Phonological therapy based on the stimulation of single sounds and groups of sounds

Terapia fonológica a partir da estimulação de sons isolados e em conjunto

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ABSTRACT

Purpose: To verify whether the stimulation of groups of sounds results in greater phonological changes than the stimulation of single sounds, and to analyze the occurrence of generalization across and within sound classes. **Methods:** The sample comprised ten children with phonological disorders, with ages between 4 years and 8 months and 7 years and 3 months, divided into two groups. Group 1 (G1) was treated by the Multiple Oppositions approach, and Group 2 (G2), by the ABAB-Withdrawal and Multiple Probes approach. The treatment of G1 consisted of stimulation of the contrast of many sounds presented together, while the treatment of G2 involved stimulation of only one target sound per cycle of treatment. It was analyzed the number of absent sounds and the occurrence of generalization across and within sound classes, pre- and post-treatment. Data were statistically and descriptively analyzed. **Results:** G1 acquired more sounds than G2; however, this difference was not significant. Considering the generalization within sound class, G1 presented major changes, while generalization across sound classes was greater for G2, although none of these results were statistically significant. **Conclusion:** Both methods favored changes in the phonological system of the children studied, allowing the acquisition of phonemes and the occurrence of generalizations. There is no difference between them regarding treatment effectiveness.

Keywords: Speech disorders; Speech; Speech therapy; Generalization, response; Sound; Child

INTRODUCTION

The search for effective treatments for phonological disorder has originated many therapeutic models that differ from each other according to their theoretical principles – nowadays there are more than ten. Among them we can highlight the Minimal Pairs approach[1], the Maximal Opposition approach[2,3], the Multiple Oppositions approach[4], the ABAB-Withdrawal and Multiple Probes model[5], the Metaphon[6], the Modified Cycles approach[7], and the Metaphonological Intervention[8]. The latest has not yet been applied in children speakers of Brazilian Portuguese.

Due to the existence of so many models of phonological therapy, it is important to conduct researches with the aim to compare them, which will contribute to the choice of the most suitable method for speech therapy. In order to select the most appropriate treatment, the speech therapist should take the phonological system of the child into consideration, in order to select both the therapeutic model and the target sounds.

Recent studies have applied therapeutic models and analyzed the different types of generalization[9-11], while others have compared the different approaches in the treatment of phonological disorder and verified its effectiveness[12-14]. However, no study has compared models considering the amount of targets selected for therapy, which makes the present research important, for it is believed that the greater the number of sounds stimulated, the faster the acquisitions and the greater the generalization[14].

The ABAB-Withdrawal and Multiple Probes and the Multiple Oppositions models differ from each other in the structure of the session and, mainly, in the amount of targets selected for therapy. The first one refers to the stimulation of only one target sound per treatment cycle (nine sessions), and the latest one to the contrast of many sounds presented simultaneously during all the sessions in the therapy cycle (five sessions or more). Dealing with sounds simultaneously can make phonological therapy more effective because it emphasizes multiple

contrasts, which are necessary for the acquisition of phonology. Moreover, the stimulation of many difficulties simultaneously can make the therapeutic process faster.

This study had the aim to verify whether the stimulation of a group of sounds provides greater phonological changes than the stimulation of a single sound, and to analyze the occurrence of generalization within and across sound classes.

METHODS

For the accomplishment of this research, we used the database of the Center for the Study of Language and Speech of the Universidade de Santa Maria (UFSM). The sample consisted of ten subjects with phonological disorder, five girls and five boys, with ages between 4 years and 7 months and 7 years and 3 months, who were treated in a research project regarding speech therapy in cases of phonological disorder. The project was approved by the Research Ethics Committee of UFSM, under number 108/05. Subjects' parents signed a Free and Informed Consent Term, authorizing their participation in the research and the publication of its results.

Selected subjects presented the following criteria: speech alterations; age above 4 years; normal hearing for speech; normal oral structures and motor skills; no previous history of phonological therapy; member of a family of monolingual Brazilian Portuguese speakers; absence of neurological problems relevant for speech production; intellectual abilities adequate for the development of oral language; oral language comprehension adequate for mental age; apparently good expressive language abilities, in terms of range of vocabulary and length of utterances.

In order to verify the criteria described above, which define the diagnosis of phonological disorder, all subjects underwent the following speech-language pathology assessments: receptive and expressive language, sensorimotor system, auditory discrimination, phonological awareness, articulation and phonology. Assessment results where within the normality standards for each age group, except for the phonological task. Subjects also underwent complementary assessments (audiological, otorhinolaryngological and neurological), with the aim to exclude any organic or functional injury.

The speech evaluation used the Children's Phonological Assessment (AFC) instrument[15]; data were recorded and later transcribed based on a spontaneous picture naming activity. After the transcription, it was conducted the contrastive analysis and the analysis through distinctive features. With the contrastive analysis, the phonetic inventory and the phonological system of each subject were obtained. Each sound was considered present in the phonetic inventory when in occurred twice or more, regardless of its position in the word[16]. In order to obtain the phonological system, we considered acquired segment when it had from 80% to 100% correct productions; partially acquired, when it had from 40% to 79%, and not acquired, when it had from 0% to 39% correct productions[17].

The subjects selected for this research should have been treated by the Multiple Oppositions Model[4] or the ABAB-Withdrawal and Multiple Probes Model[5]. Children treated by the Multiple Oppositions Model should present phonological system compatible with the proposed model[4], that is, substitution of many sounds for the same sound; the ones treated by the ABAB-Withdrawal and Multiple Probes Model should have completed three treatment cycles.

The sample was divided into two groups. Group 1 (G1) was composed by subjects treated with the Multiple Oppositions Model[4], in which the sounds that the child substitutes for a single phoneme are selected (for example: the phonemes /R/, /k/, /g/ and /m/ are replaced with [s]). The therapy involves a group of words that differ from each other by only one phoneme, for example: *rola x mola x cola x gola x sola*, which generate homonyms when they are produced by the child. This model is usually used with children with severe phonological disorders, because in these cases the substitution of many sounds by a single sound is more frequent than in less severe disorders; that is, not every child can be treated with this model. Group 2 (G2), on the other hand, was composed by subjects treated by the ABAB-Withdrawal and Multiple Probes Model[5], in which only one target sound is selected based on distinctive features. This therapeutic model is based on the assumption that a sound is treated considering the implicational hierarchy of distinctive features, in which the treatment of more complex sounds will promote the acquisition of less complex sounds, without direct intervention. This model can be applied in the treatment of milder disorders, such as moderate-severe, mild-moderate and mild disorders.

G1 was composed by S1, S2, S3, S4 and S5, and G2 by S6, S7, S8, S9 and S10. The children were paired (S1 and S6; S2 and S7; S3 and S8; S4 and S9; S5 and S10) as for the number of non-acquired phonemes in the phonological system, pre-treatment, age and gender. The average of non-acquired phonemes in both groups was seven phonemes. Mean age was 5 years and 11 months for G1, and 5 years and 6 months for G2. Regarding gender, there were three boys and two girls in each group.

The therapy applied in G1 (Multiple Oppositions approach) consisted of 25 sessions, except for a child who, after 15 sessions, had only one sound missing in the phonological system, which made it impossible to continue the treatment with the proposed model.

In the sessions with the Multiple Oppositions model, we used the therapeutic structure proposed in a previous study[18], in which the baseline is set before the beginning of the treatment. This is a survey in which each non-acquired and partially acquired sound in the phonological system is tested (this system is obtained through the phonological assessment, before treatment). In order to do this, six words that require each absent phoneme and that can be represented in pictures are selected for the child to name. The same baseline, subsequently called survey, was used during the sessions in order to monitor the patients' development.

After the definition of the baseline, the treatment itself started. There were two weekly sessions of 45 minutes each, total of 30 therapy sessions, with a survey every five sessions. After the end of the sessions, the phonological assessment was carried out again. The therapeutic session always started and

finished with auditory bombardment, for which four target words were selected for each target sound.

The therapy applied in G2 – ABAB-Withdrawal and Multiple Probes Model – consisted of 27 sessions (two weekly sessions of 45 minutes each). With regards to the therapeutic structure adopted, initially speech data were collected (A1) through recordings of spontaneous speech and picture naming, followed by transcription and phonological analysis. Then, the altered distinctive features were determined and, based on that, the target sound for the treatment was defined, as well as their respective target words and the words for the auditory bombardment. In this model only one target sound is selected to be treated during a cycle (nine sessions) or more. The auditory bombardment comprised 15 selected words, carefully containing the target sound for the treatment. The child only listened and observed the productions of the therapist, with no need to repeat. The list of words was read at the beginning and at the end of the sessions.

The therapeutic intervention, in the first treatment cycle (B1), lasted nine sessions. During the cycle, three Basic Target Probes (BTP) were carried out, in the first, fifth and ninth sessions, assessing the acquisition of target sounds in the target words and non-target words. After the treatment (B1), five sessions of the Withdrawal Period (A2) were carried out, which consisted of an interval without direct treatment of the target sound. In these sessions, data from naming and spontaneous speech were collected in order to observe the generalizations obtained concerning the acquisition of target sounds and non target sounds in the phonological system of these subjects.

For the analysis of the results, the difference in the number of absent sounds in the phonological system was compared to the mean percentage of occurrence of generalizations (across and within sound classes) before and after treatment, between G1 and G2, based on Student's t-test for two independent samples, considering $p<0.05$. Moreover, it was conducted a qualitative analysis of the generalizations based on the data obtained before and after treatment.

RESULTS

Figure 1 shows the average of absent sounds between groups. It is observed that G1 presented lower average (5.6) than G2 (6.6), that is, children in G1 acquired more sounds in their phonological system, but this difference was not significant.
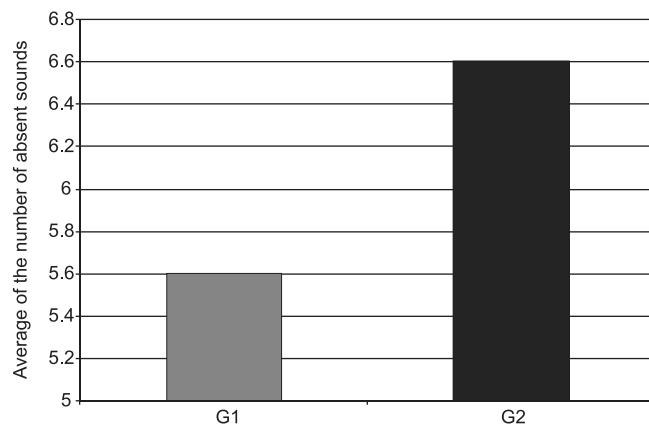
Table 1 represents the comparison between generalizations within and across sound classes. With regards to the generalization within sound classes, it is verified that G1 presented more changes, although this difference was not significant.

Student's t-test, for two independent samples: p=0.3283
Note: G1 = group 1, treated by the Multiple Oppositions Model; G2 = group 2, treated by the ABAB-Withdrawal and Multiple Probes

Figure 1. Mean number of absent sounds between the groups

There was also no difference in the generalization across sound classes, even though the number of occurrences was higher in G2.

Table 2 presents the types of structural generalization presented by the children, in the initial and final assessments, in the treatment carried out with the ABAB-Withdrawal and Multiple Probes Model and the Multiple Oppositions Model.

It is possible to observe the occurrence of both types of generalization for all subjects, except S1, who presented regressions during the treatment. It is also noted that the greatest differences of generalization within sound classes occurred mainly in G1, treated by the Multiple Oppositions Model, whereas the generalization across sound classes occurred mostly in G2, treated by the ABAB-Withdrawal and Multiple Probes Model.

DISCUSSION

Both models studied, the Multiple Oppositions and the ABAB-Withdrawal and Multiple Probes, favored acquisitions in children's phonological system, as well as the different types of generalization (across and within sound classes). Similar results were found in other studies[12-14,19,20], which showed the effectiveness of these therapeutic models. The Multiple Oppositions Model had a higher average of acquired phonemes than the ABAB-Withdrawal and Multiple Probes Model. These results may be related to the number of phonemes selected for treatment (more than three).

The generalization within sound classes was more evident in the Multiple Oppositions approach, probably because in this

Table 1. Comparison of generalization between groups

	Generalization within sound classes		Generalization across sound classes	
	Mean (%)	SD (%)	Mean (%)	SD (%)
G1	47.97	13.44	24.08	9.54
G2	28.12	9.34	29.57	14.49
p-value	0.1300		0.3798	

Student's t-test for two independent samples (p<0.05)
Note: G1 = group 1, treated with the Multiple Oppositions Model; G2 = group 2, treated with the ABAB-Withdrawal and Multiple Probes.

Table 2. Types of generalization obtained pre- and post-treatment

Model	Subject	Type of generalization (%)					
		Within sound classes			Across sound classes		
		IA	FA	Dif	IA	FA	Dif
Multiple Oppositions	S1	76.2	52.9	0.0	33.3	40.8	7.5
	S2	50.0	81.8	31.8	42.4	67.8	25.4
	S3	0.0	57.1	57.1	0.0	22.9	22.9
	S4	45.1	100.0	54.9	36.7	100.0	63.3
	S5	1.0	28.2	27.2	49.4	70.8	21.4
ABAB-Withdrawal and Multiple Probes	S6	0.0	15.6	15.6	27.0	81.9	54.9
	S7	0.0	7.0	7.0	22.5	91.1	68.6
	S8	38.1	48.8	10.7	17.4	100.0	82.6
	S9	9.5	37.7	28.2	37.8	56.4	18.6
	S10	21.8	81.5	59.7	9.0	24.2	15.2

Note: IA = initial assessment; FA = final assessment; Dif = differential

model many phonemes are contrasted with their substitutes, and the selected sounds usually belong to different sound classes[4,21]. Thus, the fact that sounds from different classes were selected may have favored this type of generalization, since each class has a range of phonemes to be acquired.

S1, who were treated by the Multiple Oppositions model, presented lower percentage of generalization in the final evaluation, when to the initial evaluation. Even though these findings have no statistical significance, they might be related to the regression process, common in children who are reorganizing their phonological system[22].

The generalization across sound classes was more frequent in the children treated by the ABAB-Withdrawal and Multiple Probes, although it had no statistical difference. In this model, even though only one sound was selected for treatment, it presented a high level of complexity, that is, it was a more complex sound in the implicational hierarchy. This confirms that the higher the level of complexity in the treatment, the greater the number of generalizations to less complex levels, which means that easier sounds can be acquired without direct intervention during the treatment of more difficult sounds[16]. Moreover, due to the fact that this model uses as prerogative the treatment of only one sound from a single sound class, this type of generalization is more likely to occur. Similar results were found in another research[19], in which the authors verified the occurrence of this type of generalization mainly in children treated by the ABAB-Withdrawal and Multiple Probes and Maximal Oppositions approaches.

CONCLUSION

Practicing sounds individually or in groups are two alternative ways to treat phonological disorder, and the choice depends on the previous knowledge of the phonological system to be treated. The present study showed that both methods (ABAB-Withdrawal and Multiple Probes and Maximal Oppositions) favored changes in the phonological system of the children studied, providing the acquisition of phonemes and the occurrence of generalizations both across and within sound classes. Thus, the findings of this study indicate that there is no difference regarding treatment effectiveness when sounds are treated individually or in groups. However, there is a relevant limitation concerning the number of subjects analyzed that does not allow the generalization of these findings. The same occurs regarding the selection and use of the therapy models, which seem more suitable for specific phonological systems.

RESUMO

Objetivo: Verificar se a estimulação de sons em conjunto resulta em maiores mudanças fonológicas do que a estimulação de sons isoladamente e analisar a ocorrência de generalização para dentro de uma classe e para outras classes de sons. **Métodos:** A amostra foi composta por dez sujeitos com desvio fonológico, com idades entre 4 anos e 8 meses a 7 anos e 3 meses, distribuídos em dois grupos. O Grupo 1 (G1) foi tratado pelo modelo de Oposições Múltiplas e o Grupo 2 (G2) pelo modelo ABAB-Retirada e Provas Múltiplas. O tratamento do G1 constou da estimulação do contraste de vários sons apresentados em conjunto enquanto que o tratamento do G2 envolveu a estimulação de apenas um som-alvo por ciclo de tratamento. Foi analisado o número de sons ausentes e a ocorrência de generalização para dentro de uma classe e para outras classes de sons pré e pós-tratamento. Os dados foram analisados estatisticamente; também foi realizada análise descritiva. **Resultados:** O G1 adquiriu maior número de sons que o G2; entretanto não houve diferença significativa. Em relação à generalização dentro da classe de sons, o G1 apresentou maiores mudanças, enquanto a generalização para outras classes foi maior para o G2; entretanto, não houve diferença estatística em nenhum desses resultados. **Conclusão:** Ambos os métodos favoreceram mudanças no sistema fonológico das crianças estudadas, levando à aquisição de fonemas e a generalizações. Não há diferença entre eles na efetividade do tratamento.

Descritores: Distúrbios da fala; Fala; Fonoterapia; Generalização da resposta; Som; Criança

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