

THE GENERALIZATION THROUGH THE TREATMENT WITH FRICATIVES: FAVORABLE ENVIRONMENTS VERSUS UNFAVORABLE AND NEUTRAL ENVIRONMENTS

A generalização a partir do tratamento com fricativas: ambientes favoráveis versus ambientes pouco favoráveis e neutros

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ABSTRACT

The aim of this study was to analyze and compare the occurrence and the types of generalization observed through the treatment of the fricatives /z/, /ʃ/ and /ʒ/ in two groups of children, one using words with favorable phonological contexts and another with unfavorable and neutral contexts. Six children with phonological disorder between 4:7 and 7:8 year-old participated in the study, with their parents' authorization. There were speech-language and complementary evaluations to diagnose the phonological disorder. The subjects were matched according to the severity of the phonological disorder, sex, age and aspects of the phonological system in relation to the altered phonemes. Half the children were treated with words in which the phonemes /z/, /ʃ/ and /ʒ/ were in favorable phonological environments and the other half with unfavorable and neutral environments. There were eight sessions and, after them, a new speech evaluation was performed in order to verify the types of generalization that were obtained. The generalization percentages were compared between the groups by statistical test *Mann-Whitney* ($p < 0.05$). At the end of therapy, it was observed an increasing in generalization percentage for all the subjects. In the comparison between the groups, no statistical difference was found to the analyzed generalizations. However, there was an advantage to for the favorable group regarding to the generalizations "to another position in the word" and "inside a sound class". The obtained results can be related to the small number of subjects or to other factors mentioned in the article.

KEYWORDS: Child; Speech Disorders; Speech Therapy; Generalization (Psychology); Speech

■ INTRODUCTION

Many researches about speech disorder (SD) and its therapy are observed in literature.

Regarding to the therapeutic strategies, the therapy models with phonological basis are very much used. One of the most used models is the

Modified Cycles Model¹ due to its easy implementation. This model has the elimination of phonological processes present in the child's speech as a basic principle. The elimination occurs from the awareness of the characteristics of the substituted sound, starting from the stimulation and production¹.

In order to improve the therapy results, one of the aspects addressed in the current Brazilian researches is the target words using the favorable environments to the production of certain target sound. The favorable environments are contexts that facilitate the production and acquisition of the treated sound². These contexts have been widely researched to the liquid consonants of Brazilian Portuguese, aiming to verify if the determination of target words with its target sounds located in favorable environments would be more beneficial

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Founding source: CAPES

Conflict of interest: non existent

to the correct production^{2,4}. However, the research of favorable environments to the other sound classes is still little explored.

One of the most recent studies about the theme addressed the favorable environments to the fricative phonemes production³. In the author's research, eight children had their therapeutic processes analyzed, and the ABAB withdrawal and multiple probes model was used. The aim of the research was verifying the value of favoring which target-words have in the therapeutic success, involving fricative phonemes. The value of favoring is caused by stress, number of syllables, word position, preceding and following phonological context. The author concluded that although the favoring environments have a role as a facilitator, they are not crucial for the production of the fricative phonemes³.

The comparison of two subjects' groups during the speech therapy, that will be showed in the present article, is unprecedented to the sounds /z/, /ʃ/ and /ʒ/, since the mentioned author³ used data basis, in which the same subject was treated with favorable, neutral and little favorable words simultaneously.

Furthermore, the study results about favorable environments were inconclusive^{2,4}, being necessary the realization of more researches about the theme, using other sounds and/or other therapeutic models, specially controlling the phonological context of target words.

To determine if the favorable environments are or not favorable to the treatment, some criteria, that need to be well determined, are necessary. The generalization analysis obtained is a good way to investigate this aspect. The generalization consists in the extension of right production of target sounds treated to others that were not stimulated. The generalization is the main contribution of phonological models, since it can help the therapist in the choice of the best model and target sounds to be stimulated⁵.

The phonological change promoted by the therapy can be of two types: structural, on the identification of structural properties of generalization or circumstances in which it occurs; or functional, that examines the functional properties of generalization or how it's used by a child to modify his/her phonological system, analyzing the intrasubject variables⁵.

Thus, the purpose of this study was to analyze and compare the occurrence and the types of generalization observed through the treatment of the fricatives /z/, /ʃ/ and /ʒ/ in three pairs of children, one using words with favorable phonological contexts and another with little favorable and neutral contexts.

■ CASE REPORT

This study consists in case reports of six children, who gave verbal consent for their participation in the study and whose parents have previously signed the Term of Free Informed Consent to participate in the research. The following criteria were adopted to subjects' inclusion: present alterations only in the phonological level of language; at least two of the fricative sounds /z/, /ʃ/ and /ʒ/ with percentage equal to or less than 40% in the phonological system⁶ in the initial and/or medial position; being aged between 4:0 and 8:0; not having undergone speech therapy before.

Description of pre treatment evaluation performed

To establish the PD diagnosis, the following assessments were performed: interview with the parents and/or the guardians, phonological evaluation, evaluation of the stomatognathic system, of language, of vocabulary, of phonological awareness skills and of auditory processing. Moreover, the subjects were forwarded to audiological and otorhinolaryngologic assessment to dismiss organic factors that could determine the PD. The interview aimed to eliminate cognitive and/or neurological factors, which might interfere in the phonological development.

The interview aimed at hearing children's history through the questions to parents about the pregnancy, childbirth, psychomotor and language development, feeding habits, physiopathology background and information about the subjects' school life.

In the evaluation of stomatognathic system, an assessment protocol based on Marchesan⁷ was used and the aspects observed are: appearance, posture, tonus and mobility of the articulators (tongue, lips, cheeks, soft palate, hard palate and teeth), as well as its functions (breathing, chewing and swallowing).

The language evaluation was held by spontaneous situations, like free dialogues or games with the child. Skills of understanding and expressing oral language were observed.

The phonological awareness abilities were evaluated by "*Protocolo de Tarefas de Consciência Fonológica*"⁸, which evaluates the child's competence in thinking about the language sounds and its organization in word formation.

The auditory processing was evaluated by "*Avaliação Simplificada do Processamento Auditivo*"⁹. This evaluation aims at verifying if the children perform cognitive analysis of sonorant events.

The vocabulary evaluation was held through ABFW – part B (Vocabulary)¹⁰. The test evaluates nine semantic fields: clothing, animals, food, means of transportation, furniture and utensils, occupations, places, shapes and colors, toys and musical instruments. The child had to denominate the drawings of box test spontaneously.

The hearing and otorhinolaryngologic evaluations were held by experienced professionals in these areas. The methods were chosen by the professionals.

The collection of speech data was held through “*Avaliação Fonológica da Criança*” (AFC)¹¹. The speech data were recorded and phonetically transcribed, initially by the main investigator and after by two judges. At least two of the three transcriptions should be coincidental. When there was no agreement, the word was excluded from the sample. Based on those data, the contrastive analysis was held to determine the phonetic and phonological inventory of the children, using the following criteria⁶: occurrence from 0 to 39% - absent or not acquired sound (NA); occurrence from 40% to 79% - partially acquired sound; occurrence equal to or greater than 80% - acquired sound.

After, the PD's severity was calculated from the Percentage of Correct Consonants (PCC-R)¹².

Pairing of subjects according to the assessment results

The selected subjects were paired according to the PD severity; gender; age and phonological system characteristics regarding to the changed sounds, specially the fricatives /z/, /ʃ/ and /ʒ/, in which the distinctive features should be the same and the percentage production similar. The subjects S1 and S2, both male, presented PCC-R of 73,1% and 78,3% (mild-moderate disorder - MMD) and age of 7:8 and 7:6, respectively, both presented changes of the feature [+voice] to the fricatives /z/ and /ʒ/ and of the feature [-anterior] to the fricatives /ʃ/ and /ʒ/. The subjects S3, S4, S5 and S6 were female and presented the feature [-anterior] altered to the production of /ʃ/ and /ʒ/. S3 and S4 had PCC-R of 73,6% and 78,4% (MMD) and age of 5:5 and 4:7, respectively. As S5 and S6 presented PCC-R of 87,6% and 87,5% (mild disorder - MD) and ages of 6:6 and 6:5, respectively.

Besides, the subjects' pairs presented the same education. S1 and S2 frequented the 2nd grade, S3 and S4 the kindergarten and S5 and S6 the 1st grade. All children studied in public school and presented similar socio-economic status.

Therapeutic Procedures

After the final of the assessments, the members of each children pair, which would receive the treatment with phonological favorable contexts, were randomly selected. The remaining children were treated with the target-words, whose phonological contexts were little favorable or neutral. We emphasize that the use of words with phonological environments little favorable and neutral couldn't impair the children's treatment, since all children would be treated. In addition, until then the therapy researches did not consider the phonological contexts in the treatment of PD.

The treatment was performed through the Modified Cycles Model¹, that was adapted to the research needs. In the choice of phonological processes to be treated, there were selected only one or two, and two target sounds due to the methodological demand of being used the sounds /z/, /ʃ/ and /ʒ/. The sessions lasted 50 minutes and were carried out twice a week. Two cycles were performed with each child, being one of them in isolated word level and the other in the sentence level. However, when the children did not reach the percentage of hits equal to or greater than 50% to certain target-sound, the sound was repeated in isolated word level in the second cycle. Each target-sound was stimulated during two sessions per cycle, totalizing eight sessions for each client in the final of data collection.

In the final of each cycle a follow-up to verify the treated sounds production in different words was performed. In the beginning and at the end of each session, the auditory bombardment was realized. This measurement consisted in the reading of words with the selected target-sound for the child. The parents were active agents in the therapeutic process, helping at home with the target-words activities and reading of auditory bombardment for the child.

To select target-words of the therapy, their phonological weight was calculated according to an author³ assumptions. The author assigned weights to the favoring absolute values. The weight varied from 0 to 3, according to the phoneme position in the word, stress, preceding and succeeding context and number of syllables of the word. It needs to add the weight of each context. The result of the addition indicates whether the word is very favorable (weight 15), favorable (weight from 14 to 10), neutral (weight 9), little favorable (weight from 8 to 3) or unfavorable (weight equal to or less than 2).

Half of the children were treated with favorable words and the other half were treated with little favorable and/or neutral words. We emphasize that the chosen target-sounds were the same to each

pair members. The only difference between the children was the context in that the target-sound was inserted. The environments very favorable and unfavorable were disregarded, because words with

so high (15) and so low (2 or less) scores, respectively, weren't found.

The target sounds and the target words were determined according to Picture 1.

Subject	Linguistic environment	Target-sounds	Target-words
S1	Favorable	/z/ - OM /ʃ/ - OM	Azedo, azeite, azul, asa, doze, casinha. Bicho, cachorro, peixe, caixa, roxo, abacaxi.
S2	Little favorable and neutral	/z/ - OM /ʃ/ - OI	Casamento, Monza, casa, mesa, onze, pesadelo. Chocalho, charuto, chaminé, chocolate, chinês, xampu.
S3	Favorable	/ʃ/ - OM /ʒ/ - OM	Bicho, cachorro, peixe, caixa, roxo, abacaxi. Beijo, queijo, anjo, canja, laranja, pijama
S4	Little favorable and neutral	/ʃ/ - OI /ʒ/ - OM	Chaminé, chocolate, chinês, xampu, chapéu, chocalho. Abajur, caju, anjinho, injeção, ajuda, agenda.
S5	Favorable	/ʃ/ - OM /ʒ/ - OM	Bicho, cachorro, peixe, caixa, roxo, abacaxi. Anjo, loja, queijo, canja, pijama, beijo.
S6	Little favorable and neutral	/ʃ/ - OI /ʒ/ - OM	Chocalho, charuto, chaminé, chocolate, chinês, xadrez. Abajur, caju, ajuda, agenda, anjinho, injeção.

Legenda: OI= *Onset inicial*; OM=*Onset medial*.

Picture 1 – Linguistic Environments randomly selected, target-sounds and target-words to each subject

Description of post-treatment analyses

After finishing two cycles, new AFC was performed to verify the changes occurred in the phonological systems of the children and the types of generalization obtained.

This study is part of a research project linked to a higher education institution and approved by the Ethics and Research Committee under number 052/04.

The therapy results were analyzed through descriptive and statistical analysis of structural generalizations obtained with the phonological treatment. The percentages between the initial and final assessments and between the groups of children treated with favorable environments versus little favorable and neutral environments. The Mann-Whitney statistical test was used, due to its small sample size, and the significance level adopted was 5% ($p < 0.05$).

The following types of generalization were considered for analysis⁶:

1. To lexical items that were not used in the treatment (other words): The percentages of correct production of the sounds stimulated in words which were different from the ones used in the therapy were analyzed.

2. To another position in the word: the percentages of correct production of the target-sounds in different position from the ones stimulated in therapy were analyzed.

3. Inside a sound class: the percentages of correct production of the fricatives that weren't stimulated in therapy were analyzed.

4. To other sound classes: the percentages of correct production of the plosives, liquids, nasals and affricates were analyzed.

■ RESULTS

All types of possible generalization were observed: to lexical items that were not used in the treatment, to another position in the word, inside a sound class and to other sound classes.

In Table 1 the generalization to lexical items that were not used in the treatment is showed.

Increase in the percentages of correct production to all subjects in all targets stimulated was observed. In the comparison between the groups, the favorable one had higher percentages. However no statistical significance was observed.

Table 1 – Generalization to lexical items that were not used in the treatment (other words) in the subjects

Subject	Linguistic context	Generalization percentage mean considering both sounds	Mean of each context	P value
S1	Favorable	73,35%	66,55%	$p = 0,127$
S3	Favorable	59,60%		
S5	Favorable	66,70%		
S2	LF and neutral	60,90%	54,05%	
S4	LF and neutral	51,25%		
S6	LF and neutral	50%		

Legend: LF = little favorable

Statistic test that was adopted: *Mann-Whitney test*, Significance level: 5% ($p < 0,05$).

Table 2 shows the percentages of generalization to another position in the word. In this respect, increase of percentages of all subjects was observed. One more time, in the comparison

between the groups, the favorable one had higher percentages. However, no statistical significance was observed.

Table 2 – Generalization to another position in the word in the subjects

Subject	Linguistic context	Mean of generalization percentage – both sounds in the two positions that they can occur	Mean of each context	p value
S1	Favorable	100%	75%	$p = 0,275$
S3	Favorable	55,70%		
S5	Favorable	70%		
S2	LF and neutral	92,85%	62,90%	
S4	LF and neutral	52,50%		
S6	LF and neutral	43,35%		

Legend: LF = little favorable

Statistic test that was adopted: *Mann-Whitney test*, Significance level: 5% ($p < 0,05$).

The percentages of generalization inside a sound class are listed in Table 3. This type of generalization could be observed only in subjects S1 and S2, that didn't present /v/ and /ʒ/ in their phonological systems, in addition to the fricatives treated /z/ and /ʃ/. This generalization was observed in S4 too, that presented the sound /s/ partially acquired in coda position.

The other subjects couldn't have presented this type of generalization, because the only changed fricatives in the phonological systems were /ʃ/ and /ʒ/, that were the targets of the treatment. Increase of consonants correct percentage to the sounds /v/ and /ʒ/ to the subjects S1 and S2 was observed. /s/ in the production of coda also improved to s4. In the comparison between S1 and S2, both presented similar percentages.

Table 3 – Generalization inside a sound class in the subjects

Subject	Linguistic context	Mean of the generalization according to the possible sounds	Mean of each context	<i>P</i> value
S1	Favorable	46,15%		<i>p</i> = 0,817
S3	Favorable	No possibility	15,38%	
S5	Favorable	No possibility		
S2	LF and neutral	18,80%		
S4	LF and neutral	26,20%	15%	
S6	LF and neutral	No possibility		

Legend: LF = little favorable

Statistic test that was adopted: *Mann-Whitney test*, Significance level: 5% ($p < 0,05$).

Table 4 shows the generalization to other sound classes. Generally, the subjects increased their correct production percentages. Only S1 and S2 could present generalizations to the plosives and affricates, because presented changes in the voiced sounds of those classes.

The other subjects presented those classes stabilized in their phonological systems. To this type of generalization, the percentages were similar between the groups, except to the liquids in which the group little favorable and neutral showed advantage over the favorable, but without statistical significance.

Table 4 – Generalization to other sound classes in the subject

Subject	Linguistic context	Non stimulated class	Mean of the generalization in each class	Means of the subjects	<i>P</i> value
S1	Favorable	Plosives	34,50%	11,50%	<i>p</i> = 0,796
S3	Favorable		No possibility		
S5	Favorable		No possibility		
S2	LF and neutral		37%	12,33%	
S4	LF and neutral		No possibility		
S6	LF and neutral		No possibility		
S1	Favorable	Affricates	3,30%	1,10%	<i>p</i> = 0,317
S3	Favorable		No possibility		
S5	Favorable		No possibility		
S2	LF and neutral		0%	0%	
S4	LF and neutral		No possibility		
S6	LF and neutral		No possibility		
S1	Favorable	Liquids	0%	19,86%	<i>p</i> = 0,513
S3	Favorable		22,82%		
S5	Favorable		36,75%		
S2	LF and neutral		24%	36,68%	
S4	LF and neutral		13,40%		
S6	LF and neutral		72,65%		

Legend: LF = little favorable

Statistic test that was adopted: *Mann-Whitney test*, Significance level: 5% ($p < 0,05$).

■ DISCUSSION

Once all types of possible structural generalization could be observed, we can verify the efficacy of the therapeutic approach, since the main purpose of phonological therapy is promoting the highest structural change in the phonological system and the maximum of generalization as possible, adapting the child's speech to the adult's target system¹³. The generalization is an essential criterion to evaluate the quality of approach, because the greater the number of sounds generalized by the child, the higher the therapeutic efficacy¹³.

Regarding to the generalization to lexical items that were not used in the treatment (Table 1), we observed advantage of the subjects treated with the targets in favorable environments, however without statistical significance. The children of this group had higher percentages of generalization than the ones treated with little favorable and neutral environments. The same was found in another research about the favorable environments to the fricative production³. It is important to highlight that all subjects had high percentages of this type of generalization, similar to other researches^{14,15}.

The generalization to another position in the word (Table 2) also occurred to all subjects¹⁶, being higher to the ones treated with words in favorable environments.

In a study that compared the phonological acquisition between two subjects treated with the sound /r/, one with favorable environments and other with little favorable environments, the authors observed this generalization with higher percentages to the subject treated with favorable environments, supporting this research⁴.

We observed that the generalizations that occurred with higher percentages were to lexical items that were not used in the treatment and to other position in the word, which supports one of the principles proposed in a research paper: "during the training of a process, the greatest gains are obtained with the sounds directly treated"¹⁷. Thus, the children should apply the same phonological rules to the production of the tested sounds, even needing to deal with a different syllabic position than those ones treated in the second type. That assumption could explain the success in the two types of generalization mentioned.

The generalization inside a sound class (Table 3) could be observed only in subjects S1, S2 and S4, since the other subjects already had the non treated fricatives acquired in their phonological systems. Concerning S1 and S2, the generalization percentages were low and similar, in the same manner as what occurred in another research³.

To S4, there was a slight increase of the percentage of productions of /s/ in coda, different from a child cited in the previous study³, also treated with /ʒ/ in little favorable and neutral environments, who obtained 55,76% of generalization to /s/. But, the subject treated with more favorable words, obtained percentage of generalization similar to S4³. We couldn't compare S4 with S3 from this variable, since the generalization inside a sound class couldn't occur to the second child mentioned.

The generalization to other sound classes (Table 4) occurred to: plosives, affricates and liquids. To the plosives, the percentages were similar between S1 and S2. In the thesis that has been commented, this type of generalization could occur only for one subject, nevertheless, even being treated with four favorable words, he/she reduced the correct production of changed plosives /b/, /d/ and /g/³.

The generalization to the allophone [dʒ] for S1 and S2 did not occur, and neither for subject 1 described by Blanco-Dutra³. However, two other subjects, one treated with /z/ and other treated with /ʒ/ had generalization to the voiced affricate.

To the liquids, the percentages of generalization were higher to the group little favorable and neutral. In other research, no difference was observed among the subjects³ regarding to this variable. Yet other research about the acquisition of /r/, showed higher occurrence of generalization to other sound classes in the subject treated with favorable environments⁴.

The percentages of generalization to other sound classes could be higher if the more complex sounds, like the liquids, were chosen as targets for treatment, since the more complex the sound, the higher the number of sounds generalized^{13,17,18}.

Generally, high rates of generalizations were observed to all children. We can imply that fact is due to the severity of the disorders presented (MMD and MD). Children with lighter disorders could show better therapeutic evolution, because they have a few issues to be adequate and because they presents some organization of phonological system, when compared to children with more severe disorders.

As already mentioned, we assumed that the percentage of generalization would be higher if the treated targets were more complex like the liquids¹⁹, except for S1 and S2, who were treated with the non-acquired sounds more complex in their phonological systems. Furthermore, a therapeutic approach that involved the complexity of features and didn't involve the occurrence of phonological processes could also show a better outcome, since what is expected of phonological treatment is that treating more complex targets, the child acquire

the less complex ones related to the former without direct intervention^{13,18}.

The fact that there hasn't been found any difference between the treatment with favorable environments *versus* little favorable and neutral can be assigned to the small number of treated children. Even though, other factors can't be discharged, because it is possible that the choice of therapeutic model or the way the sounds, are stimulated are more relevant than the contexts in which the target-sounds are inserted in the words²⁰. Furthermore, the frequency in which the words appear in the language can be a possible factor to determine either better or worse therapeutic results. Considering what was mentioned, it's important that new researches be conducted to prove or to question the hypotheses made here.

■ CONCLUSION

We observed that all types of possible generalization occurred, being the higher percentages to "lexical items that were not used in the treatment" and "to another position in the word". The generalizations "inside a sound class" and "to other sound classes" occurred with lower percentages. In the comparison between the groups, no statistical significance was observed. However, the favorable group had higher percentages in the two first types of generalization mentioned.

We highlight that this study results can't be generalized because we described case reports, with only six subjects. It needs more researches about this topic. In addition, we suggest the implementation of other studies involving the favorable environments to the fricative production through other phonological therapy models.

RESUMO

O objetivo deste estudo foi analisar e comparar a ocorrência e os tipos de generalização observados a partir do tratamento das fricativas /z/, /ʃ/ e /ʒ/ em dois grupos de crianças, um utilizando palavras com contextos fonológicos favoráveis e outro os contextos pouco favoráveis e neutros. Seis crianças com desvio fonológico e idades entre 4:7 e 7:8 participaram do estudo com a autorização dos responsáveis. Realizaram-se avaliações fonoaudiológicas e complementares para o diagnóstico do desvio fonológico. Os sujeitos foram pareados de acordo com a gravidade do desvio, sexo, faixa etária e aspectos do sistema fonológico em relação aos fonemas alterados. Metade das crianças foi tratada com palavras em que os fonemas /z/, /ʃ/ e /ʒ/ encontravam-se em ambientes fonológicos favoráveis e a outra metade com ambientes pouco favoráveis e neutros. Foram realizadas oito sessões e, após estas, nova avaliação de fala foi realizada para verificar os tipos de generalização obtidos. Os percentuais de generalizações foram comparados entre os grupos por meio do teste estatístico de *Mann-Whitney* ($p < 0.05$). Ao término da terapia, observou-se aumento dos percentuais de generalização para todos os sujeitos. Na comparação entre os grupos não foi verificada diferença estatística para as generalizações analisadas. Entretanto, houve vantagem do grupo favorável em relação às generalizações "para outra posição na palavra" e "dentro de uma classe de sons". Os resultados obtidos podem estar relacionados ao pequeno número de sujeitos ou a outros fatores mencionados no artigo.

DESCRITORES: Criança; Distúrbios da Fala; Fonoaterapia; Generalização (Psicologia); Fala

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<http://dx.doi.org/10.1590/S1516-18462013005000016>

Received on: 2011/10/27

Accepted on: 2012/03/27

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