Effectiveness of a Structured Home-Based Facial Muscle Exercise Program in Patients with Bell's Palsy: A Randomized Controlled Trial

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Abstract

Objective: To evaluate the effectiveness of a structured home-based facial muscle exercise program incorporating mime therapy and the Kabat technique, supported by a logbook, in patients with Bell's palsy receiving weekly remote monitoring.

Materials and Methods: An assessor-blinded randomized controlled trial was conducted in 60 patients with acute Bell's palsy (House-Brackmann, HB grade 4-6 at entry), block-randomized into a control group (30 patients) or an experimental group (30 patients). All participants had received standard medical treatment, primarily oral corticosteroids, before randomization; this background treatment was therefore comparable between groups. The median time from symptom onset to enrollment (12.0 versus 11.5 days, p=0.941) and baseline severity (median HB grade 5 versus 4, p=0.124) were similar. All participants received facial muscle electrical stimulation as part of standard physiotherapy twice weekly for five weeks. The control group performed a standard facial muscle exercise program; the experimental group received a logbook containing a structured program. Both groups received the same weekly remote monitoring via the LINE application. Facial function was assessed at baseline and three months using the Sunnybrook Facial Grading System (SFGS), HB Scale, and Facial Disability Index (FDI). Satisfaction was assessed in the experimental group using a 6-point Likert scale.

Results: Both groups improved significantly (p<0.001). At three months, the experimental group showed greater improvement: SFGS adjusted mean difference 10.58 (95% CI 1.29 to 19.87, p=0.026) and FDI adjusted mean difference 13.77 (95% CI 5.68 to 21.86, p=0.001). Median HB grade was 1 versus 2 (p<0.001), and recovery to HB grade I-II was 100% versus 70% (p=0.002). Satisfaction was high (5.92±0.22).

Conclusion: The structured program enhanced short-term recovery beyond the standard program at three months; longer-term outcomes remain to be determined.

Keywords: Bell's palsy; Facial paralysis; Home-based exercise; Mime therapy; Kabat technique; Remote monitoring

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Peripheral facial palsy arising from lower motor neuron lesions is caused by dysfunction of the seventh cranial nerve, resulting in ipsilateral weakness or paralysis of the facial musculature. Its development may be attributed to several triggers, ranging from spontaneous idiopathic sources and systemic infections to tumors and traumatic events. Approximately 80% of cases are idiopathic, referred to as Bell's palsy. The global incidence is reported at 11-40 per 100,000 persons per year, most often in individuals aged 15-50 years, with no sex difference. Pregnant women have a threefold higher risk compared with non-pregnant women. Other risk factors include respiratory tract infections, diabetes mellitus, and hypothyroidism[1-5].

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What is already known about this topic?

Standard physical therapy and home exercises are commonly prescribed for patients with Bell's palsy to promote facial nerve recovery. However, patients often struggle with poor adherence and difficulty maintaining correct and appropriate exercise techniques at home, leading to suboptimal outcomes.

What does this study add?

This study demonstrates that a structured home-based facial muscle exercise program integrating mime therapy and the Kabat technique, supported by a daily self-monitoring logbook, significantly enhances facial motor recovery and reduces disability compared with a standard home-based facial muscle exercise program in patients with Bell's palsy, when both programs were supported by the same weekly remote monitoring.

Facial palsy not only causes weakness of facial muscles but also impairs daily life functions, such as drinking, chewing, swallowing, expressing emotions, and social interactions. These deficits reduce patients' self-image, confidence, and overall quality of life[6-8].

Current clinical practice guidelines strongly recommend oral corticosteroids initiated within 72 hours of symptom onset as the mainstay of acute medical management for Bell's palsy in patients aged 16 years and older[2,9]. However, no clear recommendation is made regarding physical therapy, reflecting the limited evidence base for facial rehabilitation despite its widespread use. Facial rehabilitation through facial exercises is an established method to restore facial muscle function by improving voluntary control, normalizing facial proportions during both rest and voluntary action, as well as decreasing synkinesis and muscle stiffness. This enables patients to better control facial functions and emotional expression. Interventions such as mime therapy, which includes facial massage, breathing for relaxation, coordination training to reduce synkinesis, eyelid and lip closure practice, and facial expression exercises and the Kabat technique, a form of proprioceptive neuromuscular facilitation (PNF), have been shown to improve outcomes[5,10-18]. Furthermore, a recent meta-analysis strongly supports the overall clinical benefits of physical therapy for peripheral facial palsy[19]. However, regarding the Kabat technique specifically, a recent systematic review highlighted that the existing evidence remains of very low certainty due to the methodological limitations of previous trials, emphasizing the need for more rigorous studies[20]. Despite these methodological gaps, it is widely recognized that the early initiation of targeted facial rehabilitation during the acute phase is crucial for maximizing functional recovery and minimizing long-term complications[21,22].

Patients face barriers to frequent in-person visits, such as travel distance, time constraints, and limited clinic capacity. Therefore, a structured home program supported by remote follow-up may improve adherence and outcomes[23]. Patients living in remote areas, with demanding jobs, or lacking awareness of the importance of exercise were at high risk of poor adherence[24]. As a result, many patients missed follow-up and failed to receive appropriate treatment, leading to complications and reduced quality of life.

To address these challenges, we developed a structured home-based facial muscle exercise program for Bell's palsy, integrating mime therapy and the Kabat technique, supported by a facial exercise logbook. This study compared its effectiveness with a standard home-based facial muscle exercise program, with both groups receiving the same weekly remote monitoring.

Materials and Methods

Trial Design and Setting

This study was an assessor-blinded, parallel-group randomized controlled trial conducted at the Physiotherapy Department, Neurological Institute of Thailand. The study protocol was approved by the Institutional Review Board of the Neurological Institute of Thailand (048/2023, 14 September 2023). Participants were recruited between September 2023 and September 2025.

Participants

Eligible participants were outpatients referred for facial rehabilitation after receiving standard medical therapy for acute Bell's palsy, which primarily consisted of a prescribed course of oral corticosteroids by the neurologists at the Neurological Institute of Thailand, consistent with current clinical practice guidelines[2,9]. Because this standard medical management was provided to all participants as part of routine care before enrollment and before randomization, it was comparable between the two groups.

Inclusion criteria were: 1) age 18-80 years, 2) first-time diagnosis of Bell's palsy by a physician within 30 days of symptom onset, 3) House-Brackmann (HB) grade 4-6, 4) ability to attend standard physiotherapy sessions twice weekly for five consecutive weeks as an outpatient, 5) ability to follow therapist instructions for home facial exercises, and 6) no other neurological disorders affecting communication.

Exclusion criteria were facial palsy due to causes other than idiopathic Bell's palsy (e.g., tumor, infection, or trauma), inability to use the LINE mobile application via smartphone, and inability to perform or manage home facial exercises independently. Written informed consent was obtained from all participants.

After trial commencement, the inclusion criteria were amended on November 21, 2024, expanding the upper age limit from 60 to 80 years. This modification was made to better reflect the actual demographics of the patient population presenting at the clinic, as older adults constituted a substantial proportion of the cases (approximately 32% of the enrolled participants were aged over 60 years). Specifically, 24 participants were enrolled under the original protocol, and 36 participants were enrolled after the amendment. Permuted block randomization with a block size of 4 was strictly maintained before and after the amendment, and baseline characteristics, including age, did not differ

Table 1. Baseline characteristics of participants

Characteristic	Experimental (n=30)	Control (n=30)	Statistic	p-value
Age (years); mean±SD	47.63±16.76	52.47±17.46		0.278
Age group; n (%)			χ^2=0.84	0.657
≤30 years	7 (23.3)	5 (16.7)		
31-60 years	15 (50.0)	14 (46.7)		
>60 years	8 (26.7)	11 (36.7)		
Sex; n (%)			χ^2=1.07	0.302
Male	17 (56.7)	13 (43.3)		
Female	13 (43.3)	17 (56.7)		
Side of palsy; n (%)			χ^2=0.27	0.602
Left	18 (60.0)	16 (53.3)		
Right	12 (40.0)	14 (46.7)		
Time from onset to enrollment (days); median (Q1, Q3)	12.00 (6.00, 20.25)	11.50 (6.50, 20.00)	Z=−0.074	0.941
Baseline HB severity; median [IQR]	5 [1]	4 [1]	Z=−1.540	0.124
Severity group; n (%)			χ^2=2.41	0.121
Grade III-IV	11 (36.7)	17 (56.7)		
Grade V-VI	19 (63.3)	13 (43.3)		
Received oral corticosteroids before enrollment; n (%)	30 (100)	30 (100)	-	-
Comorbidities, n (%)				
Hypertension	8 (26.7)	10 (33.3)	χ^2=0.317	0.573
Diabetes mellitus	8 (26.7)	6 (20.0)	χ^2=0.373	0.542
Dyslipidemia	7 (23.3)	7 (23.3)	χ^2=0.000	1.000

SD=standard deviation; Q1=first quartile; Q3=third quartile; IQR=interquartile range; HB=House-Brackmann

All randomized participants completed the study and were included in the analysis (intention-to-treat population). Mean age was compared using the independent t-test; categorical variables were compared using the chi-square test; the time from onset to enrollment and the baseline HB grade were compared using the Mann-Whitney U test. Participants may have had more than one comorbidity, so the numbers do not sum to the group total. No between-group test was performed for corticosteroid treatment because all participants received it.

significantly between the two groups (Table 1).

Sample size

The sample size was calculated a priori based on previous research (α=0.05, power=0.80). A total of 60 participants were required and were randomized in a 1:1 ratio to the control group (30 participants) or the experimental group (30 participants).

Randomization

The random allocation sequence was generated by an independent researcher using computer-based block randomization with a block size of four.

Allocation Concealment and Implementation

The allocation sequence was stored in a computer system and revealed only after participants met eligibility criteria and were formally enrolled. Participants were enrolled by the principal investigator, who screened eligibility and obtained written informed consent. Group assignments were implemented by an independent coordinator who was separate from both the treating therapist and the outcome assessor, thereby ensuring allocation concealment until interventions were assigned.

Blinding

Outcome assessments were performed by an independent assessor who remained blinded to group allocation throughout the study. Treating therapists were not blinded due to the nature of the interventions. To reduce differential attention, both groups received weekly remote monitoring via the LINE application; however, participant blinding could not be ensured because the experimental group received an exercise logbook whereas the control group received a leaflet.

Procedures to Minimize Contamination

To minimize contamination between groups, participants in the two groups were scheduled at different appointment times and were not seen concurrently in the clinic.

Interventions

All participants received facial muscle electrical stimulation as part of standard physiotherapy twice

weekly for five weeks. In addition, all participants were taught a home-based facial muscle exercise program individually by a physiotherapist during the first clinic visit, with a hands-on demonstration and supervised practice until correct technique was confirmed. Both groups were instructed to perform their home program twice daily, in the morning and evening, every day throughout the home exercise period of approximately three months. To standardize practice conditions, participants were advised to exercise in front of a mirror, which provided visual feedback on facial movement, with each session lasting approximately 20 minutes. Both groups therefore received the same prescribed frequency and session duration, and the programs differed in exercise content and technique rather than in the number or length of daily sessions.

- Control group: Participants received a leaflet describing a standard home-based facial muscle exercise program. This comprised facial muscle massage (circular fingertip massage with medium pressure, applied from the midface outward and from the forehead downward to the chin) and six general facial movements (eyebrow raising, eye closure, nose wrinkling, lip pursing, smiling without showing teeth, and smiling showing teeth). Each movement was performed 15-20 times per session, twice daily. No formal progression was applied.
- Experimental group: Participants received an exercise logbook containing a structured home-based facial muscle exercise program incorporating mime therapy and the Kabat technique, organized into five components performed twice daily: 1) facial muscle massage, using circular fingertip massage with medium pressure from the midface outward; 2) facial muscle activation with facilitation, in which seven movements (eyebrow raising, frowning, eye closure, nose wrinkling, smiling without and with teeth, and lip pursing) were performed 3-5 times each per muscle, with the patient manually assisting the affected side and resisting the unaffected side; 3) functional facial muscle training, including diaphragmatic breathing for relaxation, straw-bubble blowing, vowel and consonant articulation, eye closure with downward gaze, and controlled smiling, performed 5-10 times each; 4) facial expression training, practicing emotional expressions (e.g., surprise, fear, sadness, happiness) 5-10 times each; and 5) active facial muscle exercises for the recovering stage, in which seven movements were performed slowly and held for 10 seconds, 5-10 times each, with attention to avoiding synkinesis. Progression was built into the program and guided by the participant's stage of recovery: exercises began with manual facilitation, the degree of assistance was reduced as voluntary movement improved, and participants advanced to active, synkinesis-controlled exercises as facial strength approached that of the unaffected side. Participants recorded the start date and marked daily completion of the exercises in a checklist grid covering the home exercise period; the logbook served as a self-monitoring tool and was retained by participants rather than collected for analysis.

Both groups received weekly remote monitoring through a dedicated LINE Official Account ("Facial Exercise"), conducted by a research assistant who was independent of the treating therapist and the outcome assessor. A reminder message was sent every Friday at 1:00 p.m., and participants replied between 1:00 p.m. and 4:00 p.m. on the same day, on which they were not attending in-person physiotherapy. Once a participant replied, the research assistant followed up on the participant's symptoms and any difficulties encountered, for up to 20 minutes per participant. When a participant reported a change in symptoms, whether improvement or deterioration, or a problem performing the exercises, the research assistant provided individualized advice and adjusted the facial exercises to suit the participant's current stage of recovery within the same session. Communication consisted of text messages; no facial photographs or video files were requested, transmitted, or stored, and in the infrequent cases where visual assessment was necessary, a non-recorded real-time video call was used. Adherence was not measured quantitatively in either group. The logbook was used by participants for self-monitoring and was not collected for analysis, and the weekly contact allowed follow-up on symptoms and difficulties but did not track the number of exercise sessions each participant actually completed.

Outcomes

Primary outcomes were facial function and disability assessed using the Sunnybrook Facial Grading System (SFGS), HB Scale, and Facial Disability Index (FDI). A secondary outcome was patient satisfaction with the home exercise program in the experimental group, assessed at three months using a 6-point Likert scale. The satisfaction questionnaire underwent content validity evaluation by three experts, with item-level content validity indices ranging from 0.67 to 1.00.

Statistical Analysis

Initial participant profiles were outlined using descriptive statistics. Continuous data are expressed

as mean ± standard deviation (SD) or as median with interquartile range (IQR), and categorical variables as frequencies and percentages. Normality was assessed using the Shapiro-Wilk test and equality of variances using Levene's test.

For the SFGS and FDI, within-group changes from baseline to 3 months were analyzed using paired t-tests. Between-group differences at each timepoint were assessed using independent-samples t-tests, with Welch's correction applied when the equal-variance assumption was not met. The primary between-group comparison used analysis of covariance (ANCOVA), with the 3-month score as the dependent variable, treatment group as the independent variable, and the corresponding baseline score as a covariate; homogeneity of regression slopes was verified before analysis, and adjusted mean differences with 95% confidence intervals (CIs) are reported.

The HB grade, an ordinal measure, is reported as median with IQR. Within-group changes were analyzed using the Wilcoxon signed-rank test, and between-group differences using the Mann-Whitney U test. As a clinically meaningful categorical outcome, the proportion of participants recovering to HB grade I-II at 3 months was compared between groups using Fisher's exact test.

Other categorical variables were compared using the chi-square test or Fisher's exact test as appropriate, and the time from symptom onset to enrollment using the Mann-Whitney U test. The secondary outcome (satisfaction score) was summarized descriptively using the mean and standard deviation. All tests were two-tailed, with statistical significance set at p-value less than 0.05. The ANCOVA, the non-parametric analyses of the HB grade, and the responder analysis were performed to refine the analysis in response to peer review; the originally planned between-group comparisons used t-tests. Statistical analysis was performed using IBM SPSS Statistics, version 22.0 (IBM Corp., Armonk, NY, USA). All randomized participants completed the study; therefore, no imputation for missing data was required. No interim analyses or stopping guidelines were planned due to the fixed sample size and study duration.

Results

Participant Flow

Of 92 patients assessed for eligibility, 32 were excluded: 26 did not meet the inclusion criteria (HB grade 2-3) and 6 had facial palsy from causes other than idiopathic Bell's palsy. The remaining 60 patients with acute Bell's palsy were randomly assigned to the experimental group (30 patients) or the control group (30 patients), and all received their allocated intervention. No participants were lost to follow-up or discontinued the intervention during the 3-month observation period, all 60 randomized participants were therefore included in the analysis, corresponding to an intention-to-treat population (Figure 1).

Baseline Characteristics

Baseline clinical characteristics are presented in Table 1. There were no statistically significant differences between groups in age, sex, side of palsy, or the time from symptom onset to enrollment (all $p>0.05$). The proportions of participants with underlying diseases, including hypertension, diabetes mellitus, and dyslipidemia, also did not differ significantly between groups (all $p>0.05$). These findings confirm the comparability of the two groups at baseline. Baseline outcomes were similar as well; no significant differences were observed between groups in HB grade (Table 1) or in SFGS or FDI scores (all $p>0.05$).

Primary Outcomes

Both groups demonstrated significant within-group improvements in SFGS and FDI scores from baseline to 3 months (all within-group $p<0.001$) (Table 2).

In between-group comparisons at 3 months, the experimental group showed better SFGS and FDI outcomes than the control group (Table 3). For the SFGS, 3-month scores were 93.80±11.66 in the experimental group and 83.17±22.96 in the control group. After adjusting for baseline scores, the between-group difference remained significant (ANCOVA adjusted mean difference 10.58, 95% CI 1.29 to 19.87, $p=0.026$), consistent with the unadjusted comparison (mean difference 10.63, 95% CI 1.22 to 20.04, $p=0.029$). For the FDI, 3-month scores were 190.37±11.17 versus 176.70±19.27, with a significant adjusted difference (ANCOVA adjusted mean difference 13.77, 95% CI 5.68 to 21.86, $p=0.001$, and unadjusted mean difference 13.67, 95% CI 5.53 to 21.81, $p=0.002$).

For the HB grade, an ordinal measure, both groups improved significantly from baseline to 3 months (Wilcoxon signed-rank test, both $p<0.001$). The median grade at 3 months was 1 (IQR 0) in the experimental group and 2 (IQR 2) in the control group, a significant between-group difference (Mann-Whitney U test, $Z=-3.752$, $p<0.001$) (Table 4). Recovery to HB grade I-II at 3 months was achieved by all participants in the

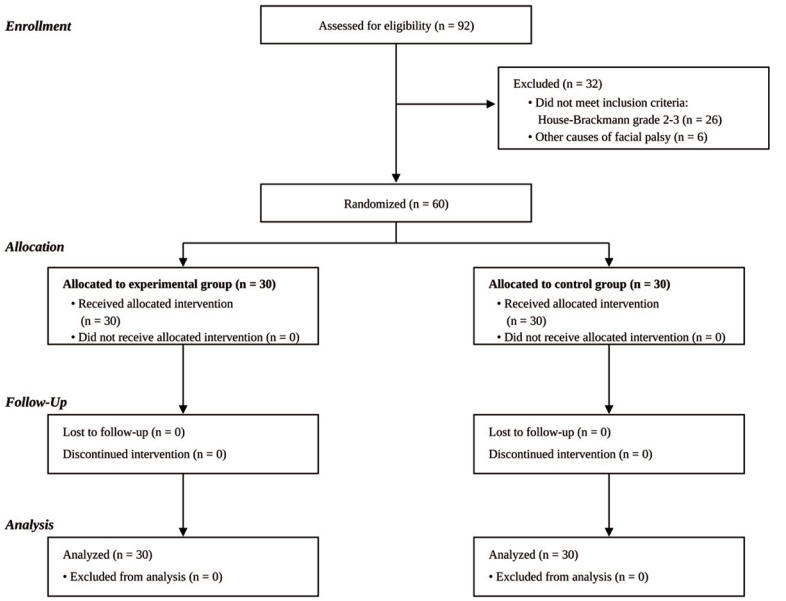

Figure 1. CONSORT flow diagram of participant progress through the trial. The diagram shows the four stages of the trial: enrollment, in which 92 patients were assessed for eligibility and 32 were excluded with reasons; allocation, in which 60 eligible patients were randomly assigned in a 1:1 ratio to the experimental group (structured home-based facial muscle exercise program) or the control group (standard home-based facial muscle exercise program), with all participants receiving their allocated intervention; follow-up, during which no participants were lost to follow-up or discontinued the intervention over the 3-month observation period; and analysis, in which all 60 randomized participants were included, corresponding to an intention-to-treat population.

Table 2. Within-group changes in SFGS and FDI from baseline to 3 months

Outcome	Group	Mean±SD		Change (95% CI)	Within-group p-value
		Baseline	3 months		
SFGS	Experimental	19.53±13.18	93.80±11.66	74.27 (68.62 to 79.92)	<0.001
	Control	19.33±14.00	83.17±22.96	63.84 (54.71 to 72.97)	<0.001
FDI (total)	Experimental	122.47±27.11	190.37±11.17	67.90 (57.25 to 78.55)	<0.001
	Control	123.67±36.74	176.70±19.27	53.03 (39.02 to 67.04)	<0.001

SFGS=Sunnybrook Facial Grading System; FDI=Facial Disability Index; SD=standard deviation; CI=confidence interval

All randomized participants completed the study and were included in the analysis (intention-to-treat population). Change is the 3-month minus baseline difference with its 95% CI. Within-group changes were analyzed using paired t-tests.

Table 3. Between-group comparison of SFGS and FDI at baseline and 3 months

Outcome	Timepoint	Mean±SD		MD (E-C) (95% CI)	Between-group p-value
		Experimental	Control		
SFGS	Baseline	19.53±13.18	19.33±14.00	0.20 (−6.79 to 7.19)	0.955
	3 months	93.80±11.66	83.17±22.96	10.63 (1.22 to 20.04)	0.029
	ANCOVA[a]			10.58 (1.29 to 19.87)	0.026
FDI (total)	Baseline	122.47±27.11	123.67±36.74	−1.20 (−17.67 to 15.27)	0.886
	3 months	190.37±11.17	176.70±19.27	13.67 (5.53 to 21.81)	0.002
	ANCOVA[a]			13.77 (5.68 to 21.86)	0.001

SFGS=Sunnybrook Facial Grading System; FDI=Facial Disability Index; SD=standard deviation; CI=confidence interval; MD=mean difference

All randomized participants completed the study and were included in the analysis (intention-to-treat population). MD (experimental minus control). Between-group p-values at each timepoint are from independent-samples t-tests, with Welch's correction applied when the equal-variance assumption was not met. (a) ANCOVA adjusted for the baseline score (SFGS: F(1,57)=5.199; FDI: F(1,57)=11.630); the adjusted mean difference and 95% CI are shown.

Table 4. House-Brackmann grade and recovery to HB grade I-II at 3 months

HB grade outcome	Experimental (n=30)	Control (n=30)	Statistic; p-value
HB grade; median (IQR)			
Baseline	5 (1)	4 (1)	p=0.124
3 months	1 (0)	2 (2)	Z=−3.752; p<0.001
Within-group change, p-value	<0.001	<0.001	
Recovery to HB grade I-II at 3 months; n (%)	30 (100)	21 (70.0)	RD 30.0%; p=0.002

HB=House-Brackmann; IQR=interquartile range; RD=risk difference

All randomized participants completed the study and were included in the analysis (intention-to-treat population). Within-group changes were analyzed using the Wilcoxon signed-rank test and between-group differences using the Mann-Whitney U test. Recovery to HB grade I-II was compared using Fisher's exact test. An odds ratio was not estimable because all experimental-group participants recovered to grade I-II.

experimental group (30/30, 100.0%) compared with 21 of 30 (70.0%) in the control group (Fisher's exact test, p=0.002, risk difference 30.0%).

Secondary Outcome

Satisfaction with the home exercise program in the experimental group was very high. The overall mean was 5.92±0.22 on a 6-point Likert scale (30 patients). Domain-specific analysis indicated the highest satisfaction in program management (5.96±0.20), followed by service provider (5.95±0.22) and content (5.87±0.38).

Adverse Events

No adverse events related to the interventions were reported in either group during the study period.

Discussion

This randomized controlled trial compared a structured home-based facial muscle exercise program with a standard home-based facial muscle exercise program in patients with Bell's palsy receiving outpatient physiotherapy. Both groups received the same standard physiotherapy and the same weekly remote monitoring, and differed only in the content of the home exercise program. Both groups improved significantly from baseline to 3 months, but the experimental group achieved significantly better outcomes at the 3-month follow-up across all three measures, indicating better facial motor recovery and lower facial disability.

For the SFGS and FDI, the between-group differences remained significant after adjusting for baseline scores using ANCOVA (adjusted mean differences of 10.58 and 13.77 points, respectively). These adjusted results were consistent with the unadjusted comparisons, indicating that the findings were robust to the analytic approach and were not attributable to baseline differences between groups. The agreement across a clinician-rated regional scale (SFGS), a global ordinal grading scale (HB), and a patient-reported measure (FDI) further strengthens the consistency of the findings.

Although a definitive minimal clinically important difference (MCID) for the SFGS has not been universally established, the observed difference of approximately 10 points is clinically meaningful. According to the correspondence analysis by Kanerva et al.[25], the span of a single HB grade corresponds to an SFGS range of approximately 20 points; an improvement of over 10 points therefore represents a meaningful shift in facial symmetry and function. This magnitude is also consistent with a recent meta-analysis by Nakano et al.[19], which reported a pooled mean difference of 12.1 points on the SFGS favoring physical therapy, and responds to their call for further well-designed randomized controlled trials.

The high 3-month SFGS scores in the experimental group (mean 93.80 on a 0-100 scale) suggest a possible ceiling effect. As many participants approached the maximum score, the scale had limited capacity to distinguish further improvement among those who recovered well, which compressed the score distribution and contributed to the unequal variances observed between groups (Levene's test, p=0.001). Mean-based comparisons may therefore underestimate the true magnitude of benefit. The responder analysis supports this interpretation: all experimental-group participants recovered to HB grade I-II, compared with 70% of the control group (p=0.002). Notably, the experimental group started from a slightly more severe baseline (median HB grade 5 versus 4) yet achieved better recovery, reinforcing the clinical benefit of the program.

Several mechanisms may help explain the superior outcomes in the experimental group, although the program was delivered as a single integrated package and the contribution of any individual component cannot be isolated in this design. First, the mime therapy component, which combines facial massage, relaxation, coordination training to reduce synkinesis,

and facial expression practice, may promote selective muscle activation and symmetry while limiting maladaptive movements. Second, the Kabat technique may enhance neuromuscular recruitment through guided movement patterns and appropriate sensory input. Third, the self-monitoring logbook may have encouraged regular self-directed practice, although adherence was not measured quantitatively in this study.

Despite these theoretical benefits, a recent systematic review by Silva et al.[20] noted that evidence supporting PNF or the Kabat technique for facial palsy remains of very low certainty, because of the poor methodological quality and small sample sizes of previous trials. Our assessor-blinded randomized design addresses this gap and provides evidence for the efficacy of a structured home program incorporating mime therapy, the Kabat technique, and a self-monitoring logbook. Weekly remote monitoring via the LINE application was provided equally to both groups; it therefore represents a balanced co-intervention rather than an explanation for the between-group difference, while helping to maintain comparable contact and reduce performance bias.

From a clinical perspective, the findings support the use of a structured home-based program with remote monitoring as a practical model for outpatient services. The program uses low-cost materials (a printed logbook and simple exercise instructions) and a widely used mobile messaging platform, which may be useful when patients cannot attend frequent in-person sessions because of distance, work constraints, or limited clinic capacity. By encouraging patients to monitor and direct their own practice, the program reflects the broader value of self-monitoring and self-regulation strategies in supporting health behaviors among patients with neurological conditions[26]. Patient satisfaction, assessed only in the experimental group, was high; this finding should be interpreted descriptively rather than as a between-group comparison, but it suggests good acceptability of the program and supports its potential implementation in routine rehabilitation services.

The 3-month follow-up in this trial captures the period of most rapid recovery but is insufficient to characterize longer-term outcomes. Synkinesis and contracture typically develop later in the course of recovery and do not reach a steady state until approximately one year after onset[27]. Although synkinesis contributes to the SFGS composite score, it was pre-specified and analyzed only as part of the composite rather than as a separate outcome; moreover, assessment at 3 months would be too early to characterize synkinesis reliably, so the extent to which the structured program influences its development remains unknown. Similarly, residual facial weakness in participants who had not fully recovered at 3 months may continue to evolve, and the FDI captured self-reported physical and psychosocial function only at this early timepoint, so the durability of the observed quality-of-life benefit cannot be established. Finally, whether participants sustained their home exercise practice after the monitored period is unknown, as adherence was not measured. Trials with follow-up of at least 6 to 12 months, with synkinesis and residual weakness assessed as distinct outcomes and adherence tracked over time, would be needed to determine whether the short-term advantages observed here are maintained.

There are several limitations of this study that should be acknowledged. First, the trial was conducted at a single center with a sample size of 60 participants, and the follow-up period was limited to 3 months; thus, the generalizability and longer-term outcomes, including synkinesis, residual facial weakness, and sustained quality-of-life benefit, remain to be evaluated. Second, a protocol amendment expanded the upper age limit from 60 to 80 years during the trial. Although older age is associated with poorer recovery in acute Bell's palsy[27], permuted block randomization (block size of 4) was maintained before and after the amendment, and baseline age did not differ significantly between groups (Table 1). Because older participants were distributed comparably across the two arms, any effect of age on recovery would apply similarly to both groups and is therefore unlikely to have biased the between-group comparison. Third, the required use of the LINE application for remote monitoring may limit the applicability of our findings to patients without smartphone access or digital literacy. Fourth, because full blinding of therapists and participants was not feasible for a physical therapy intervention, the trial was assessor-blinded. Fifth, objective neurophysiological assessments, such as electromyography, were not incorporated into the protocol. Sixth, adherence to the home exercise program was not measured quantitatively in either group; the logbook was used by participants for self-monitoring and was not collected for analysis, and the weekly remote monitoring involved symptom follow-up rather than verification of the number of sessions completed. As a result, adherence could not be compared between groups. In addition, because the experimental program combined enhanced exercise content and a self-monitoring logbook, the independent

contribution of each component could not be isolated; future trials designed to test each component separately would be needed to determine the relative effect of the exercise content and the logbook. Finally, the trial was registered retrospectively; although the study protocol and outcomes were defined a priori and approved by the ethics committee before recruitment commenced, the absence of prospective public registration is acknowledged as a limitation. Future multicenter research featuring larger sample sizes, extended follow-up durations, broader inclusion regarding technological access, objective physiological measures, quantitative adherence monitoring, and formal cost-effectiveness analyses is warranted.

Conclusion

A structured home-based facial muscle exercise program integrating mime therapy, the Kabat technique, and a self-monitoring logbook resulted in better short-term facial motor recovery and lower facial disability than a standard home-based facial muscle exercise program in patients with Bell's palsy at 3 months. Both programs were supported by the same weekly remote monitoring. This program is practical for outpatient use and may support remote follow-up in routine rehabilitation services; longer-term outcomes remain to be determined.

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Authors Contributions

All authors meet ICMJE authorship criteria. AT: Conceived and designed the study, coordinated participant enrollment, and drafted the manuscript. PK: Collected the patient satisfaction data, contributed to data interpretation, and critically revised the manuscript. CN: Performed the outcome assessments and contributed to data collection and critically revised the manuscript. NS: Delivered the home exercise program instruction and conducted weekly monitoring via LINE, and critically revised the manuscript. All authors approved the final version and are jointly accountable for all aspects of the work.

Clinical Trial Registration

This trial was registered with the Thai Clinical Trials Registry (TCTR20260327006) on 27 March 2026. Registration was completed retrospectively because the authors were not aware, at the time of study commencement, that prospective registration was required for publication. The full study protocol—including eligibility criteria, interventions, and the pre-specified primary and secondary outcomes—had been reviewed and approved by the Institutional Review Board of the Neurological Institute of Thailand (048/2023) on 14 September 2023, prior to enrolment of the first participant. The outcomes and analysis plan recorded in the registry correspond to those in the original approved protocol.

Conflicts of Interest

The authors declare no conflict of interest.

Data Availability Statement

Requests for access to the datasets produced and evaluated in this research should be directed to the corresponding author upon reasonable justification.

Ethics Approval and Consent to Participate

The study protocol was approved by the Institutional Review Board of the Neurological Institute of Thailand (Approval No. 048/2023, approved 14 September 2023) and conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants prior to participation. Participants were informed of the use of the LINE Official Account for weekly remote monitoring as part of the study procedures. To protect confidentiality, the account was administered solely by the designated research assistant, and each participant was identified only by a coded study number rather than by name. Communication consisted of text messages, and no facial photographs or video files were stored; in the infrequent cases where visual assessment was required, a non-recorded real-time video call was used. All communication records were kept confidential, were accessible only to the research team, and were managed in accordance with the IRB-approved protocol.

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Use of Artificial Intelligence

AI-assisted tools were used solely for English language editing and grammar checking during

manuscript preparation. Specifically, Gemini (Gemini 3.1 Pro, Google) was used for sentence refinement only. All scientific content, including study design, data collection, analysis, interpretation, and conclusions, was conducted exclusively by the authors. The authors take full responsibility for the integrity and originality of all content. AI tools are not listed as authors per ICMJE criteria.

References

1. Zandian A, Osiro S, Hudson R, Ali IM, Matusz P, Tubbs SR, et al. The neurologist's dilemma: A comprehensive clinical review of Bell's palsy, with emphasis on current management trends. Med Sci Monit 2014;20:83-90.
2. Eviston TJ, Croxson GR, Kennedy PG, Hadlock T, Krishnan AV. Bell's palsy: Aetiology, clinical features and multidisciplinary care. J Neurol Neurosurg Psychiatry 2015;86:1356-61.
3. Riga M, Kefalidis G, Danielides V. The role of diabetes mellitus in the clinical presentation and prognosis of Bell palsy. J Am Board Fam Med 2012;25:819-26.
4. Finsterer J. Management of peripheral facial nerve palsy. Eur Arch Otorhinolaryngol 2008;265:743-52.
5. Zhao Y, Feng G, Gao Z. Advances in diagnosis and non-surgical treatment of Bell's palsy. J Otol 2015;10:7-12.
6. Jermworapipat S, Rungsa J. Promoting quality of life: A case study of facial paralysis patient. Journal of Health and Nursing Research 2019;35:224-34.
7. Tavares-Brito J, van Veen MM, Dusseldorp JR, Bahmad F Jr, Hadlock TA. Facial palsy-specific quality of life in 920 patients: Correlation with clinician-graded severity and predicting factors. Laryngoscope 2019;129:100-4.
8. Ishii LE, Godoy A, Encarnacion CO, Byrne PJ, Boahene KD, Ishii M. What faces reveal: Impaired affect display in facial paralysis. Laryngoscope 2011;121:1138-43.
9. Baugh RF, Basura GJ, Ishii LE, Schwartz SR, Drumheller CM, Burkholder R, et al. Clinical practice guideline: Bell's palsy. Otolaryngol Head Neck Surg 2013;149(3 Suppl):S1-27.
10. Beurskens CH, Devriese PP, Van Heiningen I, Oostendorp RA. The use of mime therapy as a rehabilitation method for patients with facial nerve paresis. Int J Ther Rehabil 2004;11:206-10.
11. Pereira LM, Obara K, Dias JM, Menacho MO, Lavado EL, Cardoso JR. Facial exercise therapy for facial palsy: Systematic review and meta-analysis. Clin Rehabil 2011;25:649-58.
12. Sumathi G, Surekha K, Ramamoorthy V, Divya Bharathi V. Effectiveness of facial nerve stimulation with Kabat technique in Bell's palsy patients. Int J Res Rev 2019;6:116-20.
13. Beurskens CH, Heymans PG. Positive effects of mime therapy on sequelae of facial paralysis: stiffness, lip mobility, and social and physical aspects of facial disability. Otol Neurotol 2003;24:677-81.
14. Beurskens CH, Heymans PG. Mime therapy improves facial symmetry in people with long-term facial nerve paresis: A randomised controlled trial. Aust J Physiother 2006;52:177-83.
15. Mistry GS, Sheth MS, Vyas NJ. Comparison of the effect of mime therapy versus conventional therapy on the Sunnybrook Facial Grading System in patients with acute Bell's palsy. Int J Med Res Health Sci 2014;3:133-6.
16. Monini S, Iacolucci CM, Di Traglia M, Lazzarino AI, Barbara M. Role of Kabat rehabilitation in facial nerve palsy: A randomised study on severe cases of Bell's palsy. Acta Otorhinolaryngol Ital 2016;36:282-8.
17. Adhikari SP, Shrestha JN, Subedi M. Effectiveness of Kabat rehabilitation combined with facial expressive and functional exercises in treatment of Bell's palsy: a case study. Nepal J Neurosci. 2019;16:65-7.
18. Barbara M, Monini S, Buffoni A, Cordier A, Ronchetti F, Harguindey A, et al. Early rehabilitation of facial nerve deficit after acoustic neuroma surgery. Acta Otolaryngol 2003;123:932-5.
19. Nakano H, Fujiwara T, Tsujimoto Y, Morishima N, Kasahara T, Ameya M, et al. Physical therapy for peripheral facial palsy: A systematic review and meta-analysis. Auris Nasus Larynx 2024;51:154-60.
20. Silva MC, Oliveira MT, Azevedo-Santos IF, DeSantana JM. Effect of proprioceptive neuromuscular facilitation in the treatment of dysfunctions in facial paralysis: a systematic literature review. Braz J Phys Ther 2022;26:100454. doi: 10.1016/j.bjpt.2022.100454.
21. Boschetti CE, Lo Giudice G, Spuntarelli C, Apice C, Rauso R, Santagata M, et al. Kabat rehabilitation in facial nerve palsy after parotid gland tumor surgery: A case-control study. Diagnostics (Basel) 2022;12:565. doi: 10.3390/diagnostics12030565.
22. Somasundara D, Sullivan F. Management of Bell's palsy. Aust Prescr 2017;40:94-7.
23. Simmich J, Ross MH, Russell T. Real-time video telerehabilitation shows comparable satisfaction and similar or better attendance and adherence compared with in-person physiotherapy: A systematic review. J Physiother 2024;70:181-92.
24. Yalew ES, Melese AZ, Guadie YG, Gashaw M. Adherence to home-based exercise program and its predictors among patients treated in physiotherapy outpatient department in Amhara Region hospitals in Ethiopia: a prospective cross-sectional study. Patient Prefer Adherence 2022;16:561-72.
25. Kanerva M, Jonsson L, Berg T, Axelsson S, Stjernquist-Desatnik A, Engström M, et al. Sunnybrook and House-Brackmann systems in 5397 facial gradings. Otolaryngol Head Neck Surg 2011;144:570-4.
26. Kanyapila P, Pimthong S, Intarakamhang P, Intarakamhang U. Effectiveness of mindfulness and self-regulation program on healthcare behaviors among stroke patients: A randomized controlled trial. J Med Assoc Thai 2023;106:349-58.
27. Peitersen E. Bell's palsy: the spontaneous course of 2,500 peripheral facial nerve palsies of different etiologies. Acta Otolaryngol Suppl 2002;549:4-30.