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Stability of Benefits of Mime Therapy in Sequelae of Facial Nerve Paresis During a 1-Year Period

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Objective: To assess the stability of benefits of mime therapy, a modality of physiotherapy for patients with facial nerve paresis, during a period of 1 year.
Study Design: A prospective follow-up build on a randomized clinical trial in which a treatment group is compared with a control group.
Setting: Physiotherapy outpatient department.
Patients: Forty-eight patients with a history of a facial nerve paresis of 9 months or more.
Intervention: Mime therapy.
Method: Sequelae of facial nerve paresis were measured using the same measurement instruments as in the randomized clinical trial—the Sunnybrook and the House-Brackmann (HB) Facial Grading Systems, the lip length and pout indices, a stiffness scale, and the Facial Disability Index. Stability of outcome level and of interpatient differences is analyzed.
Results: Of the 46 patients who completed the follow-ups, repeated-measures analyses of covariance revealed no significant differences in the average scores nor significant trends of the posttherapy measurements, except for the pout index and the Facial Disability Index—social. For six sequelae (except HB), 95% of patient–sequel combinations showed immediate improvement after mime therapy, for HB grades this was 74%. Where sequelae improved, the posttherapy individual courses (T2–T3–T4) showed, also for HB, in majority absence of deterioration; benefits obtained were stable.
Conclusion: Mime therapy is effective in patients with facial nerve paresis and benefits are stable 1 year after therapy.
Key Words: Facial Asymmetry—Facial Paralysis—Facial Paresis—Long-term Stability—Physiotherapy.
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Mime therapy is a modality of physiotherapy offered in The Netherlands for more than 25 years to patients with peripheral facial nerve paresis (1,2). Mime therapy includes massages, relaxation exercises, inhibition of synkinesis, and emotional expression exercises.

It is generally thought that spontaneous recovery of the facial nerve occurs within approximately 9 months. This study concerns patients with sequelae of unilateral peripheral facial nerve paresis lasting more than 9 months.

According to the International Classification of Functioning, Disability and Health of the World Health Organization (WHO), sequelae in patients with peripheral facial nerve paresis can be described on three levels (3). On a functioning (impairment) level, the sequelae are asymmetry and stiffness of the face; on a disability level, the sequelae are problems with eating, drinking, speaking, rinsing the mouth, and lacrimation; and on a health level, the sequelae are psychosocial problems.

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In a randomized clinical trial (RCT), started at the physiotherapy outpatient department of the Radboud University Nijmegen Medical Centre and "Vrije Universiteit" Medical Centre Amsterdam in April 1999, mime therapy has been shown to be effective in reducing sequelae in patients with longstanding (more than 9 mo) facial nerve paresis (4). The RCT involved comparing two groups of 25 patients randomly assigned to receive mime therapy (treatment group) or put on a waiting list (control group). At RCT entry, House-Brackmann (HB) facial nerve grades were Grade II for 1 patient, Grade III for 14 patients, Grade IV for 19 patients, and Grade V for 16 patients. Sequelae on a functioning level concerning asymmetry were measured using the House-Brackmann Facial Nerve Grading System (HB-FGS) (5), the Sunnybrook Facial Grading System (SB-FGS) (6), the stiffness scale, and a sliding calliper (7). On a disability level, the sequelae were measured using the Facial Disability Index (FDI-physical) questionnaire, and on a health level using the social index of the FDI (FDI-social) (8). The SB-FGS, developed by Ross et al. in 1996 (6), measures three components of facial asymmetry—resting asymmetry, asymmetry in voluntary movement, and synkinesis. The SB-FGS total score is a weighted composite of these three components.

The conclusion of this RCT was that patients with sequelae of longstanding peripheral facial nerve paresis who received 10 weeks of mime therapy significantly and substantially showed more favorable scores on indices of facial asymmetry, stiffness, lip mobility, and physical and social aspects of the FDI in comparison to a waiting list control group (9). With this evidence of the short-term benefits of mime therapy, the question arose with regard to the stability of the gains achieved.

A review of the literature provided us with only one study describing the long-term follow-up after rehabilitation (biofeedback) in patients with facial nerve paresis (10). The conclusion of this biofeedback study was that unsupervised, posttherapy, home exercise programs might be detrimental.

The main purpose of our study was to assess the stability of benefits from mime therapy during a time period from 3 months to 1 year.

MATERIALS AND METHODS

Design

The design was a prospective follow-up, which was based on an RCT in which a treatment group was compared with a waiting list control group (4). The follow-up consisted of three measurement occasions within 1 year—immediately after therapy (T2) and 3 (T3) and 12 months (T4) posttherapy. Follow-up measurements took place between October 1999 and April 2003 (see Table 1).

Participants

Forty-eight patients completed the RCT and were available for follow-up. The wish to demonstrate, with a sufficient power (>85%), a minimum effect size of at least Cohen's $d = 0.80$, led to the choice of 48 participants in the original RCT. To anticipate eventual dropouts, the RCT started with n = 50; one dropout in each group reduced the sample to 48. All patients had given informed consent to participate in the RCT including the follow-up. The Advisory Committee on Ethics in Human Experimentation at the Radboud University Nijmegen Medical Centre had given its approval.

Measurements of Sequelae of Facial Nerve Paresis

Sequelae of facial nerve paresis were measured during the follow-ups using the same measurement instruments as used in the RCT. To measure asymmetry, video-recordings of the patients were made by their physiotherapists at pre- and posttest and at the two follow-ups, using standardized positioning, facial tasks, and instructions. The videotapes were scored by the first author with the SB-FGS and the HB-FGS after all data had been collected. To ensure that the scorer remained blind to the test times and treatment condition of the patients, the tapes were arranged and scored in randomized order.

The lip length (LL) and pout (P) indices were assessed by the physiotherapist using a sliding calliper after a standard protocol proposed by Jansen et al. (7). The LL index indicates the ratio between the intercommissural distance in a resting position and the intercommissural distance during contraction of the buccinator, risorius, and zygomatic muscles. The stiffness scale (a subjective five-point scale) and the FDI questionnaire were completed by the patients themselves.

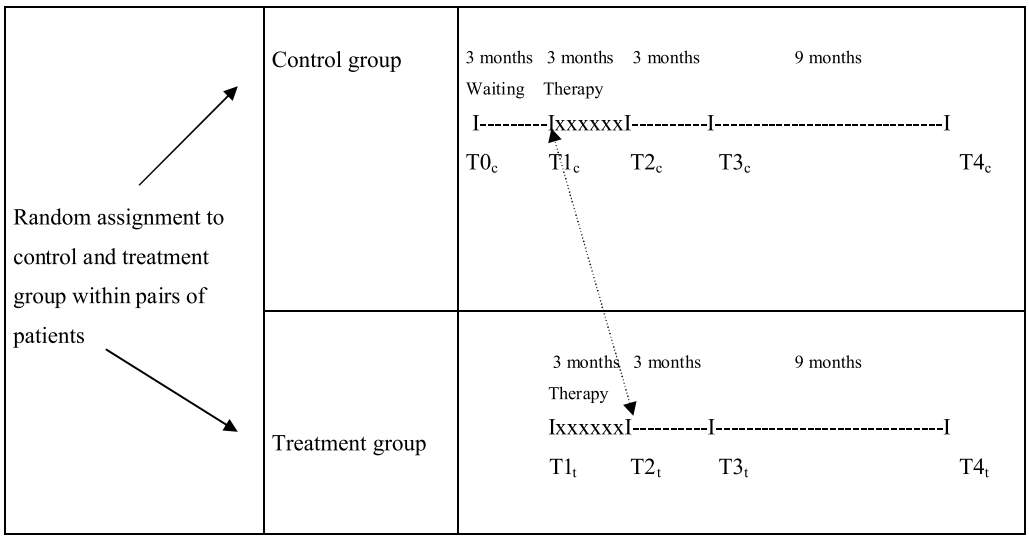
Analyses of Stability

Two types of stability will be analyzed—stability of outcome level (A) and stability of interpatient differences in outcomes (B).

Stability of Outcome Level

Stability of outcome level (A) will be analyzed primarily (A1) as absence of changes over time in the average scores of the three

TABLE 1. *Schema of the measurements in the Nijmegen Mime therapy study*



$T0_c$, Pre-test control group; $T1_c$, post-test control group; $T2_c$, immediate post-test control group; $T1_t$, pre-test experimental group; $T2_t$, immediate post-test experimental group; $T3_c$, $T4_c$, $T3_t$, $T4_t$, follow-ups.

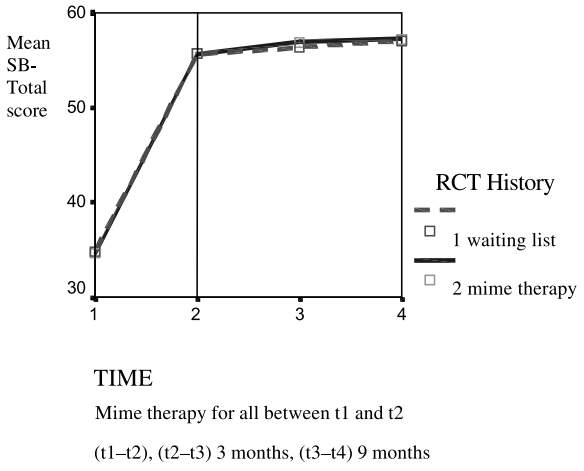


FIG. 1. Sunnybrook total score for 46 patients benefiting from mime therapy (100%).

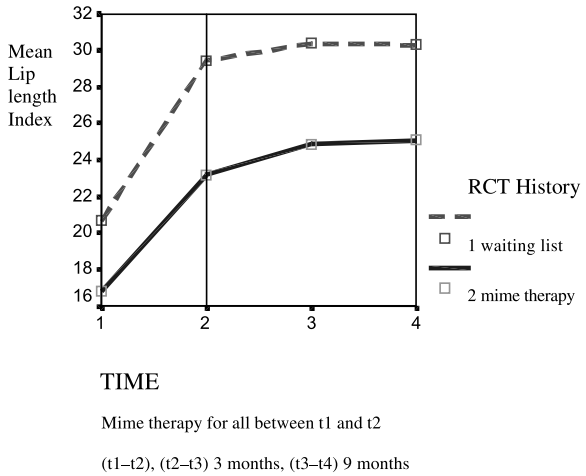


FIG. 3. LL index of 43 patients benefiting from mime therapy (93%).

posttherapy measurements, and secondly (A2) by inspection of the change profiles of all individual patients for all sequelae.

A.1 Absence of posttherapy trends in group averages. Group-level analysis of absence of changes over time is performed by applying repeated-measures analysis of variance (ANOVA) and testing for trends. To test whether the differential pretherapy history (waiting list versus direct treatment) of our RCT participants influenced the course of posttherapy outcomes, the history condition was added as a factor in the resulting Time (3) × History (2) analysis of covariance (ANCOVA) design.

The presence of mean level stability will be inferred by the absence of significant ($p < 0.05$) trends (linear or quadratic) in the three posttherapy measurements. Significant trends will be inspected for continued improvement.

From the RCT analysis, it was known that interpatient differences at pretest sometimes confounded the posttest. To overcome this confounding, ANCOVAs will be performed with the respective immediate pretherapy (T1) score as covariate. All dependent variables are subjected in this analysis procedure, except HB-FGS scores, as HB-FGS scores are rank orders, indicating stages. Individual patient's HB-FGS time courses will be classified into patterns (covering the whole period T1–T4).

A2: Change profiles of individual patients. The analysis of stability of averaged outcomes (as presented above) fits the framework of evidence-based medicine. However, the clinical practitioner is focused on the individual patient. Therefore, we checked all individual time courses of sequelae in patients with facial nerve paresis for the presence of patterns of change in the period T1 to T4.

B. Analysis of stability of interpatient differences. Pearson's correlations between time points are calculated for all sequelae of facial nerve paresis except for HB-FGS, for which Spearman rank order correlations are calculated.

RESULTS

In the follow-up of 48 patients, there were two dropouts; one patient was involved in a car accident (ex-waiting list group), the other suffered a severe heart attack (ex-mime

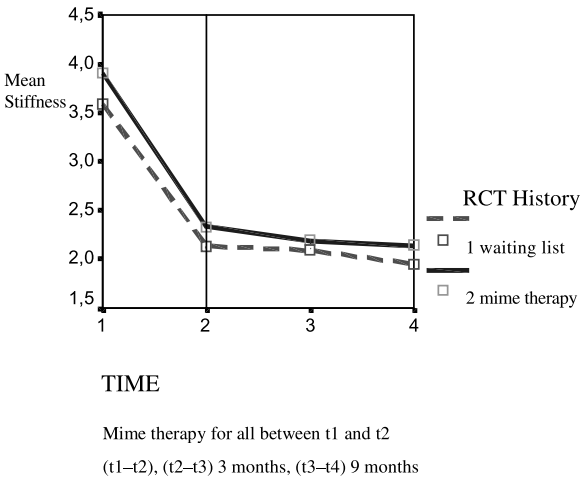


FIG. 2. Facial stiffness score of 43 patients benefiting from mime therapy (93%).

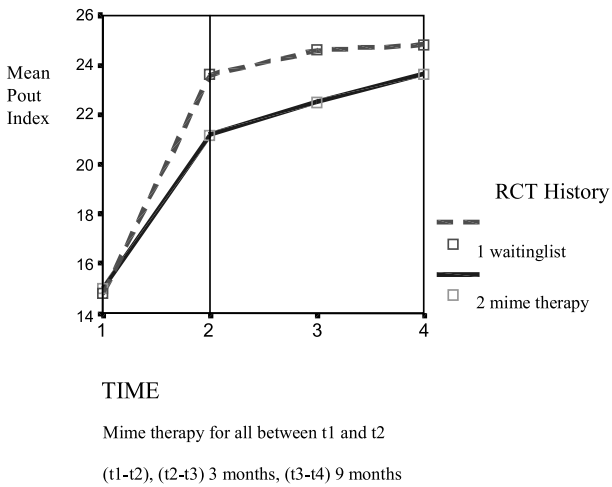


FIG. 4. P index of 43 patients benefiting from mime therapy (93%).

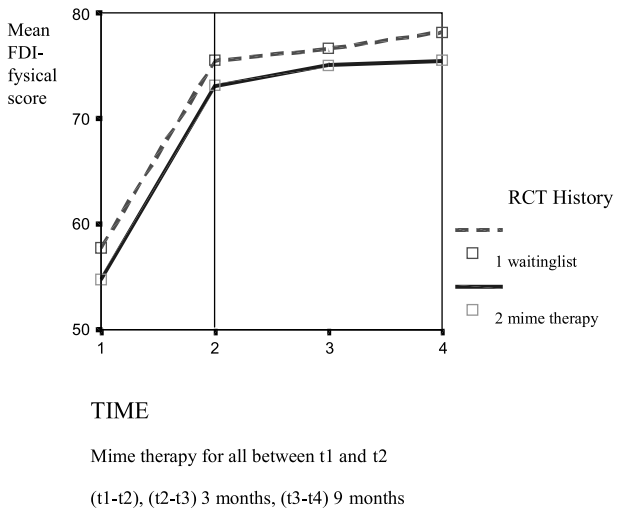


FIG. 5. Waning physical disability of 43 patients benefiting from mime therapy (93%).

therapy group). Data from 46 patients were available at 3 and 12 months after treatment.

Stability of Group Outcome Levels on SB-FGS, Lip Mobility, Stiffness, and FDI

Except for the P index and FDI-social, repeated-measures ANCOVAs (with immediate pretherapy score as covariate) showed neither significant differences in the average scores nor significant trends in the three posttherapy measurements (T2, T3, and T4). The P index showed a posttherapy improvement with a linear trend (adjusted means are T2 = 22.2; T3 = 23.5; T4 = 24.2). The FDI-social also showed a posttherapy improvement with a linear trend (adjusted means are T2 = 81.6; T3 = 83.6; T4 = 85.3). These results show group-averaged level stabilities for all sequelae except for the P index and the FDI-social, which continue to improve.

The differential pretherapy history of our RCT participants did not influence the course of any of the posttherapy outcomes when the history condition (waiting list/mime therapy) was added as a factor in the resulting Time (3) × Group (2) ANCOVA design. The Time × History interaction was not significant.

Stability of Levels of Individual Patients

For a specific sequel, a patient was classified as having "benefited" from mime therapy if the immediate posttreatment (T2) score was more than one (T2) standard error of the mean (SEM) higher (in the desired direction) than the pretest (T1) score. When the T2 score was more than 1 SEM lower than the T1 score, the patient was classified as "deteriorated" for that sequel. Otherwise, the patient was classified as "unchanged during therapy period."

On the Sunnybrook Total score, 46 patients (100%) showed improvement between T1 and T2. On the facial stiffness scale, three patients (6.5%) showed no change whereas the rest improved; the same holds for the P index and the FDI-physical score. On FDI-social, one patient (2.2%) did not change whereas the rest improved. On the LL index, one patient deteriorated, two did not change, and the rest (93.5%) improved. With these six sequelae in 46 patients, there are 276 (6 × 46) individual change patterns; 263 out of these 276 patterns reflected benefits from mime therapy.

For the patients who improved during the treatment, it makes sense to analyze the pattern of changes during the 1-year period posttreatment. These analyses demonstrated that the majority of change patterns showed stability. Although this was done for each patient individually, for reasons of economy a graphical summary will be reported of the average levels over time, for each specific sequel, taking into account the patient's "history"; that is, the group to which a patient was assigned in the intervention study (see Figs. 1–6).

Deterioration patterns were not due to a single patient but were distributed over all patients.

Stability of Outcome Level on HB-FGS

HB-FGS scores of individual time courses of patients are shown in Table 2.

Table 2 demonstrates that 12 patients did not show an improvement in their HB grade during therapy. Thirty-four patients improved their HB grade, and the achieved level at T2 was still present at the two follow-up measurements.

Stability of Interpatient Differences in Sequelae of Facial Nerve Paresis

Correlations of sequelae severity immediately after therapy (T2) and at 3 months (T3) and 12 months (T4) follow-up are shown in Table 3.

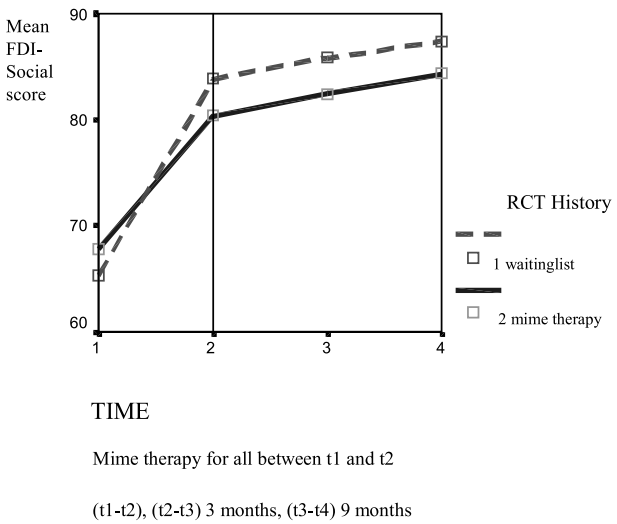


FIG. 6. Waning social disability of 45 patients benefiting from mime therapy (98%).

TABLE 2. *Patients with a specific course on the house-brackmann facial grading system, n = 46*

Category		No. patients
1	*No achievements of therapy (T1–T2)*	
1.1	Hyperstability Stable pattern (T1 = T2 = T3 = T4)	10
1.2	No achievements during therapy (T1 = T2), 1 grade improvement at T3, achieved level at T3 still present at T4	1
1.3	No achievements during therapy and 3 months thereafter, T1 = T2 = T3, 1 grade improvement at T4	1
2	*Improvements during therapy (T1–T2)*	
2.1	1 grade improvement during therapy (T1–T2) and T2 = T3 = T4	34
Total		46

T1, pretreatment; T2, immediate posttreatment; T3, 3 months posttreatment; T4, 12 months posttreatment.

It is clear from Table 3 that interpatient differences in sequelae severity show high normative stabilities for all sequelae.

DISCUSSION

The question was whether benefits of mime therapy are stable during a period of 1 year. This study demonstrates three things. a) Whether the patient in the previous RCT had been on a waiting list or had directly received mime therapy did not affect sequel level at any time point or the absence of trend. No trends were found in the average sequelae scores of all 46 patients at the three posttherapy measurements (0–3–12 mo after mime therapy), except for the P index and the FDI-social, which showed slight continuous improvement. b) For six sequelae (except HB), 95% of patient–sequel contributions (263 out of 276) showed immediate improvement after mime therapy (T2). For HB grades, this was 34 out of 46 patients (74%). Where sequelae improved, the posttherapy individual courses (T2–T3–T4) showed, also for HB, in majority absence of deterioration. As can been observed from the Graphs 1 to 6, benefits obtained were stable. c) High normative stability for all sequelae of facial nerve paresis was found over time.

TABLE 3. *Stability of interpatient differences in sequelae severity*

Sequelae	T3	T4
SB-FGS total	0.96 (0.89)	0.95 (0.88)
SB-FGS at rest	0.95 (0.56)	0.90 (0.54)
SB-FGS during movement	0.96 (0.88)	0.95 (0.88)
SB-FGS synkinesis	0.91 (0.76)	0.89 (0.65)
HB-FGS[a]	0.97 (0.84)	0.92 (0.81)
Stiffness	0.81 (0.35)	0.74 (0.47)
Lip mobility LL index	0.93 (0.84)	0.91 (0.86)
Lip mobility P index	0.95 (0.51)	0.92 (0.55)
FDI-physical	0.96 (0.81)	0.95 (0.841
FDI-social	0.91 (0.66)	0.90 (0.68)

Pearson correlations between the severity of sequelae at immediate posttherapy (T2) and at 3 months (T3) and 12 months (T4) after therapy. Values in parentheses are correlation of follow-ups and pretherapy (T1), n = 46 patients. All correlations are significant ($p < 0.05$). SB-FGS, Sunnybrook Facial Grading System; HB-FGS, House-Brackmann Facial Grading System; FDI, Facial Disability Index.

[a]Spearman's correlation.

Comparison of the study of Shiau et al. (10) with our study shows several differences in addition to the applied intervention. Firstly, the use of Shiau et al. of the term long-term "effect" is confusing as patients officially stopped therapy after the last rehabilitation session and therefore the term long-term "stability" would be more adequate. Secondly, the study of Shiau et al. is not an RCT and measures only one dependent variable—the HB-FGS, a relatively insensitive scale. A remarkable thing is that in spite of this, patients still deteriorate. It is possible that the patients improved during therapy, indicating that follow-up scores deteriorated even further. Twenty-six percent of the patients in the study of Shiau et al. deteriorated when comparing initial with follow-up function, compared with less than 1% deterioration (in seven sequelae) after therapy in our study. Although the study of Shiau et al. had collected information, next to the HB score, with a questionnaire (Medical Outcomes Study 36-item Short-Form Health Survey), these data were not used. In addition to the HB score, we also analyzed sequelae with the SB-FGS, the stiffness scale, the LL index, and the FDI, giving more detailed information not only on asymmetry of the face, but also concerning disabilities and psychosocial problems.

Why do benefits of mime therapy show long-term stability while various studies of physiotherapeutic interventions do not reveal them (see e.g., van Baar et al. [11])? We can speculate at this point. The learning of motor skills and stability of these gains can be explained by the three-stage model from Fitts and Posner (12). In the first stage, the patient has to understand the nature of the task, developing strategies used to carry out the task, this being a cognitive stage of learning (e.g., abduction of mouth corner with variations in speed and amplitude). In the second stage, the patient has to refine the skill, not only using it in closed skills (e.g., abduction of the affected mouth corner) but also in open skills (e.g., smiling) (13). The third stage, or the stability stage, is described as an autonomous stage indicating that patients can use these skills in other environments (talking to people and smiling). It seems that in mime therapy, after a conscious process of recovery (where high compliance is required), the process of recovery is ongoing or unconsciously continues.

It is conceivable that the environment also plays an important role in stimulating this process and the continuation thereof. As the facial nerve paresis has a great

impact in the communication and interactions with others, the influence of the (social) environment will cause actions and reactions by the patient. In other words, the environment invites reactions from the patient. This may also be one of the reasons why the patient compliance is very high; patients are extremely motivated in reducing their facial disfigurement. Another explanation could be that patients with facial nerve paresis usually do not have pain, so they are not curbed in their normal behavior, making it possible that the "stability process" unconsciously continues and does not deteriorate, or that the recovery process is ongoing.

Other factors contributing to the stability of benefits may be the combination of exercises (important in the first stage of treatment) with verbal instructions and an extended homework program for 10 weeks (important in all stages). This combination is favorable in that benefits become incorporated in daily life.

Another item to consider is the high frequency of "hyperstability" of the HB-FGS. Twelve of the 46 patients (26%) did not show an improvement during therapy, of which 10 are still unchanged 1 year after therapy. Thirty-four percent of the patients in the study of Shiau et al. maintained the same HB level. Both studies show that HB scores are not sensitive enough to change. The SB-FGS composite score does not show this high frequency of hyperstability. Apparently, the HB-FGS is not very sensitive in measuring improvement during therapy, and this causes doubt regarding whether the HB-FGS validly reflects stability when present. Therefore, we recommend the use of the SB-FGS above the HB-FGS. In the study of Shiau et al., sex significantly affected the relation between initial and follow-up scores, which was not the case in our study. We found no sex differences in the deterioration of sequelae.

It has been shown that the interaction of History (waiting list control–mime therapy group) × Time (time period T2, T3, T4) was not significant, which indicates that the time course is equivalent in both groups. In other words, these results contradict the idea that being on the waiting list might have a long-term negative effect on the stability of the benefits achieved by mime therapy.

CONCLUSION

On average, benefits of mime therapy are stable during 3 and 12 months for all sequelae investigated, except for the P index and FDI-social, which showed continuous improvements. This conclusion is valid for almost all sequelae in almost all patients.

Mime therapy is an investment that continuously pays dividends.

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