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Pseudowords to phonological therapy validated by expert judges

Pseudopalavras para terapia fonológica validadas por juizes especialistas

ABSTRACT

Purpose: Create a pseudowords list based on favorable environments and submit this to the judgment of expert judges, to obtain a validated list of pseudowords that can be used in therapy. **Methods:** A study that analyzed the favorable environments of all phonemes of Brazilian Portuguese was sought and, from their data, a pseudoword list for each phoneme, at different levels of favoring, was created. The judging sample of the list was composed of ten judges who reviewed thepseudowords. This analysis was performed in two distinct stages. In the first stage, five judges analyzed the bestpseudowords. In the second stage, the other five judges judged whether pseudowords were essential for therapy. The concordance analysis among the judges was performed through the Content Validity Ratio. **Results:** The judges of the first stage reviewed and considerably reduced the number ofpseudowords, from 4000 in total to 1547. And, with the statistical analysis used on the data obtained with the judges of the second stage, the pseudoword list with content validity was reduced to few options. The judges pointed to the simplicity in the structure of pseudowords as a selection criterion. **Conclusion:** The expert judges' judgment resulted in a small number of pseudowords that have content validity and can be used in phonological therapy.

RESUMO

Objetivo: Criar uma lista de pseudopalavras baseada em ambientes favorecedores e submeter esta ao julgamento de juízes especialistas, a fim de se obter uma lista validada de pseudopalavras que possam ser utilizadas em terapia. **Método:** Buscou-se um estudo que analisou os ambientes favorecedores de todos os fonemas do Português Brasileiro e, a partir de seus dados, criou-se uma lista de pseudopalavras para cada fonema, em diferentes níveis de favorecimento. A amostra julgadora da lista foi composta por dez juízes que analisaram as pseudopalavras. Esta análise foi realizada em duas etapas distintas. Na primeira etapa, cinco juízes analisaram quais as melhores pseudopalavras. Na segunda etapa, os outros cinco juízes julgaram se as pseudopalavras eram essenciais para a terapia. A análise de concordância entre os juízes foi realizada por meio da Razão de Validade de Conteúdo. **Resultados:** Os juízes da primeira etapa analisaram e reduziram consideravelmente o número de pseudopalavras, que passou de 4000 no total para 1547. E, com a análise estatística utilizada sobre os dados obtidos com os juízes da segunda etapa, a lista de pseudopalavras com validade de conteúdo foi reduzida a poucas opções. Os juízes apontaram a simplicidade na estrutura das pseudopalavras como um critério de seleção. **Conclusão:** O julgamento dos juízes especialistas resultou em um pequeno número de pseudopalavras que apresentam validade de conteúdo e podem ser utilizadas na terapia fonológica.

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INTRODUCTION

In the last decades there has been a growth, on the part of the parents, in the search for the diagnosis and therapy of Phonological Deviation (PD). Concomitantly, several studies have appeared in the scientific environment regarding phonological therapy[1-10]. These studies with phonological therapy have brought many contributions and helped in the improvement of this, approaching the theory of clinical practice.

The main objective of phonological therapy is to adjust the child's speech according to the adult pattern of his/her language, and is indicated for children who present atypical phonological development. The organization and practices of phonological therapy are based on therapeutic models that govern the structure of the sessions according to theoretical foundations. There are several resources that can be used to enhance phonological therapy, such as the type of target word and the linguistic environments involved[3,5,6,9].

The therapeutic model of "Maximum Oppositions"[11,12], widely used in Speech Therapy, indicates that therapy should be performed using pairs of words involving Real Words and Pseudowords. However, although this model is widely used in the clinic in Brazil, it is noted that, frequently, only meaningful target words are used, that is, Real Words.

Regarding target words, in clinical practice the therapist occasionally encounters the following difficulty: selecting meaningful target words that have only the altered target phoneme in the proper position. Given this, in some cases, the therapist ends up opting for another target phoneme that has more options for target words, even if this reduces the possibilities of generalizations.

Considering that the target words are an essential and determinant factor in the therapy, this study looked at two important aspects in the formation of these target words: the type, without meaning, and the linguistic environments. As pseudowords are the main focus of the research, it was opted by the incorporation of the variable favorable environments in the formation of the targets.

Pseudowords, as the name itself indicates are non-real words, that is, meaning words without meaning. Santos and Bueno[13] define them as stimuli that respect the rules of the native language, but do not have any conceptual meaning. The process of perception and production of pseudowords is quite complex for children, so it is widely used in reading, writing and memory[13] evaluation tests and should also be considered as a therapeutic resource that can be used in clinical practice.

Another resource that the therapist can focus on in the selection of target words is the favorable environments. These refer to a group of variables such as position of the target phoneme in the word, tonicity, number of syllables, preceding and following context. Several studies have been performed and confirmed the importance of favorable environments in the phonological acquisition process and in the selection of target words[3,5,9,14-18].

Thus, based on the principle that the speech therapist should use resources that optimize the therapy and consequently help in the process of acquisition of the child, it is considered that the selection of the target words should be the object of attention.

Therefore, this study created a pseudoword list for phonological therapy and submitted this to the judgment of expert judges in order to obtain a reliable resource for clinical practice. Also, it was opted to use pseudowords in therapy because they are a resource rarely explored in Brazil, where their use is more frequent in evaluation and diagnostic instruments. Noting that the elaboration of pseudowords involving favorable environments in Brazilian Portuguese (BP) is innovative.

The analysis by judges allows greater reliability to the results of the study. This analysis is a stage of the methodological procedures performed in the study. Several studies in Speech Therapy used analysis and concordance among judges as a methodological analysis[19-23].

Therefore, the present work aimed to establish a pseudowords list based on favorable environments and to submit this to the judgment of expert judges, in order to obtain a reliable pseudowords list for use in phonological therapy.

METHODS

This research is characterized as exploratory, prospective and transversal, of quantitative character. It is linked to the project "New Therapeutic Perspectives in the cases of Phonological Deviation", approved in the Institutional Research and Ethics Committee under number 280539914.1.0000.5346.

The pseudowords, object of study of this research, were elaborated considering the linguistic environments of each phoneme. For this purpose, the data referring to the favorable environments the BP phonemes presented in a study that approached and analyzed the favorable environments of all the BP phonemes were considering the variables, position in the word, number of syllables, tonicity, preceding and following context[24]. The author also performed an analysis in which she obtained the favoring weights of each variant, which makes it possible to calculate the value of any word or in the case, of any pseudowords created. Thus, based on the values of this study[24], a pseudowords list was created for each BP phoneme at each level of favoring (unfavorable, neutral and favorable), always seeking a harmony in the use of variables, in order to cover all variants, since these represent the possibilities of occurrence in BP.

At first, the list consisted of at least 20 pseudowords for each phoneme, at each level of favoring, totaling 60 pseudowords per phoneme, with a total of 1485 pseudowords. However, it was found that the material could be expanded by providing more data for the analysis, therefore, it was opted to calculate the weights of each phoneme of pseudowords, besides the phoneme for which it was created. For example, the pseudowords [sa.'bi.ri], was first created for the /r/ phoneme, and in the enlargement of the list, the favoring target value for the phonemes /b/ and /s/ was also calculated, and the pseudowords was included in the list of phonemes/b/ and /s/, according to their levels of favoring. With this, the list got a very high number of pseudowords for each phoneme, mainly in the class of plosives. This is because one of the criteria used in the creation of pseudowords was to use whenever possible phonemes less complex than the target phoneme in question, in order to minimize possible difficulties.

For this reason, a selection of these pseudowords was necessary by expert judges.

To this end, a Group of Specialist Judges 1 (GJ1), composed of 5 PhD with practice in areas related to Speech (phonological therapy, linguistics, phonology) was instructed to verify the best pseudowords for use in phonological therapy. It is noteworthy that all the judges signed the Informed Consent Form (ICF), in which they authorized their participation in the research as judges.

The judges were instructed to select and judge which are the 10 best pseudowords of each phoneme at each level of favoring. It should be noted that the judges were not informed of the levels of favoring, in order to avoid select favoring targets, that is, the judges received three lists of pseudowords for each phoneme and were asked to judge which were the 10 best pseudowords of each list.

The data obtained by the GJ1 evaluation were tabulated and submitted to the analysis through the percentage of absolute concordance. Due to the great variability of the response, recalling that the pseudowords list was quite extensive, a minimum of 25% concordance among the judges was established so that the pseudowords could be considered adequate for therapy. With this, a new pseudowords list was obtained.

In order to confer more reliability, statistical accuracy and validity, this new list was sent to other 5 PhD Judges (GJ2). The criteria used to select the judges of the GJ2 were the same as those of the GJ1, all of them being PhD with practice in Speech area and signing the ICF.

This stage, involving GJ2, is important because this validity points out how important an item is for the objective for which it was intended, that is, in this case content validity was the determining measure of how many and which pseudowords are suitable for therapy.

The GJ2 judges were instructed to analyze pseudowords (NW) and classify them as "essential", "non-essential but useful", or "non-essential" to phonological therapy. All the judges received the following explanation to perform the classification:

- Essential: Great NW, which would certainly be used in therapy;

- Non-essential, but useful: good NW, which may or may not be used in therapy;

- Non-essential: reasonable NW, which probably will not be used in therapy.

The data obtained by the GJ2 evaluation were tabulated and submitted to analysis using the Content Validity Ratio (CVR). To analyze the concordance between the judges, the minimum CVR values proposed by Lawshe[25], were considered, thus avoiding the risk of concordance occurring at random.

For a better understanding of the methodological procedures adopted in this study, Figure 1 presents a schematic of the methodology used.
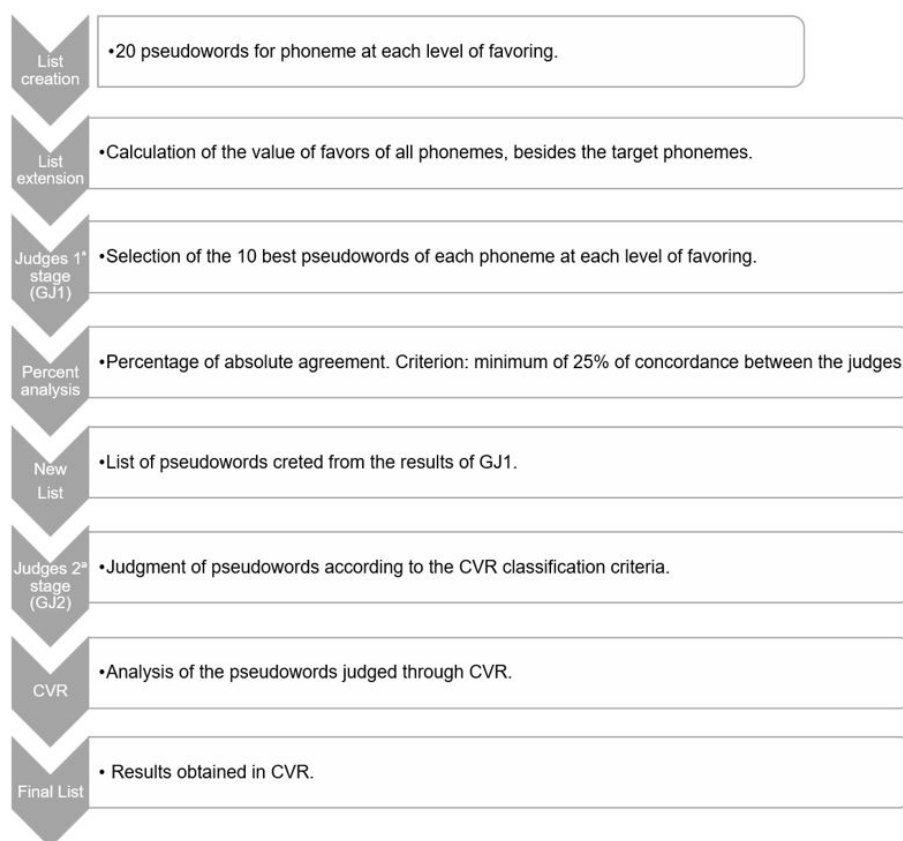
Caption: CVR = Content Validity Ratio
Figure 1. Scheme of the procedures used in the methodology

RESULTS

The pseudowords were formulated from structures that respect the rules of the Portuguese language and are not uncommon in children's speech. The table below shows the number of pseudowords created for each phoneme at each level of favoring.

It is noted in Table 1 that plosives are the phonemes for which more pseudowords were created, followed by the phonemes of the class of fricatives and nasals, a fact justified by the complexity of the phonemes. Also, the small number of pseudowords created for the phoneme /S/ at the unfavorable level, and /l/ in complex onset with fricative at the favorable level, stands out.

The GJ1 analyzed and selected the 10 best pseudowords of each phoneme at each level of favoring, but the analysis of a judge had to be excluded due to the identification of the lack of methodological criteria in the analysis. As justification for their choices the judges pointed mainly the following reasons: simple syllabic structure - CV; dissyllable words; words with plosives, and avoid liquids; ease of production; preference for lip and anterior phonemes; tonic syllable; different precedent and following contexts.

After the analysis of the GJ1, of 4000 pseudowords, a list of 1547 pseudowords was obtained, being 480 classified as unfavorable, 568 neutral and 499 favorable. As described in the methodology, this new list was analyzed by GJ2, and each pseudowords was analyzed separately through CVR. Measures of the CVR minimum proposed by Lawshe[25] were used in order to avoid that the concordance in the judges' judgment occurred at random.

Using this criterion proposed by Lawshe[25], the number of pseudowords selected by the judges reduced considerably. The following table presents the pseudowords selected by the judges who obtained concordance by the CVR, therefore, without the possibility of being selected at random.

Table 2 shows that there was no preference for phoneme or class of sounds in the concordance of the judges. Moreover, it is observed that, although the linguistic environment is controlled, the judges selected pseudowords more "simple", that is, with simpler syllabic structure, CVCV. Most of the pseudowords selected by the judges were dissyllable, with the target phoneme in the tonic position, and with the other phonemes less complex than the target.

From the pseudowords analyzed and considered essential, Table 2, none belonged to the unfavorable environment, whereas in the neutral environment there were only two pseudowords (['ta.pi] and ['flɛ]). The other pseudowords selected were from favorable environments.

Table 1. Number of pseudowords created for each phoneme and at each level of favoring

Target Phoneme	Unfavorable	Neutral	Favorable
/p/	70	196	134
/b/	55	119	132
/t/	46	177	62
/d/	64	143	55
/k/	31	159	100
/g/	50	133	69
/f/	25	36	30
/v/	30	76	40
/s/	29	64	21
/z/	33	76	32
/S/	15	62	27
/Z/	27	58	32
/l/	20	83	33
/ʎ/	20	25	23
/R/	21	21	21
/ɾ/	20	35	29
/m/	71	157	65
/n/	53	129	51
/ø/	30	34	46
/s/ coda	20	25	48
/R/ coda	43	58	42
OC/R/p	20	23	31
OC/R/f	20	20	21
OC/l/p	20	20	34
OC/l/f	20	35	5

Caption: OC/R/p = Onset Complex /r/ plosive; OC/R/f = Onset Complex /r/ fricative; OC/l/p = Onset Complex /l/ plosive; OC/l/f = Onset Complex /l/ fricative

Table 2. Pseudowords with content validity without random concordance interference

Target phoneme	Pseudoword	CVR
/p/	['ta.pi]	1
/R/	[sa.'bi.ɾi]	1
OC/l/f	['flɛ]	1
/p/	['pĩ]	1
/d/	['du.za]	1
/g/	[ni.'gɔ.ta]	1
/g/	['dɔ.gu]	1
/f/	['fe.na]	1
/f/	['fe.ni]	1
/R/	['Ri.ba]	1
/R/	['Rɛ.va]	1

Caption: CVR = Content Validity Ratio. Statistical analysis used CVR considering the criteria of Lawshe[25]

DISCUSSION

Favorable environments have already been the target of several studies[3,5,6,9,17,18], however none were performed searching the environments for pseudowords. This study sought a research encompassing all favorable environments, and applied the results in the creation of pseudowords, in order to control their linguistic environments.

The linguistic environments were important in the creation of pseudowords because they indicated which variables could facilitate or not their production, besides indicating the possibilities of occurrence of the variants in BP.

The GJ1 analysis showed that the pseudowords composed of phonemes of the earliest acquisition classes, those considered easier to produce, plosives and fricatives were the most selected, that is, forms considered to be better for therapy.

Also, the small number of pseudowords selected for some phonemes can be justified by the restrictions imposed by the favoring intervals and weights obtained in the study of favorable environments[24]. For example, according to this study[24], the level of the unfavorable level for the phoneme /S/ is 0 to 5, and for the pseudowords to achieve this score must necessarily be a monosyllabic word, with the target phoneme in initial onset (hence the tonic syllable and the preceding context void), and in the following context the vowels [a], [e], [u], [ɔ] or [ɛ]. Thus, the possibilities of creating pseudowords were very limited.

The analysis of pseudowords from the judgment of expert judges was important for this study, since it conferred greater credibility for the results. Several studies[20-23,26,27] used the analysis of judges as method and proved the efficiency of the method.

The concordance analysis among the judges using the CVR measure was based on current studies[25] which state that this measure is able to measure concordance between evaluators on how much a given item is essential, and whether it is valid for application in research and practice.

The small number of pseudowords that have validity of content can be justified by the number of judges, the minimum necessary. Thus, based on the criteria proposed by Lawshe[25]

the CVR value had to be very high (0.99), that is, all judges should agree that the pseudowords is essential.

In Brazil, pseudowords are traditionally and commonly used in evaluations, and are rarely used in therapy, especially those with a phonological approach. However, in the international literature its use in therapy has been described for some years[28,29].

The incorporation of pseudowords into phonological therapy functions as a stimulus-controlling factor and represents a significant decrease in the risk of confusion and/or association with other target words, in the case with meaning[30].

In the results it was observed that, although the linguistic environments were controlled, the judges considered some of these controlled variables as a selection criterion for the pseudowords. Most of the judges demonstrated preference for simple structure (CV), tonic syllable, and dissyllable words. These data agree with data found in the literature[3,5,14], which state that the criteria cited (tonic syllable, CV structure) facilitate the acquisition of phonemes.

CONCLUSION

From the creation of an extensive list of pseudowords, a small number that have content validity was obtained, and can be used in phonological therapy.

The small number of judges was one of the limitations of the study, because due to the high value of concordance required between them, the number of pseudowords was very reduced. Nevertheless, these pseudowords can be considered adequate and validated for the therapy, since they were judged by the minimum number of judges necessary.

The results obtained in the judges' analyzes are indicative that pseudowords are a resource rarely used by speech therapists who still show some resistance to their use.

In order to confirm the efficiency of the pseudowords obtained in this study it is suggested to perform a study using them in phonological therapy.

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Author contributions

Both authors participated in the elaboration of the article. 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.