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Case Report
Relato de Caso

Pseudowords to the Phonological Therapy: a new therapeutic approach

Pseudopalavras para Terapia Fonológica: uma nova abordagem terapêutica

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Keywords

Speech
Speech Therapy
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Child

ABSTRACT

The pseudowords are a resource rarely used in clinical practice, but may be an excellent option for phonological therapy. This study aimed to verify the therapeutic progress of children with phonological disorder, treated from a new therapeutic approach, considering the favorable linguistic environment in pseudowords and words. The sample consisted of three children, aged between 4 and 8 years old, who submitted to a new therapeutic approach to phonological basis. The children were treated with different targets involving pseudowords and real words in favorable and neutral linguistic environments. In the results, it can be observed that the therapy involving favorable linguistic environment the best results when compared to realize in neutral environment. Regarding the target words, subject treated simultaneously with pseudowords and real words presented satisfactory results, indicating that the targets were appropriate to therapy. The new therapeutic approach involving pseudowords and real words in favorable environments proved to be effective for the treatment of phonological disorders.

Descritores

Fala
Fonoterapia
Transtornos da Articulação
Fonoaudiologia
Fonética
Criança

RESUMO

As pseudopalavras são um recurso pouco utilizado na prática clínica, mas podem representar uma excelente opção para a terapia fonológica. O objetivo deste estudo foi verificar o progresso terapêutico de crianças com desvio fonológico tratadas a partir de uma nova abordagem terapêutica, considerando o ambiente linguístico favorecedor em pseudopalavras e palavras com significado. A amostra foi composta por 3 crianças, com idades entre 4 e 8 anos, submetidas a uma nova abordagem terapêutica com base fonológica. As crianças foram tratadas com diferentes alvos envolvendo pseudopalavras e palavras reais, em ambiente linguístico favorecedor e neutro. Nos resultados, pode-se observar que a terapia envolvendo ambiente linguístico favorecedor apresentou melhores resultados quando comparada com a realizada em ambiente neutro. Em relação às palavras-alvo, os sujeitos tratados simultaneamente com pseudopalavras e palavras reais apresentaram resultados satisfatórios, indicando que os alvos foram adequados à terapia. A nova abordagem terapêutica envolvendo pseudopalavras e palavras reais em ambientes favorecedores mostrou-se eficaz para o tratamento dos desvios fonológicos.

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INTRODUCTION

Phonological disorder (PD) is characterized as a change in speech during the period of phonological development, either by the absence or by some obstacle in stabilizing a certain segment, a distinctive feature and/or syllabic constituent[1]. For the adequacy of the speech of these children the therapy with phonological approach is performed.

In the last decades several studies involving phonological therapy have been performed and, with this, the therapeutic resources and strategies have been scientifically rediscussed and improved for clinical practice. One of these resources was the favorable linguistic environments on atypical phonological acquisition[2-7].

The organization of phonological therapy is based on therapeutic approaches that govern the structure and procedures of sessions based on linguistic principles. In Brazil, there are several therapeutic models that are frequently used in clinical practice, one of them is the Maximum Oppositions Model[2]. This model suggests that therapy can be performed using pairs of meaningful words, here called real words, and pseudowords, which have no meaning. However, although the model is widely used in Brazil, therapists usually only work with meaningful words, whereas in international research, pseudowords are also used[8-10].

Pseudowords are defined as a sequence of phonemes that are in accordance with the rules of language, but which have no meaning[9]. The production of pseudowords is considered a very complex task involving several brain mechanisms, such as memory[11], because it requires the child to focus on the unknown target in order to create a memory of the latter. Although rarely used as a therapeutic strategy, there are studies that report the use of pseudowords as a therapeutic strategy. A recent study[12] deals with the use of new words, created from simple syllabic structure (Consonant-Vowel), as a strategy to work on coarticulation in the speech of children with speech disorders and childhood apraxia.

This study sought to integrate these two resources into phonological therapy, a favorable linguistic environment and pseudowords, to verify its functionality and effectiveness, in order to innovate the therapeutic possibilities for clinical practice and to seek scientific results for the proposal. For this, a new therapeutic approach was proposed that uses pseudowords and real words, controlled in the linguistic environment. The hypothesis is that the therapeutic approach with both real target words and pseudowords in a favorable linguistic environment, propitiates a greater phonological acquisition in the therapy of children with PD.

Therefore, the objective of this study is to verify the therapeutic progress of children with PD, treated from a new therapeutic approach, considering the favorable linguistic environment in pseudowords and real words (with meaning).

CLINICAL CASE PRESENTATION

This study was registered and approved by the Projects Office and by the Ethics and Research Committee of the Institution of Higher Education in which the project was developed under the number 280539914.1.0000.5346. All the children who participated in the research had the Informed Consent Form (ICF) signed by their parents and/or guardians, in which they authorized the participation of their children in the research as well as the use of clinical data for scientific research, as well how the children nodded in the research participation.

The sample consisted of three subjects with a diagnosis of PD and ages of 6:05 (S1), 7:11 (S2) and 5:10 (S3). The selection of children was performed from screenings belonging to the speech sector of the school-clinic of the speech and hearing service of a Higher Education Institution.

The inclusion criteria were: to present a previous diagnosis of PD, obtained in the speech-language screening; and not having passed or receiving speech-language therapy. And, as exclusion criteria, the following were considered: presenting changes in the stomatognathic system or any other organic impairment that was influencing speech production; audiological and language changes (except in the phonological level); and emotional factors that could influence the results of therapy.

Subjects were selected for convenience in the speech-language screenings of the service, according to the inclusion and exclusion criteria established. Based on the assumption that the selected children were submitted to basic speech-language evaluations in the screening and obtained the diagnosis of PD, after the selection of the PDs, the following evaluations were performed: detailed anamnesis with those children's guardians; evaluation of the motor-oral sensory system; auditory evaluation; and phonological evaluation.

From the phonological system of the three children, and considering the therapeutic approach used in this study, the phoneme /r/ was selected as the target for the therapy. The approach used considers the principles of the implicational hierarchy of distinctive traits[2] and works with only one target phoneme. Therefore, the /r/ phoneme was selected because it is the most complex and later phonological acquisition, and consequently the most susceptible to changes.

The new therapeutic approach presents a simple organizational structure in the mode of intensive care (IC). Each therapeutic period consists of 7 sessions that last 50 minutes each and are performed 3 times a week in the intensive mode.

In this study, two therapeutic periods were performed with each child, the second period was identical to the first one, that is, the first period was repeated with the same target and the same target words. The organization of the therapeutic sessions considered two fundamental aspects of therapy, perception and production. Furthermore, the structure of the model consists of periodic stages and revaluations, so that therapeutic progress can be evaluated more effectively. Therefore, this new approach allows a greater control of the target words and the therapeutic evolution, targets of this study. And, its simple structure allows speech therapists to use it in clinical practice.

Initial and final phonological evaluation was performed using the Phonological Assessment Tool (INFONO)[13], which was applied in the first and last session of each period to verify the child's phonological system. At the beginning and end of each therapeutic session the Exploratory Evaluation (AE) was performed, through which it was possible to analyze the child's

learning in relation to the target words. It is a simple method of monitoring the therapeutic evolution. The figures withthe target words are presented to the child who should name them. The therapist transcribes these productions and calculates the correct percentage of production. With this, at the end of each session the evolution of the child during the care can be observed.

The priority of the study was to select favorable targets with pseudowords and real words. However, since there were 3 subjects, it was opted to analyze the favorable and neutral linguistic environments, with pseudowords and real words. Some studies[3,12] have shown that neutral words are efficient for phonological therapy.

To select the treatment, a random draw of the three subjects was performed, considering the linguistic environment and the type of target words to be used in the treatment, that is, subjects were treated using the following selection of target words: S1 was treated with 3 pseudowords in favorable environment + 3 real words in favorable environment; S2 with 6 real words in a favorable environment; and S3 with 3 pseudowords in a neutral environment + 3 real words in a neutral environment.

In order to select the target words considering the favorable linguistic environments the study guidelines[14] in which the author presents values and weights of favoring for all Brazilian Portuguese phonemes was used. This proposal allows us to calculate the value of favoring any word and/or pseudoword, as well as to verify its level of favoring.

The pseudowords were presented to the children along with the real words and, through playful activities; a meaning was inserted into each pseudoword. With this, the child starts to have a lexical and semantic reference of the target.

The results obtained in the AEs made it possible to perform the analysis referring to favorable and neutral words, real words and pseudowords, while the evolutions and efficacy of the therapy were analyzed by comparing the initial and final phonological evaluations in INFONO[13], with analysis through the Wilcoxon Test for related samples. Statistical analysis was performed using Statistical Analysis System (SAS), version 9.1. The level of significance was set at 5% ($p < 0.05$).

As exemplified in Chart 1, INFONO[13] (initial evaluation) was applied in the first therapeutic session. The second session was planned with activities of perception of the target sound, in which the target is presented to the child with the objective of perceiving the same, using tactile, visual and auditory cues, and allowing the differentiation of other phonemes. The third session, of imitation, is performed so that the target words containing the target sound are presented to the child by the therapist, and the play activity involves moments of imitation of the therapist's production (speech model). The other three sessions following were based on spontaneous naming production, in which the target sound in the target words is stimulated through playful activities to be produced spontaneously.

Table 1 shows the results obtained in AEs performed in all sessions for each subject.

It can be observed in Table 1 that S1 presented an increasing progress of hits in the productions of the therapeutic targets, being, in general, the percentage of hits in the final AEs higher than in the initial AEs. In relation to S2, it was observed that it was easy for the child to produce the targets correctly, highlighting the high and constant percentages of correct production presented in the second period, indicating the learning of the target words by the child. As for S3, it was observed a greater difficulty in

Chart 1. Structure of the new therapeutic approach

Section	Description
1.	Initial INFONO
2.	Perception (concept of sound)
3.	Production/Imitation
4.	Production/Nomination
5.	Production/Nomination (2)
6.	Production/Nomination (3)
7.	Final INFONO

Table 1. Percentage of correct production of the target words presented by the subjects in each session

		S1 (%)	S2 (%)	S3 (%)
Imitation Session Period1	AEI	0	0	0
	AEF	0	50	50
Nomination Session Period 1	AEI	0	50	17
	AEF	33	50	33
Nomination Session (2) Period 1	AEI	33	50	17
	AEF	33	67	33
Nomination Session (3) Period 1	AEI	50	67	0
	AEF	33	67	17
Imitation Session Period 2	AEI	30	83	0
	AEF	50	83	0
Nomination Session Period 2	AEI	30	83	17
	AEF	50	83	17
Nomination Session (2) Period 2	AEI	50	83	33
	AEF	67	83	17
Nomination Session (3) Period 2	AEI	67	83	33
	AEF	83	83	33

Caption: S1 (6 years 5 months) - targets: 3 pseudowords and 3 real words, favorable environment; S2 (7 years 11 months) - targets: 6 real words, favorable environment; S3 (5 years 10 months) - targets: 3 pseudowords and 3 real words, neutral environment

the production of the targets, since it did not exceed the value of 50% of correct productions in any AE. Also, S3 presented a regression period, in which it performed less correct productions, and after showing a small evolution, but did not reach 50% in each AE.

Following the structure of the therapeutic approach, Final INFONO[13] (post-therapy) was applied in the final evaluation to verify the evolution of the children's phonological system. Table 2 shows the results obtained in the Initial and Final INFONO[13] and the value obtained in the statistical analysis.

In Table 2, the result was statistically significant only for S3. Therapy performed with only real words did not present a significant result.

When observed the results obtained in Table 1 and 2, some disagreements are observed, S1 for example, presented satisfactory results in AEs, but in the analysis of the Initial and Final INFONO[13] did not present a statistically significant result. This divergence in results is indicative of what changes are occurring in the phonological system of treated children.

Table 2. Phonological system of subjectts pre- and post-therapy

Phoneme/ Syllabic position	S1		S2		S3	
	INF-I (%)	INF-F (%)	INF-I (%)	INF-F (%)	INF-I (%)	INF-F (%)
/p/ (onset)	100	100	100	100	100	100
/b/ (onset)	80	100	100	100	100	100
/t/ (onset)	100	100	100	100	100	100
/d/ (onset)	100	54	100	100	100	100
/k/ (onset)	100	100	100	100	100	100
/g/ (onset)	62	95	100	100	100	100
/f/ (onset)	100	100	100	100	100	100
/v/ (onset)	100	87,5	100	100	85	86
/s/ (onset)	88	100	33	44	89	89
/z/ (onset)	66	40	50	33	100	100
/S/ (onset)	100	86	100	100	14	57
/Z/ (onset)	62	60	100	83	83	100
/m/ (onset)	100	100	100	100	100	100
/n/ (onset)	100	100	100	100	83	100
/ø/ (onset)	100	100	100	100	67	67
/l/ (onset)	90	93	100	100	0	0
/ˊ/ (onset)	0	25	100	100	0	0
/r/ (onset)	9	86	0	50	0	12,5
/R/ (onset)	33	33	100	100	0	100
/s/ (coda)	92	100	0	85	50	69
/n/ (coda)	100	100	100	100	100	100
/r/ (coda)	17	20	0	17	0	0
/l/ (coda)	100	100	100	100	100	100
Cp+/r/ (OC)	14	14	0	0	0	0
Cf+/r/ (OC)	20	0	0	0	0	0
Cp+/l/ (OC)	50	25	33	100	0	0
Cf+/l/ (OC)	100	100	0	100	0	0
	p = 0,95		p = 0,09		p = 0,017	

Caption: INF-I: Initial INFONO (pre-therapy); INF-F: Final INFONO (post therapy); Cp+/r/: plosive consonants+ /r/; Cf+/r/: fricative consonants + /r/; Cp+/l/: plosive consonants + /l/; Cf+/l/: fricative consonants + /l/; OC: Onset Complex. Statistical test used for p value, Wilcoxon; p<0.05. Source: Bonini (2016)[14]

DISCUSSION

This study assumed that phonological therapy should involve all possible resources to make it happen more quickly and effectively. To that end, it is believed that the therapist must pay attention to the selection of the therapeutic model, the target sound and the target words, as well as factors that may interfere in the adequate development of the therapeutic process. The treated subjects showed the importance of care in the selection of target words with a favorable linguistic environment, and the types of therapy target words (pseudowords and real words).

All subjects were treated with the same target sound and with the same therapeutic model, and only with different target words in different linguistic environments, being: S1 - favorable targets, real words and pseudowords; S2 - favorable targets, real words; S3 - neutral targets, real words and pseudowords.

It should be noted that in pseudowords, each target had a representative design developed in therapy, created as an abstract image, but contextualized in the therapeutic process. With this, the subjects were able to evoke and name the pseudowords, inserting them into playful activity, "meaning" the pseudoword. The symbolic representation of the pseudoword is important

for the child to have a reference of this word. There are several ways to use this representation. In this study, letters with abstract figures were created. Another example of representation was the form used in a recent study[12] involving new, unknown words in which the authors report that the words were related to colored alien figures.

In the results, it was observed that the subjects treated with favorable targets (S1 and S2) presented better results, more progressive evolution, when compared to the subject treated with neutral targets (S3), which presented more oscillations between correct and incorrect production. These data indicate that linguistic environments should be considered in the selection of target words, and that favorable environments are therapeutic facilitators for phonological acquisition.

Another factor indicative of the efficacy of the favorable words were the results presented by S2 that showed a progressive evolution at each session, from the first therapeutic period. The progressive growth of this subject is an indicative of the favorable target words worked as an excellent therapeutic resource, since from the first sessions facilitated the learning of the targets by the child. The ease in target learning may also be related to the neurological and linguistic maturity of S2, who is the oldest subject of the research, therefore, memory and phonological awareness skills are better than the other subjects in the study. This favors performance in the adequacy of the phonological system.

Regarding the type of target words, the constant and progressive performance of S1 evidenced the functionality of pseudowords and real words worked together. However, when compared to the performance of S2, that presented by S1 was slower.

The facility presented by S2 with the target words indicates that the real words have the advantage of prior knowledge of the child, and are apparently "easier". In contrast, the slower progression of S1 indicates that pseudowords demand more attention from the child who is learning and memorizing the targets. When the child is exposed to a pseudoword, he/she does not yet have any specific memory of it, so he/she must necessarily direct his/her attention to it to learn how to pronounce it. With this, the child ends up focusing his/her attention also on the target phoneme, which in this case is inserted in favorable linguistic environments, which tend to facilitate the production.

These data are in agreement with other studies[12,14] that state that the child's lack of prior knowledge about pseudoword is a positive factor, since it requires that he/she focus his attention on articulatory information. Pseudowords function as a controlling factor because they eliminate the interference of familiarity and there is a decrease in the risk of confusion with other words, thus excluding the interference of other information.

The process of learning pseudowords is complex and involves several brain activities and works mainly with memory structures. When pseudowords are used as targets, short-term memory performs a constant interaction with representations of long-term memory[14,15].

It is believed that the option for intensive therapy, three times a week of 50 minutes, was decisive for the therapeutic evolution and learning of pseudowords. Given that it agrees with another study[15], in which the author states that when the stimuli are submitted to performing actions repeatedly and periodically, they tend to remain in memory for a longer period of time.

FINAL COMMENTS

The results obtained in this study indicate that the new therapeutic approach was effective, fulfilling the objective of the phonological therapy, to adapt the phonological system of the children with disorder.

Also, it has been found that pseudowords are a resource that can be used in therapy and that tend to facilitate the learning of target phonemes. The efficiency of pseudowords is enhanced when combined with favorable environments.

REFERENCES

1. Ribas LP. Aquisição das líquidas por crianças com desvio fonológico: Aquisição silábica ou segmental? Letras UFSM. 2008; 36:129-49.
2. Mota HB, Bagetti T, Keske-Soares M, Pereira LP. A generalização baseada nas relações implicacionais em sujeitos submetidos à terapia fonológica. Pró-Fono R. Atual. Cient. 2005;17(1):99-110.
3. Keske-Soares M, Mota HB, Pagliarin KC, Ceron MI. Estudo sobre os ambientes favoráveis à produção da líquida não-lateral /r/ no tratamento do desvio fonológico. Rev Soc Bras Fonoaudiol. 2007;12(1):48-54. http://dx.doi.org/10.1590/S1516-80342007000100010.
4. Brancalioni AR, Bonini JBB, Gubiani MB, Keske-Soares M. Ambientes favorecedores para produção dos fonemas plosivo /k/ e /g/. Rev. Distúrb. Comum. 2012;24(1):101-7.
5. Bonini JB, Bertagnolli APC, Freitas GP, Blanco-Dutra AP, Keske-Soares M. Eficácia de palavras favorecedoras com a fricativa /ʒ/ na terapia fonológica. Rev. Distúrb. Comum. 2014;26(2):395-404.
6. Gonçalves GF, Keske-Soares M, Checalin MA. Estudo do papel do contexto linguístico no tratamento do desvio fonológico. Rev Soc Bras Fonoaudiol. 2010;15(1):96-102. http://dx.doi.org/10.1590/S1516-80342010000100016.
7. Wiethan FM, Mota HB. Ambientes favoráveis para a produção de /z/, /ʃ/ e /Z/: análise e comparação das mudanças ocorridas no sistema fonológico. Rev CEFAC. 2013;15(2):324-33. http://dx.doi.org/10.1590/S1516-18462012005000014.
8. Gierut JA. Maximal opposition approach to phonological treatment. J Speech Hear Disord. 1989;54(1):9-19. http://dx.doi.org/10.1044/jshd.5401.09. PMid:2915530.
9. Gierut JA. The conditions and course of clinically-induced phonological change. J Speech Hear Res. 1992;35(5):1049-63. http://dx.doi.org/10.1044/jshr.3505.1049. PMid:1447917.
10. Gierut JA, Morrisette ML, Ziemer SM. Nonwords and generalization in children with phonological disorders. Am J Speech Lang Pathol. 2010;19(2):167-77. http://dx.doi.org/10.1044/1058-0360(2009/09-0020). PMid:20086043.
11. Santos FH, Bueno OF. Validation of the Brazilian Children's Test of Pseudoword Repetition in Portuguese speakers aged 4 to 10 years. Braz J Med Biol Res. 2003;36(11):1533-47. http://dx.doi.org/10.1590/S0100-879X2003001100012. PMid:14576909.
12. Maas E, Mailend ML. Fricative contrast and coarticulation in children with and without speech sound disorders. Am J Speech Lang Pathol. 2017;26(2S):649-63. http://dx.doi.org/10.1044/2017_AJSLP-16-0110. PMid:28654946.
13. Ceron, M.I. Instrumento de Avaliação Fonológica (INFONO): desenvolvimento e estudos psicométricos. [tese]. Santa Maria: Universidade Federal de Santa Maria; 2015.

14. Bonini JB. Pseudopalavras favorecedoras para terapia fonológica. [tese]. Santa Maria: Universidade Federal de Santa Maria; 2016.

15. Acheson DJ, Hamidi M, Binder JR, Postle BR. A common neural substrate for language production and verbal working memory. J Cogn Neurosci. 2011;23(6):1358-67. http://dx.doi.org/10.1162/jocn.2010.21519. PMid:20617889.

Author contributions

Contribution of each author: JBB was responsible for collecting the data, tabulating the data, interpreting the data and preparing the manuscript; MKS was responsible for the orientation of the research, review and submission of the manuscript.