Comparison of Selected Cortical-Level and Reflexive-Level Treatment Programs for Establishing Normal Deglutition Patterns

MERVYN L. FALK, Ph.D.
JAMES R. DELANEY, D.D.S., M.S.
RICHARD L. LITT, D.D.S., M.S.

The purpose of the current study is to determine whether the problem of tongue thrust is better resolved by treatment which is based upon conscious-level or reflexive-level training.

Falk et al.[1] have previously reported a subconscious approach to the establishment of normal swallow patterns utilizing neuromuscular facilitation. For the purpose of the current study, subjects treated with the use of neuromuscular facilitation are compared with those receiving training based upon relatively traditional conscious-level methodology. Garliner has reported such a program.[2] It would seem appropriate that an examination of these two divergent treatment methodologies is indicated to determine whether children are more successfully treated by one or the other approach.

METHOD

A total of 20 males and females ages eight to 12 years with deviant anterior dental relationships and tongue thrust were selected as subjects for the study from the private practice of a pedodontist in the greater Detroit area. Diagnosis of tongue thrust was made by the pedodontist and two speech pathologists experienced in the treatment of tongue thrust. Two speech clinicians, equally skilled in the use of the method advocated by Garliner and in use of the method advocated by Falk et al., were each assigned five subjects for treatment with each approach. The clinicians were supervised by two speech pathologists one of whom was skilled in the use of each treatment method used in this experiment.

Serial dental models made at zero months, three months, and six months of training were used to determine change in swallow patterns as inferred from alterations in anterior dental relationships. Improved bite relationships were held to be suggestive of successful training in the direction of more adequate swallow patterns.

In addition, no training followed for a six-month period. Models were again made at 12 months following inception of treatment to examine for regression as inferred by comparison with models made at six months. No other therapies were permitted during the 12-month period.

Models were then examined by 14 orthodontists who served as judges for the study. Each was asked to compare models made at zero months of training with models made at three months and six months of training. In addition, models made at three months were compared with models made at six months. Finally, models made at six months were compared with models made at 12 months following the start of treatment. Judges were asked to indicate whether each comparison of models for each subject was "same," "better," or "worse." These data were submitted to an analysis of variance to determine whether one treatment methodology was superior to the other.

Further, the judges were asked to indicate on a seven-point equal-appearing-intervals scale the magnitude of improvement they felt each subject had

made during the six-month course of treatment. These data were submitted to analysis using a *t*-test for matched group means.

It is to be noted that judgments rather than objective measurements from models were used for data collection because of irregularities of the upper dental units noted among subjects in both experimental groups. These irregularities would have, therefore, rendered measurements unreliable.

Results

The first task of the orthodontists who made judgments of serial models for this study was to indicate whether a subject's models over time were "same," "better," or "worse." For the purpose of using a computerized analysis of variance program,[3] 1 represented "worse," 2, "same," and 3, "better." Data derived from an analysis of variance to test for significant differences between Treatments, Judges, and Treatments x Judges are presented in Tables I-IV. Value of $F = 4.49$ (1,16) and $F = 1.75$ (13,208) are needed for significance at the .05 level of confidence.

The first variable was a comparison of models made at zero months and after three months of training. The mean judgment for subjects treated with neuromuscular facilitation for this period was 2.43; for those treated with the Garliner method, 2.15. An F = value of 4.60 (1,16) was obtained for these data which is significant at the .05 level. This finding indicates that the subjects treated with neuromuscular facilitation were significantly more improved after three months of training than were those receiving treatment utilizing the Garliner method.

Variable two compares treatment programs for subjects after six months of training. Mean judgments of 2.54 were obtained for the reflexive treatment group and 2.18 for the Garliner group. A value of $F = 5.79$ (1,16) is derived and is, again, statistically significant at the .05 level in the direction of the reflexive approach.

Variable three represents data derived from a comparison of models made after three months and six months of treatment. Mean judgments of 2.40 for the neuromuscular facilitation group and 2.07 for the Garliner group were obtained. An F value of 8.85 (1,16) is derived and is statistically significant at the .05 level of confidence indicating greater improvement for the neuromuscular facilitation group after the last three months of therapy.

Variable four tested for regression by examining models after a six-month period without treatment. Mean judgments of 2.05 and 1.94 were obtained for the neuromuscular facilitation group and the Garliner group, respectively. An F value of 1.77 (1,16) is derived and indicates no statistically significant difference between groups. It may be inferred from this finding, therefore, that neither training program results in regression following six months of treatment.

It may also be noted from Tables I-IV that judges did not disagree on the presence of difference between groups. For the judge x treatment variable, a value of $F = 1.75$ (13,208) is necessary for significance at the .05 level of confidence. Values of $F = 1.07$, $F = 1.48$, $F = .98$, $F = .56$ were obtained and are not significant at the .05 level.

Further, results of the analysis x treatment suggest that differences observed by the judges increased in the direction of the reflexive treatment method as time in treatment increased. In other words, the longer each experimental group was treated by its particular methodology, the greater the observable difference became in anterior dental relationships in favor of the

TABLE I

Summary of analysis of variance for 0 months and 3 months of treatment.

Source	DF	SS	F-ratio
Treatments	1	4.63	4.60*
Replications	16	16.78	
Judges	13	5.82	1.82*
TxJ	13	3.45	1.07
JxR	208	51.22	

* significant at .05 level of confidence

TABLE II

Summary of analysis of variance for 0 months and 6 months of treatment.

Source	DF	SS	F-ratio
Treatments	1	8.34	5.79*
Replications	16	23.03	
Judges	13	5.87	1.67
TxJ	13	5.21	1.48
JxR	208	56.19	

* significant at .05 level of confidence

TABLE III

Summary of analysis of variance for 3 months and 6 months of treatment.

Source	DF	SS	F-ratio
Treatments	1	6.79	8.85*
Replications	16	12.28	
Judges	13	2.94	.67
TxJ	13	4.34	.98
JxR	208	70.64	

* significant at .05 level of confidence

TABLE IV

Summary of analysis of variance for 6 months without treatment.

Source	DF	SS	F-ratio
Treatments	1	4.76	.18
Replications	16	42.88	
Judges	13	5.61	1.60
TxJ	13	1.99	.57
JxR	208	56.04	

TABLE V

Summary of *t*-test for differences in magnitude of improvement between groups.

Variable	*N*	$\overline{X}$	*t*
Neuromuscular Facilitation	14	3.06 ± 0.8	5.93*
Traditional	14	2.07 ± 0.8	

* significant at the .01 level of confidence

group receiving treatment utilizing neuromuscular facilitation techniques.

The second task required that judgments of magnitude of improvement in anterior dental relationships be made after six months of therapy on a seven-point equal-appearing-intervals scale, wherein "1" represented the lowest judgment and "7" the highest judgment of improvement across the models for each subject. These data were submitted to analysis using a *t*-test for matched group means.

Results of the *t*-test which examined for differences in magnitude of judged improvement are presented in Table V. A value of $t = 3.01$ ($df=13$) is needed for significance at the .01 level of confidence.

A mean value of 3.064 was obtained for subjects treated with neuromuscular facilitation; a mean value of 2.071 was derived for subjects treated with a traditional approach as represented by the Garliner method. A value of $t = 5.93$ is derived from these data and indicates that the judgments of magnitude of improvement are significantly greater for subjects exposed to the use of neuromuscular facilitation for treatment of tongue thrust.

Discussion

In the past, what is, perhaps, justifiable skepticism has emanated on the part of at least some orthodontists and speech pathologists with regard to an ability to demonstrate changes in arch form and relationship as a function of swallow pattern treatment. Such an attitude has previously culminated in a statement by the Joint Committee on Dentistry and Speech Pathology-Audiology[4] which looks with disfavor upon present treatment plans since improvement has not been demonstrated in earlier literature.

It is apparent from the present study, however, that arch form and relation-

ship can be changed and are changed with either approach used in the current study.

Treatment method then becomes the focus. The data obtained in this study indicate that treating the problem in a fashion in keeping with the reflexivity of swallowing results in significantly greater change and the magnitude of improvement is such that change would be expected to be greater and to occur more often when using a subcortical approach to the problem. This is consistent with what might logically be assumed when the daily frequency of the occurrence of swallowing is considered in relation to the reflexivity of this act.

Bringing a reflexive act to the conscious level for the purpose of extinguishing improper or incorrect reflexive behavior is fallacious with reference to the neuromuscular act.[5] Such a treatment philosophy has been primary prior to the application of principles of neuromuscular facilitation to the problem presented by deviation in the deglutition pattern.

Results of the current study imply, however, that a treatment program which utilizes reflexivity in the correction of a deviant reflexive act can be expected to establish results superior to the outcome of the results from a more traditional program.

567 Manoogian Hall
Wayne State University
Detroit, Mich. 48202

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