Mudanças fonológicas obtidas no tratamento de sujeitos comparando diferentes modelos de terapia****

Phonological changes obtained in the treatment of subjects comparing different therapy models

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Abstract
Background: there are many options of phonological disorder treatments that aim at improving children's communication. Aim: to analyze the Percentage of Consonants Correct-Revised, the number of acquired phonemes in the phonological system and the types of generalizations obtained in treatment, comparing different therapy models in subjects with different severity levels of phonological disorder. Method: participants were 21 children, mean age 5:7 years. All subjects underwent speech, language and hearing evaluations and additional exams. Children were then divided into groups according to therapy model and severity level of phonological disorder. The Percentage of Consonants Correct-Revised, the number of acquired phonemes and the types of generalizations were analyzed and compared within and between each therapeutic model, considering pre and post therapy evaluations. Results: it was possible to observe improvement in the three analyzed therapy models. When comparing the therapy models, the greater improvement in percentage terms was observed for the ABAB-Withdrawal and Multiple Probes Model and the Maximal Oppositions Model, even though the statistical analysis indicated no significant difference. Conclusion: the three therapy models were effective for the treatment of children with phonological disorder because they all of them provided an increase in the Percentage of Consonants Correct-Revised, in the number of acquired phonemes and in the types of analyzed generalizations.
Key Words: Articulation Disorders; Speech Therapy; Child.

Resumo
Tema: há muitas opções de tratamento para o desvio fonológico os quais buscam melhorar a comunicação das crianças. Objetivo: este estudo visa analisar o Percentual de Consoantes Corretas-Revisado, o número de fonemas adquiridos no sistema fonológico e os tipos de generalizações obtidas no tratamento, comparando diferentes modelos de terapia em sujeitos com diferentes gravidades do desvio fonológico. Método: a amostra constou de 21 crianças, com idade média de 5:7 anos. Foram realizadas as avaliações fonoaudiológicas e exames complementares. Após a realização destas avaliações, as crianças foram classificadas em grupos de acordo com o modelo de terapia e gravidade do desvio fonológico. O Percentual de Consoantes Corretas-Revisado, o número de fonemas adquiridos e os tipos de generalizações foram analisados e comparados em cada modelo e entre os modelos terapêuticos, por meio das avaliações inicial e final. Resultados: ao comparar os itens em cada modelo observaram-se evoluções nos três modelos pesquisados. Na comparação entre modelos, os maiores aumentos de percentuais encontram-se nos Modelos ABAB-Retirada e Provas Múltiplas e Oposições Máximas, apesar de a análise estatística mostrar que não há diferença significativa entre eles. Conclusão: os três modelos aplicados foram eficazes no tratamento destas crianças com desvio fonológico, pois proporcionaram um aumento no Percentual de Consoantes Corretas-Revisado, no número de fonemas adquiridos e nos tipos de generalizações pesquisados.
Palavras-Chave: Transtornos da Articulação; Fonoterapia; Criança.

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Introduction

An effective communication occurs normally through oral language. Some children may present difficulties in the acquisition of sounds in their language even if they are in their expected age group and if they do not have organic disorders. This difficulty is named phonological disorder, which is characterized by omissions and substitutions of speech sounds1.

Nowadays, there are several phonologically based therapeutic models to treat children with phonological disorders. Some of the models described in the literature are: ABAB - Withdrawal and Multiple Probes2, Modified Maximal Opposition Model3 and Modified Cycles Model4.

These models aim at making communication more effective by restructuring the phonological system, aiming at generalization3,5-10. Generalization is the increase of the correct production of the treated target phones to other contexts or untreated environments6,11. It is also a way of verifying the effectiveness of each therapeutic model.

However, there are few researches that compare the effectiveness of these treatment approaches5,8,10,12,13. Thus, the objective of this study is to analyze the Percentage of Consonants Correct - Revised, the number of acquired phonemes in the phonological system and the types of generalization obtained by comparing different therapy models in subjects with different levels of severity of the phonological disorder.

Method

O grupo de indivíduos foi constituído de 21 criaThe group of subjects consisted of 21 monolingual children, speakers of Brazilian Portuguese and with phonological disorder, who were 11 boys and 10 girls. The average age at the beginning of the treatment was 5:7. For the subjects to participate in the research (and also in order to publish the results afterwards), the children's parents received information about the research and signed in the Term of Free Informed Consent. This research is linked to a research project, registered on the Gabinete de Projetos (GAP) under No 018278, and approved by the Comitê de Ética em Pesquisa - CEP (Research Ethics Committee) of a Higher Education Institution, under No 046/02.

The criteria for including the group of subjects in the research were: to be diagnosed with phonological disorder; not to have meaningful alterations in the evaluations, except for the phonological one; to present different levels of severity of the phonological disorder.

In order to confirm the diagnosis of the phonological disorder and to discard other aspects that could interfere in the language development, the children underwent the following phonoaudiological evaluations: anamnesis, comprehensive and expressive language; oral-motor system; auditory discrimination and phonological evaluation. In addition, all the subjects underwent complementary examinations involving otorrinolaringological, audiological and neurological evaluations.

The speech data of all the subjects were recorded, phonetically transcribed and analyzed through contrastive analysis. Based on this analysis, it was possible to obtain the phonological system of each child. A phoneme is considered to be acquired when it occurs from 80% to 100% of the possibilities, partially acquired when it occurs from 40% to 79% and not acquired when it occurs from 0% to 39% of the possibilities14.

Based on the contrastive analysis, the level of severity of the phonological disorder was calculated through the Percentage of Consonants Correct - Revised (PCC-R)15. The percentages of classification used in this research were the same described for the PCC16.

Based on the results of the PCC-R the subjects were classified into severe disorder (PCC-R < 50%), moderate-severe disorder (51% < PCC-R > 65%), mild-moderate disorder (66% < PCC-R > 85%) and mild disorder (86% < PCC-R > 100%). According to the PCC-R, the sample was divided into two groups: group 1 (G1) was composed by nine subjects with severe or moderate-severe disorder and group 2 (G2) was composed by 12 children with mild-moderate or mild disorder.

Besides, the subjects selected to participate in this research were classified into three groups according to the model of phonological therapy used during the treatment in the following way: six underwent the treatment by the ABAB - Withdrawal and Multiple Probes (A); seven by the Modified Oppositions Model (O); and eight, by the Modified Cycles Model (C).

The phonological therapy was accomplished by using recreational activities, according to the children's interests and following the procedures and peculiarities of each model. At the end of each session, copies of the words in analysis (both in drawings and in their written form) and the list of words of the auditory bombardment, which should

be read at home by the child at least once a day, were given to the parents.

In the ABAB - Withdrawal and Multiple Probes Model there were from 2 to 4 therapy cycles, with approximately 18 to 36 sessions, according to the child's need. In the Maximal Opposition Model there were 20 therapy sessions and in the Modified Cycles Model there were 2 therapy cycles, with approximately 12 to 24 sessions.

At the end of the treatment, the subjects underwent the phonological reevaluation (final evaluation). The PCC-R, the number of acquired sounds and the following types of generalization were analyzed: to lexical items that were not used in the treatment, to other word position, within and across sound classes.

The development of the therapy was observed by comparing the difference between the contrastive analysis of the evaluations (IE - Initial Evaluation) and the reevaluations (FE - Final Evaluation) made in the different therapy models. The data were analyzed by comparing the therapeutic models and then the levels of severity of the phonological disorder. These analyses underwent statistical treatment with the ANOVA test, considering the significance level of $p<0,05$.

Results

Table 1 presents the description of the comparison of the PCC-R, the number of acquired phonemes in the phonological system and generalizations (to lexical items that were not used in the treatment, to other word position, within and across sound classes) among the therapy models in each group of severity of the phonological disorder.

It is possible to see great improvements (difference between IE and FE) as to the items in analysis, although there is no statistical difference among the ABAB - Withdrawal and Multiple Probes, the Maximal Oppositions and the Modified Cycles Models in relation to the PCC-R, to the number of acquired phonemes in the phonological system and to the types of generalization.

It is possible to see that the greatest percentage increases are found in the ABAB - Withdrawal and Multiple Probes and the Maximal Oppositions models. In both groups the statistical analysis showed that the therapeutic models did not differ as to the items in analysis: PCC-R, number of acquired phonemes and types of generalization, and the three models were effective in the treatment of subjects with different levels of severity of the phonological disorder.

Table 2 shows the comparison of the groups of severity of the phonological disorder as to the PCC-R, to the number of acquired phonemes and to the types of generalization in each therapy model.

It is possible to observe that there were improvements in the three models in analysis: ABAB - Withdrawal and Multiple Probes, Modified Maximal Opposition and Modified Cycles.

In the ABAB - Withdrawal and Multiple Probes Model, important advances were observed as to the items in analysis, but there was no statistical difference among the groups, only in the PCC-R and in the generalization within sound class.

As to the Modified Maximal Opposition Model, only the PCC-R was statistically significant in the comparison among the groups of severity. The Modified Cycles Model presented the fewest acquisitions, and there was no statistical difference between the groups (G1 e G2).

TABLE 1. Comparison of the phonological changes among the phonological models in different groups of severity of the Phonological Disorder.

	GROUP 1 (n=9)				GROUP 2 (n=12)			
Models	**A (n=4)**	**O (n=3)**	**C (n=2)**	**P**	**A (n=4)**	**O (n=4)**	**C (n=4)**	**p**
PCC-R	39,5(19,8)[a]	23,1(2,3)[a]	6,8(1,5)[a]	**0,08**	13,8(4,5)[a]	9,6(6,7)[a]	9,5(4,5)[a]	**0,46**
N. AF	3,7(2,1)[a]	3,7(2,5)[a]	0,0(0,0)[a]	**0,16**	2,0(2,3)[a]	0,5(0,6)[a]	0,2(0,5)[a]	**0,22**
Lexical items that were not used in the treatment	60,2(25,9)[a]	42,2(30,6)[a]	28,0(13,3)[a]	**0,39**	84,5(11,4)[a]	61,9(35,3)[a]	50,6(18,3)[a]	**0,18**
Other word positions	56,5(38,4)[a]	53,6(34,7)[a]	0,0(0,0)[a]	**0,20**	32,4(38,8)[a]	51,6(39,2)[a]	19,3(14,9)[a]	**0,42**
Within sound class	46,1(8,7)[a]	48,9(39,2)[a]	12,1(1,4)[a]	**0,25**	20,5(18,1)[a]	34,1(36,4)[a]	38,3(35,0)[a]	**0,70**
Across sound class	44,3(29,9)[a]	36,3(18,5)[a]	0,0(0,0)[a]	**0,17**	44,9(15,3)[a]	19,2(23,0)[a]	13,6(27,3)[a]	**0,16**

Legend: PCC-R: percentage of consonants correct-revised. AF: acquired phonemes . A: ABAB-Withdrawal and Multiple Probes. O: Modified Maximal Opposition. C: Modified Cycles.

TABLE 2. Comparison of the phonological changes in the different groups of severity in each therapeutic model.

	ABAB – Withdrawal and Multiple Probes Model (n=8)			Maximal Oppositions Model (n=7)			Modified Cycles Model (n=6)		
	G1 (n=4)	**G2 (n=4)**	**P**	**G1 (n=3)**	**G2 (n=4)**	**p**	**G1 (n=2)**	**G2 (n=4)**	**p**
PCCR	39,5(19,8)[a]	13,8(4,5)[b]	**0,04**	23,1(2,3)[a]	9,6(6,7)[b]	**0,02**	6,8(1,5)[a]	9,5(4,6)[a]	**0,48**
N. AF	3,7(2,0)[a]	2,0(2,3)[b]	**0,30**	3,7(2,5)[a]	0,5(0,6)[b]	**0,05**	0,0(0,0)[a]	0,25(0,5)[a]	**0,54**
Lexical items that were not used in the treatment	60,2(25,9)[a]	84,5(11,4)[a]	**0,13**	42,2(30,2)[a]	61,9(35,3)[a]	**0,47**	28,0(13,3)[a]	50,6(18,3)[a]	**0,20**
Other word positions	56,6(38,4)[a]	32,4(38,8)[a]	**0,41**	53,6(34,7)[a]	51,6(39,2)[a]	**0,96**	0,0(0,0)[a]	19,3(14,9)[a]	**0,16**
Within sound class	46,1(8,7)[a]	20,5(18,1)[b]	**0,04**	49,0(39,2)[a]	34,1(36,4)[a]	**0,62**	12,1(1,4)[a]	38,3(35,0)[a]	**0,37**
Across r sound classes	44,3(29,9)[a]	44,9(15,3)[a]	**0,97**	36,3(18,5)[a]	19,2(23,0)[a]	**0,34**	0,0(0,0)[a]	13,6(27,3)[a]	**0,54**

Legend: PCCR: percentage of consonants correct revised. AF: acquired phonemes .G1: group 1. G2: group 2. A ABAB – Withdrawal and Multiple Probes. O: Modified Maximal Opposition. C: Modified Cycles.

Discussion

It was possible to notice an increase in the PCC-R in all the groups of severity of the phonological disorder in the different models in analysis (ABAB - Withdrawal and Multiple Probes Model, Modified Cycles and Maximal Opposition Model), but there was no statistical difference among the models. A research8 that compares different therapy models demonstrated that all the children increased their percentage of consonants correct during the intervention.

As to the generalizations comparing the models in the different groups, it was found that the subjects presented improvements in relation to the generalization to lexical items that were not used in the treatment, to other word position, within and across sound classes in the models in analysis (ABAB - Withdrawal and Multiple Probes, Modified Cycles and Maximal Opposition). Similar results were found in other studies 8,12,13.

The comparison of the three different therapy models used in this research showed that they were effective in the treatment of the children in analysis, as they acquired sounds in their phonological system and presented generalizations. The effectiveness of these models was demonstrated in other researches 3,4,9,10. An author17 says that phonological approaches aim at generalization based on the treated targets.

In the comparison of the groups inside each therapeutic model, the statistical analysis demonstrated that the PCC-R in the ABAB - Withdrawal and Multiple Probes Model and in the Modified Maximal Opposition Model is statistically different in G1 and G2. Another study6 mentioned that the effectiveness of the treatments may be in the initial selection of the treatment target.

As to the number of acquired phonemes in the phonological treatment, it was observed a directly proportional relation among the groups. That is, the higher the level of severity (G1), the greater the number of acquired sounds, except for the Modified Cycles Model. The author of a study5 emphasized that most changes happened with children who had more to learn from the intervention. Another research18 reported the expansion of excluded sounds in the pre-treatment in the inventory of a child with phonological disorder.

With respect to the generalization to lexical items that were not used in the treatment, to other word position, within and across sound classes, when compared among the groups, there was statistical difference only in the ABAB - Withdrawal and Multiple Probes Model in the generalization within sound class. Generalization was observed in all the groups with phonological disorder in the three models in analysis. Similar results were found in various studies7,8,12,13. A reasearch13 reported that the generalization within and across sound classes occurred in all the models in analysis, but the first one happened mainly in the subjects submitted to the ABAB - Withdrawal and Multiple Probes and the Modified Maximal Opposition Models and the second one to the subjects submitted to the ABAB - Withdrawal and Multiple Probes Model. An author6 says that both these kinds of generalization are desirable in the treatment because they contribute with global changes in the sound system of the child.

Conclusion

Based on the results of this research, it was observed that the three different models of phonological therapy applied in this study were effective for the treatment of the children. There was an increase in the PCC-R, in the number of acquired phonemes in the phonological systems and in the generalization to lexical items that were not used in the treatment, to other word position, within and across sound classes in each model.

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