ELSEVIER

International Journal of Pediatric Otorhinolaryngology
49 (1999) 21–26

INTERNATIONAL JOURNAL OF
Pediatric
Oto
Rhino
Laryngology

A comparative trial of two modalities of speech intervention for compensatory articulation in cleft palate children, phonologic approach versus articulatory approach

Ma.Carmen Pamplona, Antonio Ysunza *, Jannette Espinosa

Hospital Gea González, 4800 Calzada de Tlalpan, México D.F. 14000, Mexico

Received 29 September 1998; received in revised form 19 February 1999; accepted 20 February 1999

Abstract

To compare two modalities of speech intervention (SI) in cleft palate children with compensatory articulation disorder (CAD). The first modality was a phonologic based intervention, the second modality was an articulatory or phonetic intervention. The main purpose is to study whether a phonologic intervention may reduce the total time of speech therapy necessary for correcting CAD in cleft palate children as compared to an articulatory intervention. A prospective, comparative, and randomized trial was carried out. Cleft palate children with velopharyngeal insufficiency and CAD were included in the study group. Only patients with an age ranging from 3 to 7 years were included. A total of 29 patients were selected and were divided randomly into two groups. Fifteen patients were included in the first group (control) and received articulatory SI. Forteen patients were included in the second group (active) and received phonologic SI. The speech pathologist in charge of the SI was the same in all cases. A blind procedure was utilized whereby each patient was evaluated independently by two speech pathologist every three months until both examiners were convinced that CAD had been completely corrected. The mean total time of SI required for the normalization of speech in the two groups of patients was compared. Median age in the control group was 54 months, and 55.50 months in the active group ($P > 0.05$). The mean total time of SI in the control group was 30.07, and 14.50 in the active group. A Student's t-test demonstrated that the total time of SI was significantly reduced ($P < 0.001$) when a phonological intervention was utilized. Phonologic based SI significantly reduced the time necessary for correcting CAD in cleft palate children.

Keywords: Cleft palate; Speech; Therapy

1. Introduction

Articulation disorders in children may be either phonetic or phonologic in nature. Phonetic disor-

* Corresponding Author. Fax. + 52-5-568-50-86.

0165-5876/99/$ - see front matter
PII: S0165-5876(99)00040-3

ders are related to inaccurate learning oranatomic, physiologic and/or motor deficits. In contrast, phonologic disorders are considered to be linguistically based and reflect difficulty in the child's organization and representation of the sound system of the language [3,6,14].

Several authors have described that cleft palate patients are at risk for phonetic based problems due to the structural deviations associated with clefting [1,11,18]. However, cleft palate children may be also at risk for phonologic disorders [2].

Speech disorders in cleft palate patients, such as compensatory articulation disorder, may initially occur as a consequence of the cleft, producing a phonetic based disorder. However, over time, these errors become incorporated into the child's developing rule system producing a phonologic disorder [2].

Phonology is a much broader concept than articulation, and refers to the language component that governs the manner in which speech sounds are patterned. It involves the repertoire of phonemes that are found in any language; in other words, those sounds that function in the language to signal a change in meaning. It also involves the alternations that phonemes undergo when they occur in different phonetic contexts and the combination of sounds that may occur in language [3].

Speech intervention in cleft palate children with a phonetic approach considers articulation learning as a specific time of motor learning. Moreover, errors in articulation must be seen as disruptions at some level of the relatively peripheral articulatory processes. Consequently, some therapy procedures are based almost exclusively on the notion that articulation errors are due to faulty control of the articulators [7,3]. In contrast, in a phonologic approach the children must learn -more than just a set of complex articulatory patterns associated with words. They must learn a complete phonology. Furthermore, several authors have proposed that some central, cognitive-phonological processing must be included in any description of phonological acquisition [6,14].

The phonological approach for treating compensatory articulation disorder in cleft palate patients does not necessarily rejects well established principles underlying traditional approaches for articulation disorders. In contrast, articulation must be recognized as a critical aspect of speech sound development under any theory. Consequently, phonological principles should be considered as adding new dimensions and a new perspective to an old problem, not simply as refuting established principles [3].

The purpose of this paper is to study and compare two different approaches for speech intervention in cleft palate children with compensatory articulation disorder, a phonetic approach, and a phonologic approach.

2. Materials and methods

Sample size was calculated at an α 95% confidence interval, and a β power of 80% for a comparative study of two groups. The frequency of compensatory articulation disorder in cleft palate children, and the mean period of time of speech therapy necessary for correcting this disorder were considered. According to these data, at least 14 patients should be included in each group.

All cleft palate patients attending the cleft palate clinic of the Hospital Gea González in México city from June of 1993 to December of 1994 were evaluated. To qualify for the study group for this paper, the patients had to meet the following criteria:

1. unilateral, complete cleft of primary, and secondary palate [8]. The patients had to be normal in all respects otherwise;
2. cleft palate width had to be grades I or II [13];
3. palatal repair of the UCLP had to be performed according to the surgical routine of the Cleft Palate Clinic. This routine includes: surgical repair of the lip and primary palate between 1–3 months, and surgical repair of the secondary palate between 12–18 months with a minimal incision palatopharingoplasty [13];
4. velopharyngeal insufficiency (VPI) after palatal repair had to be demonstrated by phoniatric assessment, videonasopharyngoscopy, and multi-view videofluoroscopy [4];

5. compensatory articulation disorder in association with VPI had to be demonstrated by phoniatric assessment during isolated and connected speech;
6. absence of postoperative fistulae;
7. chronological age had to be between 3–7 years of age at the time of selection for the study;
8. normal hearing demonstrated had to be demonstrated by conventional pure-tone audiometry;
9. language development had to be within normal limits as demonstrated by a battery of age appropriate standardized language tests [16];
10. patients with other neurological deficits other than the speech disorders were excluded;
11. parents had to agree to participate in the study, and attend to the speech therapy sessions, twice per week for as long as necessary.

Twenty-nine children met the criteria mentioned herein and participated in the study. The children were randomly divided into two groups. The two groups were assessed at the beginning and at the end of the study to determine their level in language development and to identify the phonological rules present in the phonological system of each child with special attention in compensatory articulation patterns. For this purpose, the children were videotaped interacting with a trained speech pathologist during free play for 30 min. A 10-min segment was selected where a high level of verbal interaction occurred. The 10 min of interaction were transcribed verbatim to analyze the child's phonological system and the presence of compensatory articulation.

A blind procedure was utilized, whereby all analysis were independently conducted by two speech pathologists who were trained in the procedures. Both speech pathologists participating in this study had been performing phonological transcriptions of cleft palate children for the last 8 years.

Both groups received speech therapy aimed to correct compensatory articulation. The speech pathologist providing therapy was the same for all patients from both groups.The first group received therapy according to a traditional 'articulatory intervention' [10,19], where errors in articulation were treated in a phoneme-by-phoneme basis (e.g. discrimination and production of /p/, first, isolated, then in words, later in sentences).

The second group received therapy with a phonologic approach including the following aspects: (a) the treatment goals were set depending on the phonological rules that are active in the child's system [5], (b) the intervention program was focused on the modification of groups of sounds that seemed to be treated by the child in a similar fashion. In other words, errors were attacked at the rule level, rather than at the phonetic level (e.g. all plosives substituted by glottal stops), and (c) emphasis was placed on the establishment of previously neutralized phonological contrasts. For example, the child who replaced all fricatives with stops could receive a positive response from the clinician when any fricative was used, even if place of articulation or voice errors persisted.

The goal can be conceived as establishing and maintaining new contrasts. With such goal in mind, correct production is not essential. There is much greater emphasis on the use of speech sounds for communicative purposes, rather than on the correct production of sounds as a goal in itself [3].

Children were placed in small groups (of similar age and speech characteristics) to provide opportunities for peer interaction and socialization. Only two to three children were placed in one group to maximize individual opportunities for adult modeling and other intervention prompts.

Intervention consisted of 1-h sessions, twice per week. All patients were followed until both examiners had coincided that compensatory articulation disorder (CAD) was completely eliminated.

The following variables from both groups were compared: age at the onset of speech therapy, and total time of speech therapy.

Total time of speech therapy was considered as the time from the onset of speech therapy until the complete normalization of articulation as assessed in a phonological analysis from a free speech sample (videotape). Once articulation was corrected, all the patients underwent additional

nasopharyngoscopy and multi-view videofluoroscopy for pre-operative surgical planning.

Two-hundred and seventy-eight cleft palate children were revised. A total of 29 patients met the inclusion criteria and were included in the study group. Fifteen patients were randomly selected and were included in the first group. Fourteen patients were included in the second group. The first group underwent an articulatory intervention program of speech therapy. The 14 patients included in the second group started a phonological intervention speech therapy program.

A blind procedure was utilized whereby all analysis of child utterances were independently conducted by two speech pathologists who were trained in the procedures. Language performance and the phonological rules (compensatory articulation) present in each child's system were classified before and after the follow-up period and a concordance value was obtained.

3. Results

Results showed a 94% agreement at pre-test, and a 95% level of agreement at post-test. In the small percentage of cases in which there were disagreements, the observations were discussed until a consensus was reached.

Age ranged from 37 to 113 months. Mean age in group 1 (articulatory approach) was 55.33 months, and mean age in group 2 (phonologic approach) was 57.64 months. A Mann–Whitney rank sum test revealed a non significant difference in the age at the onset of speech therapy between both groups (Table 1).

At the onset of the speech therapy period, all patients included in both groups demonstrated glottal stops and pharyngeal fricatives. In addition, other types of compensatory articulation patterns (i.e. pharyngeal stops, mid-dorsal contacts, posterior nasal fricatives) were found in less than 10% of the patients. The distribution of the types of compensatory articulation patterns across the two groups of patients was similar.

Table 2 shows total time of speech therapy from both groups. The total time necessary for correcting compensatory articulation disorder in the patients from group 1 (articulatory approach) ranged from 14 to 46 months (mean = 30.07 months). In the patients included in group 2 (phonologic approach), the total time of speech therapy ranged from 6 to 22 months (mean = 14.50 months). A Student's t-test demonstrated that the patients that received speech therapy with a phonologic approach required a significantly shorter time of speech therapy for correcting CAD.

4. Discussion

It is evident that the total time of speech intervention necessary for correcting children compensatory articulation disorder (CAD) associated with cleft palate, was critically reduced when a phonological approach was used. In a phonological approach, errors are considered to be linguistically based and are attacked at the rule level, rather than at the phonetic level.

Table 1
Age at the onset of speech therapy (months)[a]

Patient number	Group 1 (articulatory approach)	Group 2 (phonologic approach)
1	85	46
2	54	57
3	38	85
4	46	77
5	68	78
6	63	54
7	78	53
8	61	72
9	41	37
10	44	38
11	65	67
12	65	40
13	39	45
14	43	58
15	40	
	$n = 15$; $X = 55.33$, median = 55.50, S.D. = 15.14	$n = 14$, $X = 57.64$, median = 55.50, S.D. = 15.90

[a] Mann–Whitney rank sum test (median) $T = 0.284$, $P = 0.0776$.

Table 2
Total time of speech therapy (months)[a]

Patient number	Group 1 (articulatory approach)	Group 2 (Phonologic approach)
1	18	13
2	42	20
3	42	6
4	18	13
5	26	22
6	38	18
7	25	10
8	14	16
9	32	12
10	18	18
11	46	17
12	39	11
13	28	14
14	29	13
15	36	
	$n = 15$, $X = 30.07$, median = 29, S.D. = 10.22	$n = 14$, $X = 14.50$, median = 13.50, S.D. = 4.27

[a] Student's t-test, $P < 0.001$.

Several authors have described the phonetic disorders in cleft palate patients [12], and most of them reported that these patients have articulation abilities below age expectations [1,18]. Only a few studies have focused on the phonologic disabilities of these children [5,9,15]. These data suggest that some of the speech sound problems present in cleft palate children are phonologic in nature [5]. Chapman in 1993, studied the phonologic processes in children with cleft palate and found that children with cleft palate exhibit early delays in phonologic development. This finding has implications for the assessment and management of children with cleft palate, including analysis of phonologic processes in addition to phonetic analysis. It also implies that during speech intervention, remediation strategies based on phonological principles should be employed. Moreover, these strategies should emphasize cognitive-linguistic activities [2].

The reduction in the total time of speech intervention necessary for complete correction of CAD using the phonological approach with cleft palate patients, suggests that the study of the phonologic system in these patients is of great importance.

Traditionally, the treatment for compensatory articulation disorder in cleft palate patients has been at a phonetic level [1,11,18]. However, higher organizational levels of language have not been considered. A phonologic approach considers speech sound production as an integral component of higher levels of language organization such as pragmatic, syntactic, and semantic knowledge. Also, phonological treatments acknowledge that speech sounds function as phonemes that signify differences in word meaning, and have become more cognitive and meaning-based than traditional treatments which practice execution of gestures in meaningless syllables [6].

The final goal of both modalities of intervention is to improve intelligibility of speech; the difference is in the methods for achieving this objective.

It should be pointed out that the small number of patients and the homogeneity of the sample [17] included in this study does not allow definite conclusions, but the results obtained are promising.

It will be necessary to use the phonologic approach in a larger number of patients including different conditions, i.e. different kinds of cleft, and different levels of linguistic development, in order to further assess its efficiency for correcting CAD associated with cleft palate.

References

[1] K. R. Bzoch, Articulation proficiency and error patterns of preschool cleft palate and normal children, Cleft Palate J. 2 (1965) 340–349.
[2] K. Chapman, Phonologic processes in children with cleft palate, Cleft Palate J. 30 (1993) 64–71.
[3] M. Fey, Clinical Forum: Phonological Assessment and Treatment. Articulation and Phonology: An Introduction. Language, Speech and Hearing Services in Schools, 23, 1992, pp. 224–232.
[4] K. Golding-Kushner, A. Ysunza, et al., Standarization for the reporting of videonasopharyngoscopy and multiview fluoroscopy. A report from an interanational working group, Cleft Palate J. 27 (1990) 337–347.
[5] B. Hodson, E. Paden, Targeting Intelligible Speech, College Hill Press, San Diego, CA, 1983.
[6] P. Hoffman, Clinical Forum: Phonological Assessment and Treatment. Synergistic Development of Phonetic Skill. Language, Speech and Hearing Services in Schools 23, 1992, pp. 254–260.

[7] P. Hoffman, R. Daniloff, Evolving Views of Children's Disordered Speech Sound Production from Motoric to Phonological, JSLPA/ROA 14 (1990) 13–22.
[8] D.A. Kernahan, R.B. Stark, A new classification for cleft lip and palate, Plast. Reconst. Surg. 22 (1958) 435–443.
[9] J. Lynch, D. Fox, et al., Phonological proficiency of two cleft palate toddlers with school age follow up, J. Speech Hearing Disord. 48 (1983) 274–285.
[10] E.T. McDonald, Articulation Testing and Treatment: A sensory-motor approach, PA: Stanwix-House, Pittsburgh, 1964.
[11] B. McWilliams, R. Musgrave, Diagnosis of speech problems in patients with cleft palate, Brit. J Com. Dis. Spring 26 (1977) 241–274.
[12] B. McWilliams, et al., Diagnosis of speech problems in patients with cleft palate, 2, BC Decker, Philadelphia, 1990, pp. 5–19.
[13] M. Mendoza, et al., Minimal incision palatopharyngoplasty, Scand. J Plastic. Reconstr. Hans Surg. 28 (1994) 199–205.
[14] J Norris, J. Damico, Whole language in theory and practice: implication for language intervention, Language Speech Hearing Services School 21 (1990) 212–220.
[15] G. Powers, et al., Speech analysis of four children with repaired cleft palate, J. Speech Hearing Disord 55 (1990) 542–550.
[16] E. Rangel, et al., Batería de Evaluación de la Lengua Española (BELE) para niños mexicanos de 3 a 11 años SEP-DGEE, México, 1988, pp. 1–383.
[17] R.J. Shprintzen, Fallibility of clinical research, Cleft Palate-Craniofacial J. 28 (1991) 136–140.
[18] D. Van Demark, et al., Patterns of articulation abilities in speakers with cleft palate, Cleft Palate J. 16 (1979) 230–239.
[19] Van Riper, C. (1963) Speech Correction: Principles and methods (4^{th} ed.). Prentice Hall, Englewood Cliffs, NJ, pp. 1–74.