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Analysis of the therapeutic progress of children with phonological disorders after the application of the Multiple Oppositions Approach

Análise do progresso terapêutico de crianças com desvio fonológico após aplicação do Modelo de Oposições Múltiplas

ABSTRACT

The Multiple Oppositions Approach is described as an alternative model for the treatment of children with the severe phonological disorders. The aim of this study was to analyze the therapeutic progress of five children with phonological disorder, submitted to the Multiple Oppositions Approach, regarding the phonetic (sounds) and phonological (phonemes and altered distinctive features) inventories. Participants were five children with phonological disorder, with mean age of 6 years and 1 month. Speech data were collected through phonological assessment, and the Multiple Oppositions Approach was used during 25 sessions of intervention. Changes in the phonetic and phonological inventories (number of phonemes and altered distinctive features) of the subjects were analyzed. It was verified an increase in the number of sounds in the phonetic inventory and phonemes in the phonological inventory, as well as a decrease in the number of altered distinctive features. The Multiple Oppositions Approach allows adequate progress in the treatment of subjects with phonological disorders, providing an expansion in the phonetic (acquisition of sounds) and phonological (acquisition of phonemes and decrease in the number of altered distinctive features) inventories.

RESUMO

O Modelo de Oposições Múltiplas é descrito como um modelo alternativo para o tratamento de crianças com desvio fonológico severo. O objetivo deste estudo foi analisar o progresso terapêutico de cinco crianças com desvio fonológico, submetidas ao Modelo de Oposições Múltiplas, no que se refere aos inventários fonético (sons) e fonológico (fonemas e traços distintivos alterados). Participaram cinco crianças com desvio fonológico, com média de idade de 6 anos e 1 mês. Os dados da fala foram coletados por meio da avaliação fonológica. Para o tratamento, foi utilizado o Modelo de Oposições Múltiplas durante 25 sessões. Foram analisadas as mudanças nos inventários fonético e fonológico (número de fonemas e traços distintivos alterados) das crianças. Houve um aumento do número de sons no inventário fonético e de fonemas no inventário fonológico, assim como uma diminuição do número de traços distintivos alterados. O Modelo de Oposições Múltiplas possibilita um adequado progresso no tratamento dos sujeitos com desvio fonológico, proporcionando uma expansão nos inventários fonético (aquisição de sons) e fonológico (aquisição de fonemas e diminuição dos traços distintivos alterados).

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INTRODUCTION

The main objective of the phonological intervention approaches is to induce or facilitate the reorganization and/or the changes on the phonological inventory of subjects with phonological disorders^(1,2). Among the phonological approaches of therapy, the Multiple Oppositions Approach, still little researched in Brazil, was described in international literature as an alternative model for the treatment of children with severe phonological disorders^(2,3).

The Multiple Oppositions Approach deals directly with the multiple absences of phonemes on the adult inventory, resulting in extensive phonemic substitutions⁽³⁾. By substituting these phonemes in speech, the contrastive function of several sounds becomes absent. Therefore, two or more sounds are similarly produced, but form words with different meanings. In Portuguese, for example, a child that substitutes /l,ʃ,r,z/ for [t] will say ['cata] for the words *cala*, *caixa*, *cara*, *casa*.

In this approach, several target-sounds are contrasted simultaneously with the one that has been substituted. In the example above, the target-sounds would involve the sound present on the phonological inventory [t] and the substituted sounds [l,ʃ,r,z]. The objective of this model is to make new contrasts of sounds emerge from the ones that are substituted, in order to reduce the homonyms on the phonological inventory of the child^(3,4).

Several studies^(1-3,5-11) have indicated changes/acquisitions on the phonological and/or phonetic inventories of their subjects after being submitted to different models of phonological therapy. Some researches^(4,8) have observed changes in the phonological inventories, in which sounds that had not been stimulated during therapy were added to it. Another study⁽⁷⁾ also reported generalization for sounds that were absent from the phonological inventory during the pre-treatment period.

Researchers⁽¹⁰⁾ have stated that one of the ways to verify the effectiveness of a therapy approach is to draw comparisons between the phonetic and phonological inventories and the altered distinctive features. Hence, the present study had the aim to analyze the therapeutic progress regarding the phonetic (number of sounds) and phonological (number of phonemes and altered distinctive features) inventories of children with phonological disorders, treated by the Multiple Oppositions Approach.

CLINICAL CASES PRESENTATION

This case report considers the therapeutic process of five children with phonological disorders – three girls and two boys – with ages between 4 years and 2 months and 8 years and 11 months at the beginning of the treatment. The five participants initially presented severe (S1, S2) moderate-severe (S3, S4) and mild-moderate (S5) phonological disorders. The parents and/or tutors signed the Free and Informed Consent Term. The project was approved by the Research Ethics Committee of the Universidade Federal de Santa Maria, under number 108/05.

Subjects carried out the following assessments: anamnesis, expressive and receptive language, orofacial motor system, articulatory test, auditory discrimination, simplified central

auditory processing assessment, phonological awareness, phonological, and audiological. Additionally, they were submitted to inspection of the external acoustic meatus and neurological assessment, in order to confirm the diagnosis of phonological disorders and exclude other disorders that may interfere in speech acquisition.

Speech/phonological assessment data were gathered through the spontaneous naming of pictures. Data analysis used the contrastive analyses and the analysis of distinctive features. On the contrastive analysis, the sound was considered present in the phonetic inventory when it occurred at least twice at any position in the syllable and in the word. On the phonological inventory, the phoneme was considered acquired if it occurred from 80% to 100% of the possibilities; partially acquired, from 40% to 79%; and not acquired from 0% to 39%⁽¹²⁾.

The distinctive features analysis was obtained by the observation of the substitutions in the contrastive analysis. It was adopted as criterion the minimum occurrence of 10% of the possibilities. This number was chosen due to the fact that higher percentages define better the most frequent substitutions in speech, allowing a better verification of the changes in the course of therapy.

Based on the analyses, it was possible to observe the difficulties of each subject in the phonetic (sounds) and phonological (phonemes and distinctive features) inventories during the initial assessment (Chart 1).

Based on the phonological inventory, it was necessary to define the target-sounds to be used in therapy. For this selection it was necessary to conduct some modifications on the Multiple Oppositions Approach, in order to adequate it into Brazilian Portuguese. The following modifications were carried out: use of target-sounds from the same sound class when there were no substituted sounds from other classes; constitute, as much as possible, meaningful word pairs. These modifications were necessary because of the difficulty to find: (1) sounds of different classes substituted by the same sound; (2) substitutions with different syllabic structure (substitution of onset by a consonant cluster) and, (3) meaningful pairs of words in order to build sets of words to be treated.

The targets selected for the therapy of Subject 1 (S1) were /l/, /R/, /z/ e /v/ and its substitute [j]. The words used in the treatment were ['kaju], ['kalu], ['kaRu], ['kazu] and ['kavu]. For S2, as well as for S5, the [ʃ] was contrasted with /s/, /z/ and /ʒ/, and the target-words selected were ['kaʃa], ['kasa], ['kaza] and ['kaʒa]. S3 was treated with /ʒ/, /l/, /ʎ/ and /r/, plus the phoneme [z], which was produced correctly. The words used as stimuli for treatment were ['kaʒa], ['kala], ['kaʎa], ['kara] and ['kaza]. For S4, the phonemes /z/, /ʃ/ and /ʒ/, that were produced as [s] (also included as target), were approached. The target-words selected were ['kaʃa], ['kasa], ['kaza] and ['kaʒa]. For all participants, the targets were worked in the Onset Medial (OM) position, either due to the inexistence of target-sounds in initial position or to the difficulty in finding pairs of words in this position.

Participants were submitted to treatment by the Multiple Oppositions Approach. The sessions were carried out twice a week, in a total of 25 sessions of 45 minutes each. There was an exception for one of the participants, who acquired the

Chart 1.Characterization of the phonetic and phonological inventories

		Stops					Fricatives							Affricates		Nasals			Liquids			
		p	b	t	d	k	g	f	v	s	z	ʃ	ʒ	R	tʃ	dʒ	m	n	ɲ	l	ʎ	r
Phonetic inventory	S1	p	b	t	d	k	-	-	-	s	z	-	-	-	tʃ	dʒ	m	n	ɲ	-	-	-
	S2	p	b	t	d	k	g	f	v	s	z	ʃ	ʒ	-	tʃ	-	m	n	ɲ	-	-	-
	S3	p	b	t	d	k	g	f	v	s	z	ʃ	-	R	tʃ	dʒ	m	n	ɲ	-	-	r
	S4	p	-	t	-	k	-	f	-	s	-	-	-	-	tʃ	-	m	n	ɲ	l	-	-
	S5	p	b	t	d	k	g	f	v	s	z	ʃ	-	R	tʃ	dʒ	m	n	ɲ	l	-	-
Phonological inventory	S1	p	b	t	d*	k	g	-	-	-	-	-	-	#	#	m	n	ɲ*	-	-	-	
	S2	p	b*	t	d*	k*	-	f*	v	-	-	ʃ*	-	-	#	#	m*	n*	ɲ*	-	-	-
	S3	p	b*	t	d	k	-	f	-	s	z	ʃ*	-	R	#	#	m	n	ɲ	-	-	-
	S4	p	-	t	-	k	-	f	-	s	-	-	-	-	#	#	m	n	ɲ	l	-	-
	S5	p	b*	t	d*	k	-	f	v*	s	-	ʃ	-	R	#	#	m	n	ɲ	l*	-	-

Note: * = partially acquired phoneme on the initial assessment; # = not Portuguese phonemes; - = absent

targets in 15 sessions and, for this reason, it was not possible to continue with the same model.

Initially, it was carried out the baselines for the partially acquired and not acquired phonemes in the phonological inventory of each child. Afterwards, the treatment was started. Every five sessions, it was performed a probing, in the same manner the baselines had been conducted. The objective of this procedure was to analyze the progress of patients regarding the targets.

In order to discuss the changes/acquisitions for each participant, a comparison was drawn among the number of sounds present on the phonetic inventory, the number of acquired phonemes on the phonological inventory, and the number of altered distinctive features, pre- and post-treatment. The Student's t test was employed in the analysis.

The sounds absent on the phonetic inventory, as well as the absent and partially acquired phonemes on the phonological inventories, in both initial and final assessments, were identified for each participant (Table 1).

With regards to the phonetic inventory, there has been an

acquisition of a great number of sounds. S1, who used to present ten absent sounds, presented only three at the end of the treatment. S2, who used to present five, presented one absent phoneme. S3 acquired all the absent phonemes. S4 remained with three of the 11 sounds absent on the initial phonetic inventory. S5 acquired two of the three absent sounds. With regards to the phonological inventory, all participants acquired phonemes but S4, who acquired the phonemes /v/ and /z/ only partially.

The results of the statistical analysis were obtained by drawing a comparison of the mean numbers of present sounds on the initial and final assessments, related to the phonetic and phonological inventories (Table 2).

There was an increase in the number of sounds present on the phonetic inventory and in the acquired phonemes on the phonological inventory after treatment. Furthermore, there was a reduction in the number of altered distinctive features, since the participants added segments to their phonological inventories, decreasing the alterations of features present in the initial assessment.

Table 1. Sounds absent from the phonetic inventory, and partially acquired and absent phonemes on the phonological inventory

Participants	Assessment	Phonetic inventory		Phonological inventory	
				PAP	AP
S1	IA	g, f,v,z,ʃ,ʒ, l,r,ʎ,R		d, R	g,f, v, s, z, ʃ,ʒ, l, r, ʎ, R
	FA	g,ʒ,r		b, z,R	g, f,ʒ, l, r, ʎ
S2	IA	dʒ,l, r,ʎ, R		b, d,k, f, ʃ,m, n, R	g, s, z,ʒ, l, r,ʎ, R
	FA	ʎ		k,g, l, R	s, z, r,ʎ
S3	IA	ʒ, l,ʎ		b, z, ʃ	g, v,ʒ, l, r,ʎ
	FA	ʎ		-	R
S4	IA	b, d, g, v, z,ʃ,ʒ, dʒ, r,ʎ, R		-	b, d,g, v,z, ʃ,ʒ, r,ʎ, R
	FA	g, ʒ, ʎ		v, z	b, d, g, ʃ,ʒ, r,ʎ, R
S5	IA	ʒ, r,ʎ		b, d, v, l	g, z, ʒ, r,ʎ
	FA	ʎ		b, v, z, l	g, r, ʎ

Note: IA= initial assessment; FA = final assessment; AS = absent sounds; PAP = partially acquired phoneme; AP = absent phoneme

Table 2. Sounds present on the phonetic inventory, phonemes acquired on the general phonological inventory and altered distinctive features pre and post-treatment

	IA		FA		p-value
	Mean	(SD)	Mean	(SD)	
Pel	14.6	(3.8)	19.4	(1.3)	0.01*
Pol	7.2	(2.7)	11.8	(3.6)	0.03*
ADF	27.4	(9.0)	18	(9.0)	0.03*

* Significant values ($p < 0.05$) - Student's t test

Note: Pel = phonetic inventory; Pol = phonological inventory; ADF = altered distinctive features; IA = initial assessment; FA = final assessment

The acquisitions were compared for the different sound classes, the phonetic (stops, fricatives, affricates, nasals and liquids) and phonological (stops, fricatives, nasals and liquids) inventories, and for the number of altered distinctive features. For the analysis, the Fisher Exact test was employed, and both analyses adopted significance level of 5% ($p < 0.05$).

Concerning the initial and final assessments, the following data were obtained: the mean number of sounds on the phonetic inventory; the mean number of phonemes on the phonological inventory; the number of expected sounds for each sound class (Figure 1). The expected number corresponds to the maximum quantity of sounds in each class.

With regards to the phonetic inventory, acquisitions in all sound classes were verified, except for the nasals, which was already complete before treatment. The class with the largest number of acquisitions was the fricatives (/f,v,s,z,ʒ/), followed by the liquids (/l,r,R,ʎ/). The targets employed during treatment belonged to these two sound classes only. The affricates class ([tʃ,dʒ]) became complete after treatment, that is, it reached what was expected. For the stops (/p,b,t,d,k,g/), there was an increase on the number of sounds, but it was not sufficient to reach the expected. There were no differences between initial and final assessments regarding the different sound classes.

As for the phonological inventory, there was acquisition of phonemes in all possible sound classes, even though the nasal was the only sound class to reach the expected after treatment. The greatest phoneme reorganizations occurred for fricative sounds (/f,z,ʒ/), followed by stops (/b,d,g/) and liquids

(/l,R,ʎ/). Improvements were also observed for nasal sounds (/m,n,ɲ/). The major evolutions occurred for fricative sounds, perhaps due to the fact that they were treated in all participants, although the number of sounds varied according to the phonological inventory of each participant. Three participants were treated only with fricatives, which may have favored the acquisition of stops, a hierarchically less complex sound class. The nasals class was the only one to reach 100% of acquisition, since that most participants had already acquired /m/, /n/ and /ɲ/ in the pre-treatment. The nasals class is one of the most stable classes during acquisition, even in cases of severe disorders. There was no difference between initial and final assessments regarding the different sound classes.

DISCUSSION

The Multiple Oppositions Approach, employed on the therapy of the five children with phonological disorders, provided an increase in the number of sounds present on the phonetic inventory and in the number of phonemes on the phonological inventory. Hence, there was improvement in the speech intelligibility of these participants, speakers of Brazilian Portuguese. Some studies^(2,3) have reported a phonological reorganization after the beginning of treatment using this approach in English speakers. In the Brazilian literature, there are few studies that employ the Multiple Oppositions Approach, making it difficult to draw a comparison with the results obtained in this study.

With regards to the phonetic inventory, there was an increase in the number of present sounds, mainly for fricatives and liquids. In general, these are the most compromised sound classes in cases of phonological disorder, since they are more complex in acquisition. Several studies^(5,6,10) about children with phonological disorder have reported the acquisition of sounds in the phonetic inventory after the application of phonological-based therapy approaches. A research⁽¹⁰⁾ that compared the models ABAB-Withdrawal and Multiple Probes, Maximal Oppositions and Modified Cycles found difference between pre- and post-therapy phonetic inventories.

In the initial assessment, the participants in this study had already acquired all nasal sounds /m, n, ɲ/, which belong to a less complex and easier to produce sound class. Studies^(6,7,13) have pointed out that the treatment of more complex sounds

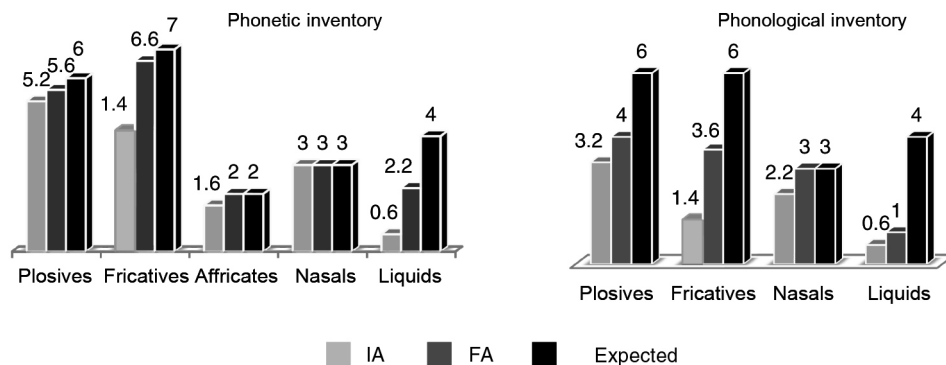


Figure 1. Number of sounds on the phonetic inventory and of phonemes on the phonological inventory on the initial (IA) and final (FA) assessments, and the number of phonemes expected for each class

(fricatives and liquids) results in greater changes on the phonological inventory. Hence, on these studies, the treatment of more complex sound classes resulted in the acquisition of less complex sounds without direct treatment, which has provided reorganization of the inventory and a quicker and more efficient therapy. Another study⁽⁸⁾ have reported that one of the objectives of phonological intervention is to obtain maximum reorganization of sounds in the shortest period of time.

Children in this study presented acquisition in all other sound classes (stops, fricatives and liquids). This finding agrees with the results of another study⁽⁶⁾, which reported an increase on the number of acquired sounds after therapy employing the Model ABAB-Withdrawal and Multiple Probes.

In reference to the phonological inventory of the five participants, there was an increase on the number of acquired phonemes after treatment with the Multiple Oppositions Approach. Some studies^(4,8,14) have observed that sounds not treated during therapy were added to the phonological inventories of the subjects, providing modifications on their speech, such as intelligibility improvement. As previously referred, there are several studies in national literature employing the Multiple Oppositions Approach in Brazilian Portuguese speakers. Therefore, the evolution observed in the present study with this type of treatment were compared to different models already studied in Brazil. Studies^(5,6,10,11) with Brazilian children who presented phonological disorder have reported the expansion of the phonological inventory of participants submitted to different therapy models (ABAB-Withdrawal and Multiple Probes, Maximal Oppositions, Modified Cycles), all of them with phonological basis.

It was observed, on the phonological inventory, great improvement in the production of phonemes in all sound classes. The greatest increase in percentage occurred for the fricative class, followed by the stops. A study⁽⁵⁾ have reported that it is not necessary to have all less complex sounds acquired to acquire more complex sounds. For instance, a child does not need to acquire all stops (less complex phonemes) before acquiring fricatives (more complex phonemes). That was observed on S1, who acquired the phonemes /f, v, s, z, ʃ, ʒ/ before the complete acquisition of stops (/g/). The same occurred for S2, who acquired liquids (/R, l/) previously to the acquisition of all stops. Such aspect has also been observed for participants S4 and S5. S4 acquired the fricative sounds /f, s/ and the liquid /l/ before he had acquired the stops /b, d, g/. S5 acquired the voiceless fricatives /f, s, ʃ/ before the /g/ sound.

It was possible to verify a decrease in the number of altered distinctive features after 25 therapy sessions. Despite this reduction, some alterations remained at the final assessment. It is probable that the participants, although they had presented some acquisition in the phonetic and phonological inventories, had not established the phonological inventory yet, and, for this reason, maintained substitutions of phonemes and, consequently, altered distinctive features. Such finding agrees with other studies^(6,10,11) that observed a decrease in the number of altered distinctive features after phonological therapy. Another research⁽¹⁴⁾ reported the acquisition of a higher number of phonemes on the phonological inventory, based on the stimulation

with target-sounds that comprised most of the altered distinctive features, and with less complex sounds.

FINAL COMMENTS

The application of the Multiple Oppositions Approach makes it possible to evolve regarding the phonetic inventory (acquisition of sounds) as well as the phonological inventory (acquisition of phonemes and reduction of altered distinctive features). Such development shows that the opposition of features in the treatment of several sounds simultaneously may favor phonological reorganization.

For the Multiple Oppositions Approach to be applied in Brazil, it had to be modified in several aspects concerning the choice of target-sounds, in order to enable its application in participants with phonological disorder. Thus, further studies are suggested with a higher number of children, so that the applicability and efficacy of this approach in children with phonological disorder is proved for speakers of Brazilian Portuguese.

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