensory exercises on facial symmetry and functional abilities among Bell palsy patients. The improvement in group A participants who received electrical stimulation with conventional therapy could be because whenever external electrical stimulus excites the axon at a given point between the motor neuron and the muscle, a pair of action potentials are produced and travel in both the orthodromic and antidromic directions producing muscle contraction, thereby, decreasing muscle atrophy and improving muscle force [27, 28]. Electrical stimulation with appropriate parameters causes metabolic and mechanical changes in the motor units of the muscles [29] and gives rise to muscle contractions by the depolarization of nerve fibers that influence muscle activation, the prevention of atrophy, and retraining. When a pathology of facial muscles exists, electrically induced excitation of the sensory fibers of the trigeminal nerve afferent fiber facilitates adaptation of denervated facial nerve motor fibers. Reinnervation through both trigeminal nerve adap-

Table 5. Intergroup analysis on FDI and SFGS using ANOVA and Kruskal-Wallis Tests between group A, group B, and group C

| Outcome Variables                      | Mean±SD       | X/F     | P       |
|----------------------------------------|---------------|---------|---------|
| Difference FDI: Physical component     | 24.43±5.38    | 10.408* | 0.0001  |
| Difference FDI: Social component       | 2.53±0.99     | 10.015  | 0.0001  |
| Difference SFGS: Resting symmetry      | 7.83±0.73     | 13.490  | 0.0001  |
| Difference SFGS: Symmetry of voluntary movement | 46.06±0.81   | 2.362   | 0.05    |
| Difference SFGS: Composite score       | 54.3±4.17     | 11.700  | 0.0001  |

*X value.

Table 6. Intergroup comparison of FDI and SFGS using Post Hoc Test between group A, group B, and group C

| Outcome Variables                      | Groups Mean±SD | P   |
|----------------------------------------|----------------|-----|
| Difference FDI: Physical component     | Group A Group B | -9.21±11.81 | 0.05 |
|                                        | Group C Group B | 15.46±11.81 | 0.03 |
|                                        | Group C Group C | 24.67±11.81 | 0.04 |
| Difference FDI: Social component       | Group A Group B | -0.20±0.54  | 0.02 |
|                                        | Group C Group B | 2.00±0.54   | 0.0001 |
|                                        | Group C Group C | 2.20±0.54   | 0.0001 |
| Difference SFGS: Resting symmetry      | Group A Group B | 1.00±0.58   | 0.02 |
|                                        | Group C Group B | 3.00±0.58   | 0.0001 |
|                                        | Group C Group C | 2.00±0.58   | 0.0001 |
| Difference SFGS: Symmetry of voluntary movement | Group A Group C | 0.30±0.42   | 0.05 |
|                                        | Group C Group C | 1.00±0.42   | 0.04 |
|                                        | Group B Group C | 0.70±0.42   | 0.05 |
| Difference SFGS: Composite score       | Group A Group C | -17.49±5.67 | 0.01 |
|                                        | Group C Group B | 9.56±5.67   | 0.02 |
|                                        | Group B Group C | 27.05±5.67  | 0.0001 |

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tation and facial nerve adaptation increases the potential of the patient to generate more volitional muscle force and shorten motor conduction latency. A similar result was obtained by Targan et al. where long-term electrical stimulation showed good motor recovery and the improvement of clinical residuals in patients with unresolved facial nerve palsy.

Facial conventional exercises like smiling, frowning, etc are the passive facilitatory type of exercises that helps in regaining and restoring lost muscle function by performing all facial activities of daily living multiple times. The voluntary activation of facial muscles with passive facilitation when performed in front of a mirror improves facial muscles’ function by the principle of feedback knowledge of performance and result. Similar results were obtained by Bulstrode et al. who stated that conventional exercise helps in improving facial symmetry and muscle function in chronic Bell palsy patients [30].

The improvement in group B participants who received mime therapy along with electrical stimulation could be because that mime therapy involves facial massage, stretching, and mime exercises, which are based on expressions like happy, sad, angry, surprise, etc, which are a part of an individual’s daily routine with regards to facial activities. These exercises help in facial rehabilitation that illustrates neural plasticity of the facial neuromotor system where new roles are adopted by diminishing abnormal movement patterns and reestablishing symmetrical muscle activity control for intended facial actions [31]. Few studies indicate that mime therapy reduces facial asymmetry both at rest and during voluntary movements, thereby, reducing synkinesis [32]. Also, mime exercises are associated with emotional control that is interlinked with the activation of the thalamus, globus pallidus, and reticular system. Whenever these exercises are performed, they activate the reticular system that adds to the muscle control, thereby, reduce synkinesis [33]. Performing these facial exercises causes a constant increase in muscle tension followed by bilateral relaxation that improves facial circulation [12, 19] and also coordination between the two halves of the face, which enables them to display facial movements and emotions in a symmetrical form [12].

The improvement in group C patients who received sensory exercise along with mime therapy and electrical stimulation could be because of the application of the gustatory chemical stimulus. The quality of the solution activates taste receptors that activate brainstem gustatory reflex that assesses the hedonics values and results in facial motor coordinated contraction response. Common motor coordinated contraction responses seen were as follows: salty solution led to the uplift of the eyebrow, slight closure of eye, pursue of lips, and budging of cheeks. The sour solution caused the frowning of the eyebrow, tight closure of the eye, tight jaw muscles, and smacking of lips. Whereas the bitter solution led to the popping of eyes, tugging of the chin, and after swallowing widening on oral musculature with flat and protruded out tongue. Studies have shown that varied taste stimuli causing an increase in facial blood flow was controlled by the adrenergic vasoconstrictor nerve; this goes in hand with our study as flushing response appreciated when solutions were applied [34]. For example, bitter tea causes vasoconstriction in the nose, the mechanism of which is explained in terms of the nose’s high quantities of arteriovenous anastomoses controlled by adrenergic vasconstrictor nerves. Previous studies have also noted sympathetic vasoconstrictor activity in the forehead and cheek [35]. Besides, sour and salty stimuli could increase skin blood flow via the parasympathetic vasodilator reflex.

At the time of intergroup analysis, there was a significant improvement in group C, followed by group B and group A. This could be because electrical stimulation and its therapeutic effects remain the same for the three groups. In addition, the other two groups received mime therapy, which helped in restoring facial function and facial activities of daily living as it is associated with the emotional center of the central nervous system. To add on, group C also received sensory exercise that activated brainstem gustatory reflex resulting in reflexive facial motor coordinated response, that enhanced symmetrical facial expressions. Also, these exercises as based on taste receptor which is more associated with the emotional center of the brain, thereby, maximize facial movements and coordination. Our study did not consider a pharmacological treatment, which is a limitation of the study.

**Conclusion**

The present study concluded that all three treatment protocols showed significant improvement in facial muscle function and recovery. However, a combination of mime therapy and electrical stimulation along with sensory exercises showed maximum benefit to improve facial function and reduce facial synkinesis in Bell palsy individuals. Hence, sensory exercises are recommended as an adjunct to electrical stimulation and mime therapy for the line of treatment for individuals with Bell palsy.
Ethical Considerations

Compliance with ethical guidelines

Ethical approval was obtained from the Institutional Ethical Review Board Committee (N-EC/2019/SC/04/69). Also, each participant signed a written informed consent before the commencement of the comparative experimental study.

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Authors’ contributions

Conceptualization, supervision, methodology: Siddharth S Mishra; Data collection, investigation, writing- original draft, funding acquisition, resources: Both authors.

Conflict of interest

The authors declared no conflict of interests.

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مقاله پژوهشی
بررسی تأثیر مایم تراپی و تمرینات حسی بر بهبودی عملکردی بیماران دارای فلج پاز

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مقدمه
فلج پاز یکی از انواع اختلالات نورون محرکه تحتانی است که به ضعف یک طرفه و حاد عضلات صورت نشان می‌دهد. فیزیوتراپی می‌تواند در پیشگیری از محدودیت حرکتی و بهبود عملکرد بیمار موثر باشد. هدف از مطالعه حاضر بررسی تأثیر مایم تراپی و تمرینات حسی بر بهبودی عملکردی بیماران دارای فلج پاز است.

مواد و روش‌ها
تعداد 30 نفر حضور داشتند. گروه اول تحریک الکتریکی به همراه تمرینات حسیی و گروه دوم تحریک الکتریکی و تمرینات حسیی و گروه سوم ترکیب هر دو روش را دریافت کردند. هر گروه در طی سه ماه و نیم در مرکز مطالعه در دو مرحله تمرینی به مدت هفته‌ای تمرینات صورت داشتند. از سیستم درجه‌بندی صورت 6 دقیقه، 60 جلسه برای ارزیابی ناتوانی صورت استفاده گردید.

نتایج و نتیجه‌گیری
یافته‌ها بین گروه‌های مختلف متفاوت بودند و بیشترین بهبودی در گروه سوم پیدا شد. ترکیب مایم تراپی و تحریک الکتریکی و تمرینات حسی موثرترین روش بود که بهبود عملکرد صورت را بهبودی می‌داد. 

کلیدواژه‌ها:
فلج پاز، مایم تراپی، تحریک الکتریکی، تمرینات حسی

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