

Some Results of Speech Therapy for Children with Cleft Palate

D. R. VAN DEMARK, Ph.D.

Iowa City, Iowa 52242

Little information is provided in the literature regarding the efficacy of speech therapy for children with cleft palate. Although Phillips et al. (4, 5) have reported improvement in language skills for preschool children who have received therapy, current information concerning the acquisition of articulation skills for children with clefts who receive therapy is inconclusive and practically nonexistent. Since speech therapy was available to subjects in a previously reported study (12), an attempt was made to compare the articulation skills of children with clefts who have received speech therapy with those who have not.

In the initial study, the articulation and the velopharyngeal competency of 108 Danish cleft palate patients, born in 1963-64, were assessed (12). When this sample was compared on articulation tests to their normal peers, they were significantly poorer in articulation skills. Forty-eight percent of the subjects were judged as exhibiting velopharyngeal competency, 41 % were rated as having a marginal mechanism, and 11 % were rated as incompetent. Comparison of articulation scores between the normal and the competent groups indicated that cleft subjects with velopharyngeal closure were inferior in articulation skills.

Procedure

Each of the 108 subjects was administered a 99 item articulation test (13) and a previously described battery of measures derived to evaluate velopharyngeal competency (12). In addition, each parent was asked to fill out a brief questionnaire which consisted of the following:

- (1) Has your child ever received speech therapy?
- (2) If so, at what age did therapy begin?
- (3) How often did he go to therapy?
- (4) How many sessions of therapy has he attended?

Answers of the parents were validated for each patient by checking the records at the Statens Institut for Talelidende in Denmark, which serves

D. R. Van Demark, Ph.D., is Associate Professor, Department of Otolaryngology and Maxillofacial Surgery, and Department of Speech Pathology and Audiology, University of Iowa, Iowa City, Iowa 52242.

This research was done in 1970-71 and was supported in part by PHS, Special Fellowship Grant DE-46898 and Research Grant DE-00853, the National Institute of Dental Research, and through the cooperation of Statens Institut for Talelidende, Aarbus, Denmark, and the George Marshall Foundation.

TABLE 1. Tabulation of 108 responses to a parental questionnaire concerning speech therapy: speech therapy and length of therapy, beginning age of therapy, frequency of therapy, and number of sessions attended.

<i>speech therapy</i>	<i>N</i>	<i>beginning age</i>	<i>N</i>
none.....	59	4 years or younger	18
less than 1 year.....	21	4½ years	5
less than 2 years.....	14	5 years	9
less than 3 years.....	9	5½ years	6
more than 3 years.....	5	6 years or older	11
<i>frequency of therapy</i>	<i>N</i>	<i>number of sessions</i>	<i>N</i>
twice a month.....	7	None	59
once a week.....	18	1-29	10
twice a week.....	17	30-59	12
more often.....	1	60-89	8
unknown.....	6	90+	19

as the central administration center for payment of fees to speech pathologists in the local community. Therefore, the number of sessions reported by the parents could be cross-checked with the records at the Institut. The information obtained was tabulated and is presented in Table 1.

An additional criteria of this study was that subjects were required to have a tape recorded articulation test on file at the Institut. Examination of the files indicated that 67 of the 108 subjects had articulation tests for which at least 80 % of the items on the Danish Pressure Articulation Test (1) were included on tape. These 67 subjects, 31 of whom had received speech therapy, were considered the suitable sample to study the affects of speech therapy.

ARTICULATION TESTS. The articulation tests available from the tape files at the Institut consisted of the Danish Pressure Articulation Test and two alternative items. As constructed, this test includes 44 items and 76 elements. Included in this test, described in detail elsewhere (13), are items which consist of one, two and three consonant elements; for example, [sk-] is considered as one item, but consists of two elements. Scores were determined by both items and elements. The test is highly similar to the Iowa Pressure Articulation Test (3), although some differences do exist in that more nasal and glide sounds are tested in single positions on the Danish Pressure Test of Articulation than on the Iowa Test.

For the 67 subjects who had recordings of the Danish Pressure Articulation Test, the mean age of test administration was 63.4 months. This test will be referred to hereafter as Test I.

Although a 99 item articulation test was administered by the investigator at the time of observation, only the items on the Danish Pressure Articulation Test were considered in this study. The mean age of observation was

82.9 months. The articulation test administered by the investigator is referred to hereafter as Test II.

SCORING PROCEDURE. All elements on Test I and Test II were scored by the investigator from the tape recordings available. Each element was evaluated as being either correct or incorrect. If incorrect, the type of error was noted, i.e. omission, substitution, pharyngeal-fricative substitution, glottal-stop substitution, nasal substitution, oral distortion (mild, moderate, severe), and nasal distortion (mild, moderate, severe).

The reliability of the investigator was determined by having a native speaking Danish speech pathologist also score articulation tests for 10 cleft subjects. The percentage of agreement between the investigator and the speech pathologist was 95 %. The investigator's reliability in determining type of error has been previously reported (10). Examination of the investigator's ratings with the speech pathologist also indicated a high degree of agreement in classifying error type.

The score obtained for each element was coded according to the criteria used in the Iowa Research Protocol for Articulation Tests (9) so that the data could be analyzed by a computer. Data presentation allowed for the computation of two scores on each test by item (44 items) and by element (76 elements). All articulation scores were converted to percentage scores of the total number of elements tested so that any missing item would not unduly bias the test scores.

General Results

When articulation scores were compared for the 67 subjects (Test I vs. Test II), *t* tests demonstrated that subjects performed significantly better at the .001 level on Test II for both the 44 item and the 76 element tests. Between-group comparisons indicated that the 36 subjects who had not received therapy performed significantly better than the 31 subjects who had received therapy on both Test I and Test II (Table 2).

TABLE 2. Comparison of subjects who had speech therapy with those who did not for Test I, (a) 44 items and (b) 76 elements, and Test II, (a) 44 items and (b) 76 elements.

<i>N</i>	<i>% correct 44 item</i>	<i>P</i>	<i>% correct 76 element</i>	<i>P</i>
Test I				
36Ss no therapy.....	42.48	.001	58.45	.001
31Ss therapy.....	17.75		33.50	
Test II				
36Ss no therapy.....	49.62	.002	65.38	.001
31Ss therapy.....	35.11		51.53	

TABLE 3. Within group comparisons on Test I and Test II for subjects who did not receive therapy and for subjects who received therapy.

<i>N</i>	<i>test I</i> % correct	<i>test II</i> % correct	<i>P</i>
36ss no therapy			
44 item	42.48	49.62	
76 element	58.45	65.38	
31ss therapy			
44 item	17.75	35.11	.001
76 element	33.50	51.53	.001

Comparison of scores obtained from the non-therapy group (Test I vs. Test II) indicated that there were no significant differences in articulation scores between the two testing sessions (Table 3). However, when scores on Test I and Test II were compared for the therapy group, subjects performed significantly better (.001) on Test II for both the 44 items and 76 elements (Table 3).

To counteract the effect that the non-therapy group had achieved better articulation scores on Test I than did the therapy group, difference scores were determined. Difference scores were defined as the number of items (or elements) correct on the second test that were incorrect on the first test. As can be seen in Table 4, those subjects who had therapy achieved greater difference scores than the non-therapy group. The difference scores were significantly greater for the therapy group at the .01 level for the 44 item test and at the .001 level for the 76 element test.

Although the non-therapy group achieved better articulation scores on both tests than the therapy group, they did not demonstrate any significant improvement between tests. The therapy group demonstrated significant improvement between tests. However, they still had not achieved the level of articulation proficiency of the non-therapy group on Test II.

To further investigate the differences between the two groups, an element analysis, summarized in Table 5, was completed to study the types of errors exhibited. Examination of Table 5 indicates that on Test I the non-therapy group produced a higher percentage of correct sounds and exhibited more oral distortions than the therapy group. On Test I, the therapy group

TABLE 4. Comparisons of difference scores (Test II—Test I) for (a) 44 item and (b) 76 elements.

<i>articulation test</i>	<i>N</i>	<i>difference scores</i>	<i>P</i>
44 item	31ss therapy	17.4	.01
	36ss no therapy	7.1	
76 element	31ss therapy	18.0	.001
	36ss no therapy	6.9	

TABLE 5. Comparison of the percent of correct productions and percent of error types for both therapy and non-therapy groups on articulation tests I and II.

<i>production</i>	<i>non-therapy</i> <i>n = 36</i>		<i>therapy</i> <i>n = 31</i>	
	<i>test I</i>	<i>test II</i>	<i>test I</i>	<i>test II</i>
Correct.....	58.45	65.38	33.50	51.53
Mild oral distortion.....	4.88	4.68	1.48	2.33
Moderate oral distortion.....	9.56	9.40	4.17	6.37
Severe oral distortion.....	3.27	2.56	4.08	3.46
Any oral distortion.....	17.72	16.66	9.74	12.17
Mild nasal distortion.....	5.63	6.15	4.08	3.99
Moderate nasal distortion.....	4.43	5.17	6.62	9.63
Severe nasal distortion.....	1.98	1.04	8.68	5.76
Any nasal distortion.....	12.05	12.39	19.39	19.39
Substitution.....	3.31	2.01	7.15	3.50
Substitution—nasal.....	.74	.03	2.11	.96
Substitution—glottal.....	1.03	.24	4.84	2.45
Substitution—pharyngeal.....	1.53	.06	2.59	.76
Omissions.....	5.88	3.15	22.65	10.12

exhibited more nasal distortions (7 %), substitutions (4 %), glottals (3.8 %), pharyngeals (1 %), and omissions (17 %) than the non-therapy group.

When intragroup comparisons were made, the non-therapy group improved production approximately 7 % between Test I and Test II. The percent of errors decreased very little in any one category with the exception that omissions decreased approximately 2.5 %. When comparisons were made for the therapy group (Test I vs. Test II), correct production increased 18 %. The greatest difference in the group was the decrease in the number of omissions from 22.6 % to 10.1 %. The percent of errors also decreased for substitutions and substitutions of the nasal, glottal, and pharyngeal types, but increased for oral distortions.

It is of interest that for the therapy group the number of nasal distortions remained the same, although the degree of severity appeared to decrease slightly on the second test. One could assume that if, in fact, these subjects did not achieve velopharyngeal competency, nasal emission might increase as omissions decrease. For example, if a subject says /-un/ for "sun," he may not say the /s/ because he cannot impound enough air pressure. If given therapy, he may learn to approximate the /s/ in "sun," but if the mechanism remains the same, one would expect that the /s/ would be nasally distorted. It is probable that some speech sounds which were omitted on Test I were rated as nasal distortions on Test II, and that sounds which originally were nasal distortions were produced correctly on Test II.

Velopharyngeal closure. At the time of observation (Test II), the adequacy of velopharyngeal closure was evaluated for each subject. For the

TABLE 6. Articulation scores on Test I and Test II when groups are defined by degree of velopharyngeal closure and therapy.

<i>adequacy of closure</i>	<i>N</i>	<i>% closure</i>		
		<i>test I</i>	<i>test II</i>	<i>difference between test I and test II</i>
closure	T 8	39%	64%	25%
	NT 23	61%	70%	9%
marginal	T 14	37%	56%	19%
	NT 12	57%	56%	-1%
incompetent	T 9	23%	33%	10%
	NT 1	25%	36%	11%

therapy group, eight subjects exhibited closure, 14 exhibited marginal closure, and 9 were judged incompetent (Table 6). For the non-therapy group, 23 subjects exhibited closure, 12 marginal closure, and one was judged as exhibiting velopharyngeal incompetency. Thus, at the time of observation, the therapy group exhibited poorer closure than the non-therapy group.

Since adequacy of the velopharyngeal mechanism most likely contributes to the articulation abilities of subjects with clefts, scores achieved on articulation tests were compared for subjects in each of the three closure groups. Since the number of subjects in each group was small, the data was not submitted to statistical tests; however, as Table 6 demonstrates, some interesting trends can be noted.

Examination of the data indicates that when velopharyngeal closure is achieved one can expect more progress in therapy than if a subject exhibits a marginal or an incompetent mechanism. Those subjects who had therapy and were rated as having an adequate mechanism improved their articulation scores 25%, whereas the marginal group improved 19% and the incompetent group improved 10%. It is also of interest that the closure group had fewer sessions of therapy than either the marginal or incompetent group.

In contrast, subjects with a marginal mechanism who did not have therapy achieved essentially the same articulation scores on both tests and did not demonstrate any improvement. The therapy group improved articulation scores (19%) and attained the same level of articulation proficiency as the non-therapy group (56%). The incompetent group which received therapy improved articulation scores 10%. The number of subjects with an incompetent mechanism who did not receive therapy was so small that a comparison between the two groups could not be made. However, it would appear to this author that the incompetent group, which averaged between 60 and 90 sessions of therapy, made minimal progress.

Discussion

Forty-five percent of the 108 cleft palate subjects examined had received speech therapy in their local community. When velopharyngeal competency ratings were examined in relation to those subjects who had not received therapy, 36 subjects (62%) fell within the adequate closure group, 22 subjects (38%) fell within the marginal group, and only one subject (1.7%) was in the incompetent group. Therefore, it is obvious that in the adequate closure group, therapy was not generally recommended since only 11% of 52 subjects judged to achieve velopharyngeal closure received therapy for more than one year. In the marginal group ($n = 44$), 50% of the subjects had not received therapy, but 32% of them had received more than one year of therapy. In the incompetent group ($n = 12$), 75% had received more than one year of therapy.

Therefore, it appears that Danish children with clefts receive speech therapy, at least in part, based on the adequacy of the velopharyngeal mechanism. Those subjects with adequate velopharyngeal closure receive little therapy, but as the adequacy of closure decreases, the percent of subjects receiving therapy, as well as the duration of therapy, increases.

There are several limitations to this study and most studies involving the evaluation of speech therapy, simply because it is difficult to control all of the variables which may influence the results. For example, in the present study it is impossible to know exactly what each child did in therapy. Secondly, cinefluorographic films were not available for examination of palatal function. However, situations in which all variables can be controlled, such as the type of therapy, surgery, type of cleft, adequacy of velopharyngeal competency, and environment, as well as other factors, is difficult to envision. If one assumes that under optimal conditions the above variables could be controlled, the reports of Spriestersbach et al. (7) and Ross and Johnston (6), which clearly indicate the heterogeneity of the cleft population, would make it difficult for an investigator to generalize to other subjects. Therefore, it seems likely that the present sample is representative of the type of data available for study at the present time.

Although the data presented must be interpreted with caution, the results of this study indicate that children with clefts improve articulation skills as a result of speech therapy. The amount of improvement appears to be related to the adequacy of the velopharyngeal mechanism exhibited by subjects rather than the number of sessions of therapy.

The results of other studies, such as Templin (8), have indicated that as age increases, articulation proficiency also increases for normal children. This finding has also been reported for subjects with clefts (2, 11) and is confirmed in this study in that for the total group of subjects, articulation scores were better on the second test. However, in previous studies, adequacy of velopharyngeal closure and the influence of therapy have not generally been defined. It is of interest to note that subjects who exhibited

marginal velopharyngeal competency in this study demonstrated no improvement in articulation skills when they did not receive therapy, whereas subjects who achieved velopharyngeal closure did make some articulation gains without therapy. For subjects who received therapy and exhibited either velopharyngeal competency or marginal velopharyngeal competency, improvement in articulation skills as age increased was demonstrated.

For those subjects rated as exhibiting velopharyngeal incompetency, improvement in articulation skills with therapy appeared to be minimal. It would appear that differential diagnosis to determine which subjects exhibit velopharyngeal incompetency is important and that such a diagnosis should be made as soon as possible. In this manner, the speech clinician's time could be better utilized and further management procedures could be considered. The problem remains, however, in determining reliable diagnostic measures of velopharyngeal inadequacy for young subjects. Until such measures are developed, the recommendation of secondary palatal procedures is poorly supported by reliable documentation. It seems at the present time that greater emphasis is needed in accurately predicting those subjects who will not achieve velopharyngeal closure.

Summary

Articulation tests were administered to 67 subjects with cleft palate who averaged 63 months of age on Test I and 83 months of age on Test II. In the interim between the two tests, speech therapy was provided for 31 subjects while 36 subjects received no therapy. The non-therapy group achieved better articulation scores on both tests than the therapy group, but the non-therapy group did not demonstrate any significant improvement between tests. In contrast, the therapy group demonstrated significant improvement between tests and significantly greater difference scores (% correct between Test I and Test II) than did the non-therapy group. Analysis of the types of errors indicated that most types of errors, particularly the number of omissions, decreased for the therapy group, whereas in the non-therapy group the change was much less.

Further analysis indicated that subjects in therapy who achieved velopharyngeal closure made greater gains in articulatory proficiency in fewer therapy sessions than subjects who had therapy and exhibited a marginal or inadequate velopharyngeal mechanism. For subjects who did not receive therapy, the improvement in articulation scores was not significant, and no improvement in articulation proficiency was demonstrated by subjects with marginal closure.

References

1. BRØNSTED, K. and A. G. EPSTEIN, Skema til artikulationsundersøgelse af ganespaltepatienter, Statens Institut for Talelidende, Aarhus, Denmark.
2. MOLL, K., Speech characteristics of individuals with cleft lip and palate. D. C. Spriestersbach and D. Sherman, Eds., *Cleft Palate and Communication Skills*. New York: Academic Press, 1968.

3. MORRIS, H. L., D. C. SPRIESTERSBACH, and F. L. DARLEY, An articulation test for assessing competency of velopharyngeal closure. *J. Sp. Hear. Res.* 4, 48-55, 1961.
4. PHILIPS, B. J., Stimulating language and speech development in cleft palate infants. K. R. Bzoch, Ed., *Communicative Disorders Related to Cleft Lip and Palate*. Boston: Little Brown and Company, 1971.
5. PHILIPS, B. J., Preventive speech and language stimulation for cleft palate children. American Speech and Hearing Association, Short Course, Chicago, Illinois, 1971.
6. ROSS, R. B. and M. C. JOHNSTON, *Cleft Lip and Palate*. Baltimore: The Williams and Wilkins Company, 1972.
7. SPRIESTERSBACH, D. C., K. L. MOLL, and H. L. MORRIS, Heterogeneity of the cleft palate population and research design. *Cleft Palate J.*, 1, 210-16, 1964.
8. TEMPLIN, M. C., *Certain language skills in children*. Minneapolis: University of Minnesota Press, 1957.
9. VAN DEMARK, D. R. and R. T. THARP, A computer program for articulation tests, presented at the annual meeting of the American Cleft Palate Association, Oklahoma City, 1973, and accepted for publication in *Cleft Palate J.*
10. VAN DEMARK, D. R., Misarticulations and listener judgments of the speech of individuals with cleft palates. *Cleft Palate J.*, 1, 232-45, 1964.
11. VAN DEMARK, D. R., Consistency of articulation of subjects with cleft palate. *Cleft Palate J.*, 6, 254-262, 1969.
12. VAN DEMARK, D. R., Assessment of articulation and velopharyngeal competency for children with cleft palate. Submitted for publication (1973).
13. VAN DEMARK, D. R., I. JØRGENSEN, and A. VAN DEMARK, A comparison of articulation abilities and velopharyngeal competency between Danish and American children, Second International Congress on Cleft Palate, August, 1973, Copenhagen, Denmark.