

Changes in phonological system after phonological therapy with the contrastive approach

Mudanças no sistema fonológico após terapia fonológica de abordagem contrastiva

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ABSTRACT

Purpose: To verify the changes in the deviant phonological system regarding phonemes acquisition and in the severity level of phonological disorders in subjects submitted to phonological therapy using the contrastive approach, in comparison to a group of subjects not submitted to intervention. **Methods:** Participants were 18 subjects aged between 4 years and 10 months and 7 years and 4 months, of both genders, with diagnosis of phonological disorder. Nine subjects treated by contrastive approach constituted the Experimental Group, and the other nine subjects, the Control Group (on the waiting list for phonological therapy). All subjects were assessed before and after the period of contrastive therapy applied only to the Experimental Group. Subjects in both groups were matched by age, severity level of the phonological disorder, number of absent sounds in the first phonological assessment, and period of time between the first and the second phonological assessment. In both assessments, the number of acquired sounds in the general phonological system was verified and the Percentage of Consonants Correct – Revised was calculated to determine the severity level of the phonological disorder. Data were statistically analyzed. **Results:** The Experimental Group acquired more sounds, which determined changes in the severity level of the phonological disorder. The differences found between groups were significant. **Conclusion:** The phonological therapy using the contrastive approach promotes changes in the phonological system that significantly influence the acquisition of sounds and the change of the severity level.

Keywords: Speech; Speech disorders; Articulation disorders; Speech therapy; Child language

INTRODUCTION

The phonological acquisition and development occur gradually, until the stabilization of the sounds production in the phonological system, according to the children's linguistic community. The adaptation, as well as the sounds establishment into the phonological system, occur when children are about five years old. However, it is common to find children that, even without organic impairments, reach this age with language sounds acquisition deficit^(1,2).

This alteration of the language sounds organization, expressed through spoken language, in the absence of or-

ganic impairments to determine it, is called phonological disorder⁽¹⁻³⁾ or phonological disturbance⁽⁴⁾, both considered as synonyms. This disturbance⁽⁴⁾ is defined as difficulty to use the rules of the phonological system, including phonemes, their distribution and types of syllabic structures. The phonological disorder⁽²⁾ determines that children present a disorder that keeps their phonological systems deviating, away and/or different in relation to their pairs with the same age with typical phonological development.

To treat the phonological disorder, there are different therapeutic phonological based models with the same general purpose: the reorganization of the phonological system, based on the adult system⁽⁵⁾, and the promotion of generalizations⁽⁶⁾. Although they mention differences regarding the treatment duration, in the phonemes acquisition or in the increase of the Percentage of Correct Consonants (PCC) in cases of phonological disorder, some studies⁽⁷⁻¹⁰⁾ observe that the different models are efficient to treat the different severities of the phonological disorder. Besides, they reveal the importance of the speech language therapy, with phonological basis to the adjustment of the speech pattern of children with phonological disorders. The contrastive approach presents the therapy basis on distinctive features and it uses the principle of the

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contrast (minimal, maximal or multiple) in the selection of target-sounds to the adjustment of the phonological system.

In general, researches in the area⁽⁶⁻¹⁵⁾ aimed at describing the improvements obtained through the treatment. However, it is important to understand the course of acquisition in which, even without therapy, the child with phonological disorder goes through with the purpose of supplying, or not, their speech difficulties as time passes, evidencing that the changes in the phonological systems, which are stagnant, may occur, without therapy.

Literature⁽¹⁶⁾ refers that children with phonological disorders present stagnant systems, which do not propitiate changes without treatment. Ethical issues justify the lack of studies about the acquisition of deviating phonological systems, without speech language intervention, because some people consider as improper to keep children with speech impairments without therapy (only because of some researches).

Nevertheless, the free speech language clinics, as the ones which are in school clinics, usually are not able to supply all the speech-language therapy demand, what enables the use of the present methodology, which involves the retrospective analysis of prompt-books of children with phonological disorders.

Bearing in mind this possibility, the present study had the purpose of verifying the changes in the phonological system (phonemes acquisition) and in the severity of the phonological disorder of subjects submitted to phonological therapy through contrastive approach, in comparison with a group of subjects without intervention, who were waiting for treatment.

METHODS

This study is transversal, retrospective and quantitative. The data were collected from two research projects, properly registered and approved by the Ethics Committee at Universidade Federal de Santa Maria (UFSM), n. 108/06 and 60/09. The first project has as purpose the speech-language therapy of children with phonological disorders. The second project aimed at performing speech-language evaluations of children with phonological disorders who were waiting for therapy in a school clinic (*Serviço de Atendimento Fonoaudiológico – SAF* of UFSM). All parents and/or responsible for the subjects signed the Informed Consent (IC), authorizing the children to participate in the research, as well as the publication of the data. The children also agreed in participating in the study. There was clarification about the IC, as well as in oral way, about the evaluation process and the possible delay to start the speech-language therapy.

The sample consisted of 18 subjects, 12 boys and six girls, with ages between 4 years and 10 months and 7 years and 4 months. They presented diagnosis of phonological disorder, according to the following criteria⁽¹⁾: to present speech with disorders in comparison with the adult target; absence of any anatomic or physiological alteration in the organs involved in speech; proper intellectual ability; normal hearing.

To have the diagnosis of phonological disorder, all the subjects which were part of the data basis were submitted to anamnesis and to the following evaluations: comprehensive and expressive oral language (which occurred through organi-

zation and retelling of a logic sequence, in which it was possible to observe if the entertainment, as well as the children's intellectual ability were proper); phonological; stomatognathic system; and hearing.

The sample was organized as follows: Experimental Group (EG), with nine subjects who were part of the data basis at UFSM research laboratory, and who were submitted to treatment through the contrastive approach (Minimal or Maximal Opposition)⁽¹⁵⁾; and the Control Group (CG), with nine subjects, who were in the therapy waiting list at SAF – UFSM, who did not receive previous speech-language treatment.

The not immediate speech-hearing intervention in the CG subjects was justified by the reduced amount of vacancy in comparison to the large demand of individuals to have speech-hearing therapy in the school-clinic in which the study was performed.

All subjects (CG and EG) were phonologically evaluated previously (PE-1) – for the EG it was related to the initial data collection, and for the CG, it was related to the data of the speech-language screening at the laboratory in which the research was performed.

PE-1 and PE-2 were performed through the instrument Child's Phonological Assessment (CPA)⁽¹⁷⁾. After the data collection, it was performed the restrict phonological transcription and the contrastive analysis, according to the procedures which were suggested by a study⁽¹⁸⁾. The severity of the phonological disorder was classified according to the Percentage of Correct Consonants Revised (PCC-R)⁽¹⁸⁾, in which only the omissions and substitutions were considered as errors, not the distortions. After the PCC-R calculation, the severity of the phonological disorder was classified in: mild (higher than 86%); mild-moderate (between 65 and 85%); moderate-severe (between 50 and 65%) and severe (lower than 50%), following the indexes from another study⁽¹⁹⁾. Besides, the number of phonemes which were present in the subjects' phonological system⁽²⁰⁾ was quantified in the performed phonological evaluations (CPA).

The selection of the CG includes subjects which participated in the speech-language screening, who were waiting in the list to be attended, and which were recruited and submitted to another Phonological Evaluation (PE-2).

To select the subjects of the EG, it was analyzed the data regarding the prompt-books of evaluation and therapy of subjects which were treated through contrastive approach in a project. Only after the EG sample definition, the data of the second Phonological Evaluation (PE-2) were collected. So, the EG subjects' selection, initially, was blind to the PE-2 data.

The inclusion of subjects in the sample considered the matching criteria (EG and CG) was done according to the severity of the disorder, general phonological system of the first Phonological Evaluation (PE-1) and age. Moreover, it considered the matching according to the period (in months) in which the EG received speech-language therapy, and the same period in which the CG remained without speech-language therapy. The average of pause between the evaluations for the CG was 6.77 months (the shortest period was three months and the longest period was 10 months) and for the EG the average of pause was seven months (the shortest pause was four months and the longest pause was 11 months). This criterion was used to control the variable time/duration.

In order, the inclusion criteria for the samples EG and CG were:

- Severity of the phonological disorder: First, the paired up subjects should present the same severity;
- General phonological system: subjects paired up according to the number of absent phonemes;
- Period in months between PE-1 and PE-2: the difference in months between the evaluations of the paired up subjects should be the shortest as possible;
- Age: the age difference among the paired up subjects should be the shortest as possible;
- Random draw: when there was more than one pairing up possibility (CG e EG).

Regarding the annealing of the subjects according to the phonological system, the ideal criteria would be that the paired up subjects presented the same amount of absent, partially acquired and acquired phonemes⁽¹⁷⁾. However, as this criterion could not be adopted, because it is difficult to find children with so similar phonological systems and, considering that the absent phonemes presented higher impact on the phonological disorder, it was decided to pair them up according to the amount of phonemes in the general phonological system.

All subjects, except S1EG x S1CG, S2EG x S2CG and S7EG x S7CG, presented the same amount of absent phonemes in PE-1. Chart 1 illustrates the sample characterization.

For the EG, the PE-1 was performed before the speech-language therapy and the PE-2 was performed after a period of four or five cycles (20 to 25 sessions) of therapy in general.

The EG was treated through the contrastive approach (Maximal Oppositions: S8 and S9; and Maximal Oppositions: S1, S2, S3, S4, S5, S6 and S7)⁽¹⁶⁾. The contrastive approach involved pairs of two words that present only one different phoneme between them (if they differ in the maximum of two distinctive features, they form the Minimal Opposition, and

if there is difference in more than two features, they form the Maximal Oppositions)^(16,21,22).

The therapy using the contrastive approach (Minimal and Maximal Oppositions) was performed according to procedures in a previous study with Brazilian Portuguese speakers' children⁽¹¹⁾. In the beginning and in the end of each session, it was performed the auditory bombardment with eight to 10 words for each target sound. The minimal pairs, which included only meaningful words, were used, initially, by the imitation of the therapist's production and, after 80% or more of correct productions, by the spontaneous production. Two sessions per week were performed, with 45 minutes each. All the treatment was performed by the same trainee therapist from the "Speech-Language Pathology Undergraduate Program".

The data was tabulated and submitted to statistical analysis, using the Student's t-test (to compare the PCC-R and the number of acquired phonemes) and Fisher's exact test (to compare the severity changes). The statistical program Stata 10.0 was used, and the adopted level of significance was 5% (p<0.05).

RESULTS

In Table 1, it is observed the number of acquired phonemes by the EG and by the CG. It is verified that in the EG only one subject did not present phonemes acquisition, while in the CG two subjects did not present acquisition, one of them presented regression (lower amount of acquired phonemes). Besides, it is detected that the EG presented, on average, higher number of acquired phonemes than the CG, with significant difference. Also, the highest amount of acquired phonemes was verified for the EG, subjects S1, S2, S3, S4, S5, S6 and S7, treated through the Maximal Opposition contrastive approach.

In Figure 1, it is presented the difference of PCC-R for the Experimental Group (EG) and for the Control Group (CG). It

Chart 1. Sample characterization

EG							CG						
Subject	Age	Severity	Number of absent phonemes ausentes	Number of partially acquired phonemes	Number of acquired phonemes	Period (months)	Subject	Age	Severity	Number of absent phonemes	Number of partially acquired phonemes	Number of acquired phonemes	Period (months)
S1	6y1m	SD	11	1	7	8	S1	6y4m	SD	12	3	4	7
S2	5y7m	SD	7	0	12	8	S2	4y8m	SD	10	1	8	8
S3	6y4m	MSD	4	2	13	7	S3	6y11m	MSD	4	6	9	7
S4	4y11m	MSD	6	1	12	6	S4	4y11m	MSD	6	7	6	7
S5	7y2m	MMD	2	3	14	6	S5	7y6m	MMD	2	5	12	5
S6	5y4m	MMD	3	0	16	7	S6	5y9m	MMD	3	1	15	8
S7	6y1m	MMD	6	1	12	3	S7	6y5m	MMD	5	0	14	4
S8	6y11m	MD	2	0	17	10	S8	6y3m	MD	2	0	17	11
S9	6y7m	MD	1	0	18	6	S9	5y10m	MD	1	2	16	6

Note: EG = experimental group; CG = control group; SD = severe disorder; MSD = moderate-severe disorder; MMD = mild-moderate disorder; MD = mild disorder; y = years; m = months

Table 1. Phonemes acquired by the Experimental Group and by the Control Group

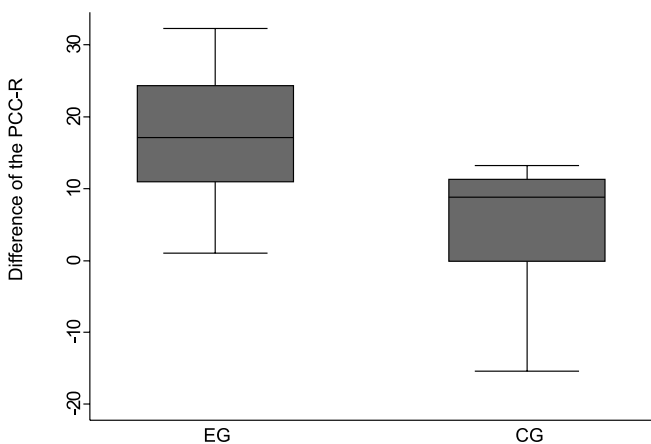
EG				Contrastive Approach (opposition)	CG			
Subject	N. of acquired phonemes PE-1	N. of acquired phonemes PE-2	Difference		Subject	N. of acquired phonemes PE-1	N. of acquired phonemes PE-2	Difference
S1	7	10	3	Maximal	S1	4	6	2
S2	12	17	5	Maximal	S2	8	11	3
S3	13	17	4	Maximal	S3	9	11	2
S4	12	17	5	Maximal	S4	6	6	0
S5	14	19	5	Maximal	S5	12	10	-2
S6	16	19	3	Maximal	S6	15	15	0
S7	12	15	3	Maximal	S7	14	17	3
S8	17	19	2	Minimal	S8	17	19	2
S9	18	18	0	Minimal	S9	16	18	2
Mean			3.33		Mean			1.33
±SD			1.66		±SD			1.66
p-value					0.0210			

Student's t-test (two independent samples)

Acquired phonemes: percentage of correct production higher than 80%⁽¹⁷⁾

Note: PE-1 = first phonological evaluation; PE-2 = second phonological evaluation; SD = standard deviation

is observed that the median value, represented by the internal line in the Box, was higher for the EG (17.0) than for the CG (8.8). Considering the minimal and maximal values, it is verified that the EG obtained higher values (0.2 and 32.3) than the CG (-15.4 and 13.2). Moreover, it is possible to observe that the values of the first and second quartiles were higher for the EG. Thus, it is observed that there was higher PCC-R increase for the EG when compared with the CG. The Student's t-test for two independent samples also revealed significant difference ($p=0.0063$).



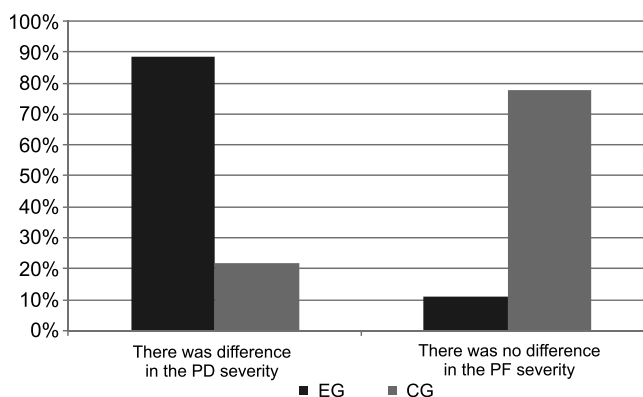
Student's t-test (two independent samples) ($p=0.0063$)

Note: EG = Experimental Group; CG = Control Group

Figure 1. Difference of the PCC-R for the Experimental Group and for the Control Group, in the period between PE-1 and PE-2

Figure 1 demonstrates the change in the severity of the phonological disorder for the EG and for the CG. It is observed that in the EG eight subjects (88.89%) presented attenuation in the disorder severity, while in the CG only two subjects

(22.22%) had their degree of severity modified, with significant difference ($p=0.0080$).



Fisher's exact test ($p=0.0080$)

Note: EG = Experimental Group; CG = Control Group; PD = phonological disorder

Figure 2. Change in the severity of the phonological disorder after the studied period

DISCUSSION

The therapy which applies the contrastive approach (Minimal and Maximal Oppositions) was considered as effective, because the EG presented more improvements than the CG, in relation to the number of acquired phonemes and disorder severity. These findings agree with studies⁽⁶⁻⁹⁾ which affirm that the contrastive approach is effective to treat phonological disorders. Besides, they evidence that the phonological based therapy to treat disorders allows the reorganization of the children's sounds system⁽⁶⁾.

About the phonemes acquisition, the fact that the EG presented significant increase regarding acquired phonemes agree with studies⁽⁷⁻⁹⁾ that verified improvement in relation to the

phonological system acquisition with phonological therapy. Besides, it confirms that the therapeutic intervention is efficient to increase the number of sounds in the phonological system^(7,8,13).

The phonemes acquisition for the CG, after the second evaluation (PE-2) refers, mainly, to the partially acquired phonemes. It was verified in a CG subject that there was phonological system regression. This finding is described in literature^(23,24), which mentions that if the phonological acquisition is a non linear process, it is clearly observed that there are moments of decrease in the ascending line of the typical development, with short periods of regression in the segment acquisition.

The highest phonemes acquisition was verified in the EG when compared with the CG. It is justified by the stimulation of the treated phonemes (what did not happen with the CG, because it did not receive therapeutic intervention). This stimulation was performed through perception (hearing, visual and kinesthetic) and production (repetition, naming and contrast comprehension) of the minimal pairs (minimal or maximal oppositions).

Regarding the PCC-R value, it was verified that there were more differences for the EG. This was the expected finding, because the therapy aims at organizing the children's phonological system. So, when there is organization of this system, there is also increase of correct productions. This finding agrees with other studies^(8,10,12) which verified PCC value significant increase after therapeutic intervention.

Also, the fact that the EG obtained higher changes in its severity levels of phonological disorder than the CG is justified, because the phonological therapy improved the children's speech. With therapy, it was also observed a reduction of the use of repair strategies and, as a consequence, a reduction of the phonological disorder severity. With the increase of the number of acquired phonemes, there is attenuation of the phonological disorder severity, as it is quantified through PCC-R^(7,8).

CONCLUSION

This study analyzed the influence of the phonological therapy, as the EG presented higher improvements in phonemes acquisition and severity of phonological disorder. These findings are extremely important for the clinical practice, because they show the importance of speech therapy, as the phonological system of subjects with phonological disorders, without treatment, may remain stagnant, without spontaneous improvements or it may occur in a slow way.

Besides, it is confirmed that the phonological therapy, through the contrastive approach (Minimal and Maximal Oppositions), promotes changes in the phonological system, propitiating the phonemes acquisition and the change in the severity of the phonological disorder.

RESUMO

Objetivo: Verificar as mudanças no sistema fonológico (aquisição de fonemas) e na gravidade do desvio fonológico de sujeitos submetidos à terapia fonológica de abordagem contrastiva, em comparação a um grupo de sujeitos sem intervenção. **Métodos:** A amostra foi constituída por 18 sujeitos com idades entre 4 anos e 10 meses e 7 anos e 4 meses, de ambos os gêneros, com diagnóstico de desvio fonológico. Nove sujeitos constituíram o Grupo Experimental (submetidos à terapia fonoaudiológica) e os outros nove constituíram o Grupo Controle (em lista de espera para terapia fonoaudiológica). Todos foram avaliados antes e após o período de terapia de abordagem contrastiva, recebida apenas pelo Grupo Experimental. Os sujeitos de ambos os grupos foram pareados quanto à idade, à gravidade do desvio fonológico, ao número de fonemas ausentes na primeira Avaliação Fonológica, e ao período de tempo entre a primeira e a segunda avaliação fonológica. Verificou-se o número de fonemas adquiridos no sistema fonológico geral e calculou-se o Percentual de Consoantes Corretas-Revisado para a determinação da gravidade do desvio fonológico, em ambas as avaliações fonológicas. Os dados foram analisados estatisticamente. **Resultados:** O Grupo Experimental adquiriu maior número de fonemas, que determinaram mudança na gravidade do desvio fonológico. As diferenças encontradas entre ambos os grupos foram significativas. **Conclusão:** A terapia fonológica de abordagem contrastiva promove mudanças no sistema fonológico, que influenciam significativamente a aquisição de fonemas e a mudança da gravidade.

Descritores: Fala; Distúrbios da fala; Transtornos da articulação; Fonoaterapia; Linguagem infantil

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