

# ANALYSIS OF STRATEGIES EMPLOYED IN A PHONOLOGICAL INTERVENTION PROGRAM FOR HARD OF HEARING CHILDREN<sup>1</sup>

## *ANÁLISE DAS ESTRATÉGIAS EMPREGADAS EM UM PROGRAMA DE INTERVENÇÃO FONOLÓGICA PARA CRIANÇAS COM DEFICIÊNCIA AUDITIVA<sup>2</sup>*

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**ABSTRACT:** Phonological intervention programs for hard of hearing children has been studied worldwide, given their proven benefits for literacy development. However, in Brazil, there is no reference to the evaluation of these programs for hearing impaired children inserted in auditory (re)habilitation services. The objective of this research was to analyze the strategies employed in a phonological intervention program for hard of hearing children. This is an exploratory study, from a documentary, longitudinal source with a qualitative approach, carried out from the intervention with 11 hearing impaired children and three educators who followed the group intervention. Eighty session plans and 80 observation sheets of the educators were analyzed, as well as the description of the results of the focus group carried out with the educators at the end of the intervention. It was observed the need for adaptations regarding the instructions, strategies and materials used, in this order of frequency, as well as the use of communication strategies and specific techniques to optimize children's understanding and execution of the activities. It was concluded that the phonological intervention program for children with hearing impairment needed adaptations and the importance of training professionals in specialized therapy services for this performance is highlighted.

**KEYWORDS:** Hearing impairment. Speech therapy. Learning to read. Pedagogical training. Models of Special Education.

**RESUMO:** Programas de intervenção fonológica para crianças com deficiência auditiva têm sido estudados mundialmente, dados os seus comprovados benefícios para o desenvolvimento da leitura. No entanto, no Brasil não há referência à avaliação destes programas para crianças com deficiência auditiva inseridas em serviços de (re) habilitação auditiva. O objetivo desta pesquisa foi analisar as estratégias empregadas em um programa de intervenção fonológica para crianças com deficiência auditiva. Trata-se de estudo do tipo exploratório, de fonte documental, longitudinal com abordagem qualitativa, realizado a partir da intervenção com 11 crianças com deficiência auditiva e três pedagogas que acompanharam a intervenção em grupo. Foram analisados os 80 planos das sessões e as 80 fichas de observação das pedagogas, além da descrição dos resultados do grupo focal realizado com as pedagogas ao término da intervenção. Observou-se a necessidade de adaptações quanto às instruções, às estratégias e aos materiais utilizados, nesta ordem de frequência, assim como a utilização de estratégias de comunicação e técnicas específicas para otimizar a compreensão e execução das atividades pelas crianças. Concluiu-se que o programa de intervenção fonológica para crianças com deficiência auditiva necessitou de adaptações e destaca-se a importância da capacitação dos profissionais nos serviços de terapia especializada para esta atuação.

**PALAVRAS-CHAVE:** Deficiências da audição. Terapia fonoaudiológica. Aprendizagem da leitura. Formação pedagógica. Modelos de Educação Especial.

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## 1 INTRODUCTION

Over the past 30 years, surprising technological and scientific advances have given children with hearing impairment access to speech sounds at a time favorable to their language development (Wake & Carew, 2016; Bornstein, 2018). Even so, due to the variables involved in the (re)habilitation process - such as: age at diagnosis, cause and degree of hearing impairment, time of use of hearing aid devices, family involvement in the therapeutic process (Bicas, Guijo, & Delgado-Pinheiro, 2017; Moret, 2017; Oliveira, Penna, & Lemos, 2015; Penna, Lemos, & Alves, 2015; Tabaquim et al., 2013; Vasconcelos & Pereira, 2015), among other factors -, hearing impaired children have a disadvantage in relation to hearing children in terms of phonological processing and are, therefore, a risk population for the acquisition of the ability to read (Goldberg & Lederberg, 2015; Lederberg, Schick, & Spencer, 2013; Naveka von Mentzer et al., 2013; Werfel, Douglas, & Ackal, 2016).

It is noteworthy that, for children with hearing impairment, the apprehension of the written code is especially important because this acquisition strengthens the mastery of oral language, in addition to the appropriate development of essential cognitive skills for many of their achievements (Gabriel, Morais, & Kolinsky, 2016; Lemes & Goldfeld, 2008).

It is considered that the auditory skills development work carried out with these children in the auditory (re)habilitation programs, associated with the training of metalinguistic skills, especially phonological awareness, are the protagonists for a good linguistic performance (Gamba-Yoshida, 2017; Goldberg & Lederberg, 2015; Spencer, Schuele, Guillot, & Lee, 2008). According to these authors, phonological awareness is the ability to analyze and manipulate the sounds of a language.

As for therapeutic approaches for children with hearing impairment, the Aurial Approach is widely used in Brazil, when families choose the path of auditory development for the acquisition of their children's oral language (Bevilacqua & Formigoni, 2012). This approach prioritizes the auditory sensory pathway in interactional language situations as a goal for the development of oral language, responding to the psychological, social and educational needs of children with hearing impairment and their families (Moret, 2017).

For this, children (re) qualified through this approach commonly attend individual speech therapy, with the participation of family members and, usually, specialized (re) habilitation services also offer speech therapy and/or pedagogical services in a group setting, considering the positive aspects of the motivation of working in small groups with children, in addition to the therapeutic cost, in order to optimize both the amount of care provided and the quality of the stimulation offered (Bevilacqua & Formigoni, 2012; Moret, 2017).

In individual and group care, a series of communication strategies and techniques to capitalize the hearing capacity of children with the electronic devices used by them, namely, in particular, the Personal Sound Amplification Products (PSAPs) and/or Cochlear Implants (CI), are used by therapists in order to favor communication in the most fluid way possible so that the child perceives him/herself as a competent communicator (Granha, Oliveira, & Rumpf, 2008; Resegue-Coppi, 2008).

Based on the premise that all children with hearing impairment, if well adapted to hearing aid resources and involved in an appropriate therapeutic process, should access the language code appropriately, the development of written language in this population is based on the skills required to hearing children (Bergeron, Lederberg, Easterbrooks, Miller, &

Connor, 2009; Easterbrooks, Lederberg, & Connor, 2010; Harris, Terlektsi, & Kyle, 2017; Lederberg, Miller, Easterbrooks, & Connor, 2014; Mahapatra, 2015).

Easterbrooks, Lederberg and Connor (2010), in a descriptive study, observed classrooms of Early Childhood Education and Elementary Education. The researchers used information based on the observation protocol to develop an initial literacy curriculum called *Foundations for Literacy*. The premise of the aforementioned authors was that it is possible to literate children with hearing impairments to use the same constructs of literacy for hearing children, provided that adaptations were made to support children with hearing impairment. The developed curriculum focused on teaching phonological awareness, phonetics, fluency, vocabulary and language with appropriate adaptations. Their results after application with children with hearing impairment demonstrated that they could learn specific phoneme-grapheme correspondences through the instruction of explicit auditory skills with language and visual support.

In a controlled experimental study with 37 hearing impaired preschoolers, Gilliver, Cupples, Ching, Leigh and Gunnourie (2016) found that the specific phonological awareness training was superior to the vocabulary training of the control group, and that this type of intervention is therefore highly beneficial for children with hearing impairment. Similar results confirm that the specific phonological awareness training is positive for children with hearing impairment at pre and school ages, including computerized training or using telepractice resources (Chen, 2014; Lee, Hall, & Sancibrian, 2017; Miller, Lederberg, & Easterbrooks, 2013; Nakeva von Mentzer et al., 2013; Rakhshanfadaee & Salehi, 2016; Wang, Spychala, Harris, & Oetting, 2013; Werfel, Douglas, & Ackal, 2016).

In Brazil, the scarcity of studies on phonological intervention with the population of hearing-impaired children brings to light the need to build or adapt specific instructional programs for these skills, which seek to develop, in general: the grapheme-phoneme relationship, rhyme, alliteration, syllabic manipulation, phonemic manipulation, identification of words in sentences (Capellini et al., 2010), working memory, also including reading and writing in later stages (Salgado, 2010). It is important, therefore, to investigate the best way to work such skills with hearing-impaired children, since adaptations are necessary, as referred to by literature (Easterbrooks, Lederberg, & Connor, 2010; Lederberg et al., 2014; Lee, Hall, & Sancibrian, 2017).

In addition, instruction to teachers or pedagogues for specific training work with phonological awareness is essential (Capellini et al., 2010; Messier & Jackson, 2014; Spencer, Schuele, Kathryn, & Marvin, 2008) and, therefore, in auditory (re)habilitation programs, it is essential that the team of therapists can receive adequate training for the specific work of phonological intervention. In this sense, the objective of this study was to analyze the strategies of a phonological intervention program applied in groups for children with hearing impairment, according to the assessment of researchers and pedagogues, therapists of these children.

## 2 MATERIALS AND METHODS

This is an exploratory, documentary, longitudinal study with a qualitative approach, carried out at the SUVAG RN Center, a highly complex hearing health service of the Unified Health System, of philanthropic nature. It is important to clarify that this study is part of a broader research that sought to analyze the effectiveness of the phonological intervention program designed for group work for children with hearing impairment, whose execution was

approved by the Research Ethics Committee of the Federal University of Rio Grande do Norte (UFRN), under Opinion no. 1.144.295.

For researching the effectiveness of phonological intervention, children were randomly divided into control (11 children) and experimental (11 children) groups, with a statistically significant positive change in the experimental group in relation to the control group, post-intervention evaluation. It should be noted that the present study emphasized the qualitative analysis of the program, focusing on the strategies employed and not on the pre and post-intervention statistical analysis. The sample was selected by convenience, being composed by the three educators working in the sector of hearing (re)habilitation and by 11 children with moderate to profound sensorineural hearing impairment, users of PSAPs, in the age group of 8 to 14 years old. The educators participating in the research as well as the families of children with hearing impairment were informed about the study and all agreed to participate in it and thus signed the Free and Informed Consent Form (ICF).

At the beginning of each session, the researchers delivered an observation sheet to the educator responsible for each class. In this form, they made notes about the session according to the performance of each child and the general performance of the class, in view of the strategies carried out. These observation sheets will also be analyzed in this research.

All the mentioned children attended speech and language therapies in individual and group settings, with the aim of hearing (re)habilitation. Such assistance was distributed two to three times a week, lasting 50 minutes, in the period of no regular classes, as the children attended regular school (Elementary School I).

The intervention work took place within the care routine of the 11 children in the experimental group, and was therefore accompanied by the educators of the service. Six researchers participated in the study. A scale was organized, making two researchers responsible for the intervention in one of the groups: one directed the session, and the other functioned as support, made the notes of the results, organized the materials, etc. All six researchers received training for the application of the strategies and all participated in the elaboration of 200 activities aimed at the phonological intervention work. It is worth mentioning that a skill could be worked through more than one strategy, per session.

The children's groups were divided according to their age group, development of auditory and oral language skills, reading and writing, criteria established by the auditory (re)habilitation service. Such groups were identified by colors, namely: purple, blue, orange and brown, which are shown in Table 1 further below.

The phonological intervention was based on Capellini et al. (2010), Salgado (2010) and in the literature review on phonological intervention programs for children with hearing impairment in other languages (Lederberg et al., 2014; Lee, Hall, & Sancibrian, 2017; Spencer et al., 2008). Each session had an average of four children per class. A file was previously prepared with the description of all strategies, by skill, which were worked on during the study, totaling 200 strategies. Eight skills were listed to be worked on in all 20 sessions, namely: 1) Grapheme-phoneme correspondence, 2) Discrimination of phonemes in syllables, 3) Rhyme, 4) Classification of pairs of words, 5) Addition, subtraction and syllabic and phonemic manipulation, 6) Alliteration, 7) Phoneme-grapheme correspondence and 8) Phonological Working Memory.

All 80 sessions, totaling 20 sessions for each of the 4 groups, were described in a daily therapy plan, which will be analyzed in this study. Thus, the analysis material for this research consisted of 80 daily plans filled in with the researchers' evaluations and 80 observation sheets filled out by the educators, totaling 160 forms. In addition, for a general analysis of the perception of the educators about the phonological intervention program, a focus group (Trad, 2009) was carried out after the completion of the intervention.

### 3 RESULTS

In this section, the descriptive analysis of the 160 forms will be presented, including the daily plans of each intervention session, as well as the observation forms of the educators, in addition to their evaluation about the intervention program, collected through the focus group. In order to approximate the characterization of the children participating in the study with the results mentioned, their characteristics are shown in Table 1 below.

CHARACTERISTICS OF THE CHILDREN	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Degree of HL-RE	M	S	M	S	M	M	S	S	M	S	M
Degree of PA - OE	-	S	M	S	S	M	S	S	S	S	M
Age	8 y 11m	9 y 6m	10 y 11m	11 y 1m	11 y 5m	11 y 2m	12 y 7m	13 y 3m	13 y 4m	12 y 5m	14 y 7m
SDT	7 y1 1m	5 y 7m	8y	1 y 2m	7y	6 y 3m	3 y 9m	7 y 10m	7 y 4m	5 y 0m	9 y 6m
Hearing age	1y	3 y 11m	2 y 11m	9 y 11m	4 y 5m	4 y 11m	8 y 10m	5y7m	6y	7y5m	4 y 11m
Device used	PSAP RE	PSAP Bilat.	PSAP Bilat.	PSAP Bilat.	PSAP Bilat.	PSAP Bilat.	PSAP Bilat.	PSAP Bilat.	PSAP Bilat.	PSAP Bilat.	PSAP Bilat.
Device usage time (h/day) RE	11	6	5	13	12	9	8	4	13	12	9
Device usage time (h/day) LE	-	6	5	13	12	5	9	3	13	12	9
Family Participation in (Re)habilitation (FIS)	4	4	4	3	3	3	2	4	3	3	4
Resides in the city of (Re)habilitation (Y/N)	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y
Hearing Category	6	5	6	5	5	3	5	6	5	6	5
Language Category	5	3	5	4	5	5	4	5	4	5	4
Uses MF System (Y/N)	N	S	S	S	N	S	N	S	S	S	S
Entry Age in the in (Re)habilitation (years)	7	6	6	1	7	7	4	8	8	6	13

Table 1. Characterization of participating children and their organization in care groups.

Source: Elaborated by the authors.

Legend: HL-RE: Hearing loss in the right ear; HL-LE: Hearing loss in the left ear; M: Moderate; S: Severe; SDT: Sensory Deprivation Time: time the child was deprived of exposure to sounds, prior to the adaptation of hearing aid electronic devices; Hearing Age: Time the child used hearing aid devices (in this case, the PSAP), since it was adapted; PSAP: Personal Sound Amplification Product; Bilat: Bilateral; FIS: Family Involvement Scale: family participation analysis scale with scores from 1 to 5, with 1 participation below the necessary and 5 optimal participation; Y: Yes; N: No; Hearing Category: categorizing the child according to their auditory performance, with scores from 0 to 6, being 0 - does not detect speech until 6 - comprehends oral speech, without the use of orofacial reading; Language Category: analogous to the hearing category, it is the child's categorization according to their oral linguistic performance, being 0 - does not use speech until 5 - uses complex oral speech; MF System: Modulated Frequency System - hearing aid used in general in the school environment, which allows the child to pick up the teacher's speech without distant interference, minimizing the effects of noise and reverberation in the classroom, with benefits for accessing content in the classroom.

It was observed, in the characterization of the children participating in the study, that they are children with moderate and severe sensorineural hearing loss, with an average sensory deprivation time of 7 years and 9 months and an average hearing age of 6 years. With the exception of C4, all other children had auditory sensory deprivation times (time when they were without hearing aids) longer than recommended and auditory age (time of using the devices since their adaptation), which justify the need for interventions focused on hearing, oral language and metalinguistic skills, even in schoolchildren of this age group (mean sample - 11 years).

Of the 11 children, 10 were hearing aid users bilaterally, and one child used the hearing aid on the right ear. The average daily use of hearing aids was nine hours, indicating regular use of the devices, but still less than desirable (the ideal time should be 14 to 16 hours per day). Regarding their auditory performance, except C6, all the others presented themselves in hearing categories 5 or 6, indicating that they were children who identified the meaning of most of what was said to them, without the need for orofacial reading or who understood using only hearing, respectively. As for the development of oral language, with the exception of C2, evaluated as producing short sentences, the other children presented oral speech, although they were not in a mature stage (corresponding to language category 4).

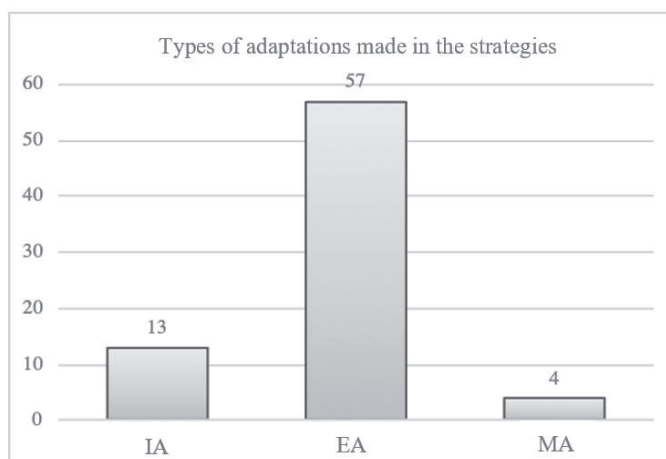


Figure 1. Number of types of adaptations performed in the group phonological intervention.

Source: Elaborated by the authors.

Legend: IA: Adaptation during strategy instruction; EA: Adaptation of the strategy itself; MA: Adaptation of materials.

The adaptations made in each session were described; thus, it was observed, from the analysis, that the adaptations of instruction, occurring in lesser quantity (13), referred to the tips to help the children to understand the activity, to the use of concrete objects during the instruction to facilitate the comprehension, repetition of instruction, use of synonyms and decreased speech rate, which was also observed during the activities, through the analysis of daily group therapy plans, regarding the use of techniques and communication strategies by the researchers.

As for adaptations in the execution of strategies (57), the decrease in the number of training items, especially the digit memory, or the number of rounds of each skill to be worked out, in the case of phonemic manipulation skills, the use of acoustic highlights, especially in the activity of phoneme discrimination in syllables, as well as the use of orofacial reading, in



addition to the need for visual support (words or figures and objects) that would help children to perform syllabic and phonemic manipulation.

The adaptations of the materials (4) were observed to a lesser extent and referred to the use of written words or extra figures to support the activities. It was observed, from the analysis of the daily plans and observation sheets, that the skills in which the children exhibited greater difficulty were: the discrimination of phonemes in syllables, the memory of digits and the phonemic awareness, all of which require auditory performance expected for the age and schooling of the children involved in this study. However, as seen in Table 1, this sample is characterized by older children (8 to 14 years old), who should already have a certain domain of phonological skills. As possible interference in their performance, we highlight the long sensory deprivation times, the moderate or minimum use of hearing aids by some of the children and the late entry into the (re) habilitation program.

In the analysis of daily plans by group, it was observed that the brown group (BG) required adaptation of strategies in all sessions performed in at least one skill, followed by the blue group (BG), orange group (OG) and purple group (PG), consecutively.

About the techniques used to optimize communication and listening to children in the intervention situations, from the general analysis of the 80 daily plans, the researchers reported, in order of frequency, that the most used techniques were: acoustic highlights (consists of emphasizing a certain sound or a given word) with 40% occurrence in the 20 sessions, followed by visual support with 15%, which consisted of the use of objects or figures, use of repetition or rephrasing, with 10% and decreased speech speed and emphasis on keywords, both techniques with 5% occurrence. It was observed, therefore, that the phonological intervention program outlined required adaptations of various natures, in addition to the use of communication strategies and techniques to improve audibility for children, in order to adapt to the target audience.

On the general evaluation of the educators on the intervention program, Figure 2 shows the results of the speeches of the three educators.

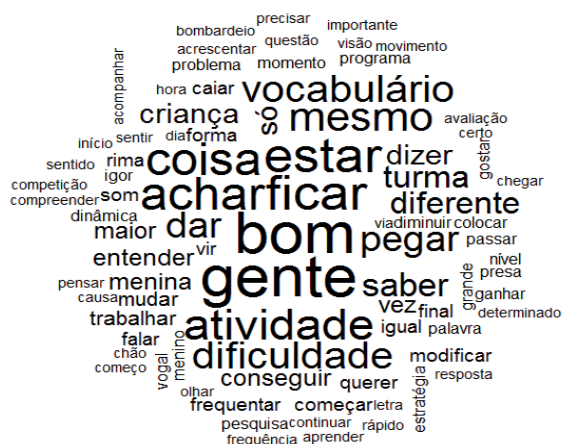


Figure 2. Analysis of word frequency from the focus group script<sup>6</sup>.

Source: Elaborated by the authors.

<sup>6</sup> Translation note: The words (in Portuguese) that appear most frequently in the educators' speeches appear, in the figure, in greater prominence; thus, "good" and "people" were the most used. Other words that were highlighted were: vocabulary, child, only, same, thing, being, say, find, stay, different, give, good, take, people, know, activity, difficulty.

From the analysis of the frequency of words, it can be seen that the evaluation of the educators on the intervention program was positive (the words “good” and “people” stand out) and that they were interested in continuing with the proposal (with emphasis on the word “stay”). As noted in some of the comments analyzed, by session, the educators highlighted that the activities were enriching for them and that some were used in their clinical practice in other groups of the (re)habilitation service.

(S8): *The strategies for carrying out the activities were excellent and quite diverse.*

(S11): *“I liked the strategies for each activity, which favored the involvement of the group as well as the better understanding by the majority of the participants.”*

(S13): *“Good strategies in each activity, excellent interaction between the therapist and the group and good results.”*

It was also mentioned that, in the first sessions, the children had difficulties, especially regarding the understanding to participate in the activities and the time of the session to work with various skills.

(S3): *“For the group to understand, I find the activities quick, the time is short to apply all activities.”*

(S4): *“Children get involved well, are attentive to strategies, but show difficulties in understanding how to do the activity.”*

(S6): *“The time for each activity is short and they need more time to better understand what is required and to train more in each session.”*

However, it was noted that, after the ninth session, the educators observed faster response times and better understanding of the children, even in the activities in which they still had difficulty performing.

(S9): *“The activities designed for the children were quite interesting. I observed an evolution from Monday to today towards better understanding and better responses.”*

(S11): *“Everyone understood the instructions given to each activity, the strategies were great, which facilitated everyone’s involvement.”*

(S19): *“All participated with a lot of interaction and had a good understanding of what was oriented.”*

The aspects highlighted by the educators could also be noticed in the analysis of the daily plans of the sessions, in which, from the ninth session, even without changing the session time, the children started to perform the proposed activities more easily, according to the results described by the researchers. In addition, a decrease in the use of communication strategies and techniques was observed in the analysis of the daily plans in the middle of the program until the end of the sessions. This fact can be attributed to the children’s improvement in the understanding of the phonological work, as well as to the improvement of the researchers as therapists of these groups, which involves the researcher-child relationship and even the children’s familiarity with each researcher’s speech, a fact also noticed by the educators.

(S13): *“Good strategies in each activity, excellent interaction between the therapist and the group and good results.”*

As for the last questioning of the focus group, about the suggestions for improving the phonological intervention program, the educators highlighted: the need for intervention



work with the children's vocabulary, since they noticed how much the deficit presented by some of the children had an impact in understanding the strategy and taking advantage of the entire group in the time allotted for each session; increasing the session time or decreasing the number of activities per session, for groups with greater difficulty; or, still, the increase in the number of sessions.

(S3): "For the group's understanding, I find the activities quick, the time is short to apply all the activities. I believe that the dynamics of work is the information bombardment."

(S8): "Activity time is very short."

(S15): "They have a lot of difficulty in understanding, vocabulary and memory, which makes the work very difficult."

Table 2 below shows the observations of the educators on each of the intervention sessions.

Session	Educators' analysis
1	"The work developed was phonological awareness, in which the children had to speak the name of the letters and say the sound of each one. The four started timidly. The children already had this knowledge, it was very easy."; "Very dynamic activities. The children remained interested all the time, but had difficulty in the sounds of the phonemes. They recognized even more letters than I expected. It was very good."
2	"Very good activities, they were interested all the time. The great difficulty is memorizing and understanding simple orders of what to do."; "The children were initially shy, but then they let go, but they showed great difficulty in understanding the development of activities. I think the time is very short, as the group had difficulties in understanding the activities."; "Difficulty in remembering the sound of the letters, rhyming a few words. Children experienced difficulty due to limited vocabulary. However, the class already knows about rhymes, words where we add syllables and remove syllables, letter names and their sound ..."
3	"For the group's understanding, I find the activities quick, the time is short to apply all the activities. I believe that the dynamics of work are the information bombardment."
4	"Children get involved well, are attentive to strategies, but they show difficulties in understanding how to do the activity."; "The session was very dynamic. The children liked it, responding to everything that was proposed, they responded well to the same and different words, the letters and sounds, the exchanges of letters to form a new word."
5	"Today the children were well involved, but I still find it a lot of information for the time. The strategies are very good, the girls are able to pass on what they want in each activity, but as it is a new job for the class, they need more time to assimilate the proposed activities."; "It was really cool, the kids liked it and were able to respond well in rhyme activities, the same and different words, in the activity that removed a letter to form a new word."
6	"The time for each activity is short and they need more time to better understand what is required and to train more in each session. I believe that if I had the support of writing, it would facilitate understanding."; "The children did not do well in the sequence of meaningless words. The therapists' strategies were good."; "The activities are very good, although they are fast, but they have great difficulty in understanding and memory, in addition to the reduced vocabulary, which makes work difficult."
7	"Children get involved, but there is a lack of explanation for each activity explored. The time of each one is very short. The children did not understand the activity of repeating the syllables, the one of rhymes, but even so, another activity is given. I know that the work is phonological, but I am sure that if, in the explanation, they used writing, it would facilitate."; "In all activities, good dynamics were presented. The children were able to get well involved in the activities, had a good understanding of the works presented and also due to an extra resource that the therapist used in the rhyme. I still find the time short."; "Very good and diverse games. Still the same difficulties. Short time."

Session	Educators' analysis
8	"Everyone managed to know the name of the letter, but the sounds of the letters they only managed with the help of the phono. I believe that with more time, that is, more repetitions, they would succeed."; "The strategies for carrying out the activities were great and very diverse. Activity time is very short."
9	"The activities designed for the children were quite interesting. I observed an evolution from Monday to today towards better understanding and better responses. In the two cases observed, the rhyme was the most difficult. When the children were asked to take and put syllables in words, none of them managed to get it right."; "Everyone gets well involved in activities, has good dynamics and great strategies."; "They improved the recognition of letters and some of their sounds. The difficulty of memorization, comprehension and restricted vocabulary, makes it very difficult to understand the work."
10	"The child had doubts about the rhyme task, but when the therapist repeated and explained again, she got it right."; "For a better understanding of the group on the performance of the activity, it is necessary that everyone's attention is drawn to the instructions and this should be given slowly, especially regarding games."
11	"The task of saying the name of the letter of the family and then the sound, failed to get it right. They presented difficulties in the rhyme tasks, the same and different words, to take a syllable out of the word and add a syllable in the word."; "Everyone understood the instructions given to each activity, the strategies were great, which facilitated everyone's involvement."; "I liked the strategies for each activity, which favored the group's involvement, as well as the better understanding on the part of most participants."
12	"The time for each activity was very good. Given the good explanation of the activities, all had good involvement and good performance."
13	"Difficulty in alliteration. It is needed to reinforce the repetition of numbers."; "The strategies presented in the activities were very attractive, they were well oriented."; "Good strategies in each activity, excellent interaction between the therapist and the group and good results."
14	"Difficulty in the words that rhyme, few children understand."; "Even with a good explanation of the strategies presented, the two were very inattentive."; "Very good session."; "Good involvement of everyone in the activities, the timing was good and the strategies were very dynamic and well applied, which also facilitates performance and results."
15	"Twister® activity is very good."; "They have great difficulty in understanding, vocabulary and memory, which makes work very difficult."; "The strategy for each activity was very cool, dynamic and well explained, which favored the performance and results of most activities."
16	"In the activity of finding the letter equivalent to the sound, they 'guess, go for 'trial and error', for elimination."
17	"This class is slower in responding, needing the guidelines to be repeated more than once."
18	"All had difficulty memorizing."
19	"Everyone participated with a lot of interaction and had a good understanding of what was being guided."; "Good class to work with and that gave good results, despite absences. Dynamic and interactive service, with good work strategies very well explained."
20	"By the sound they discovered the name of the letter. They matched the same syllables and same or different words."

Table 2. Observations of the participating educators about each intervention session.

#### 4 DISCUSSION

In this research, the results obtained corroborate those found in the literature, that there is a need for adaptations for phonological intervention for children with hearing loss (Easterbrooks, Lederberg, & Connor, 2010; Lederberg et al., 2014; Lee, Hall, & Sancibrian, 2017).

The phonological intervention program developed based on the remediation models of Capellini et al. (2010), Salgado (2010) and in the literature review on phonological

intervention programs for children with hearing impairment, in other languages (Lederberg et al., 2014; Lee, Hall, & Sancibrian, 2017; Spencer et al., 2008), it needed specific adjustments for the studied sample, which reinforces the need for further research involving the referred program, applied to different samples, to validate its applicability in the population of children with hearing impairment.

According to Lederberg et al. (2014), children with hearing loss, at preschool levels, can develop the linguistic ability to read from instructions and strategies specifically adapted to their needs. The same proved to be true for children at a more advanced school level, participating in this research, based on the analysis of the daily intervention plans.

All sessions underwent some type of adaptation - strategy, instruction or material - with more than one type of adaptation being observed per session, especially in the first sessions. As for the type of adaptation, the specific literature portrays, in particular, the use of visual support (written or concrete materials), which facilitates the hearing-impaired child to access the phonological task (Chen, 2014; Easterbrooks Lederberg, & Connor, 2010; Gilliver et al., 2016; Lee, Hall, & Sancibrian, 2017; Miller, Lederberg, & Easterbrooks, 2013; Nakeva et al., 2013; Rakhshanfadaee & Salehi, 2016; Wang et al., 2013; Werfel, Douglas, & Ackal 2016), this being the second type of support most observed in this research. The most frequent support for the participants of this research was the use of acoustic highlights. Such changes were made especially due to the difficulty observed in the children in understanding and performing the activities in the time allotted for the session, as well as their level of prior knowledge of phonological skills, an observation that agrees with the literature (Spencer et al., 2008).

The analysis of the daily plans of the sessions also allowed to list the main communication strategies and auditory techniques used by the researchers during the phonological work. It is noteworthy that a wide range of techniques can be used according to the need and skills to be worked, to favor the performance of children in this type of training, which goes beyond conventional speech therapy (Granha, Oliveira, & Rumpf, 2008; Resegue-Coppi, 2008).

It was observed that the characteristics of the children in the intervention groups certainly determined the needs for adaptations to be made (Lederberg, Schick, & Spencer, 2013), with emphasis on the time of sensory deprivation (Bornstein, 2018; Wake & Carew, 2016), the restricted use of hearing aids for some of them (Penna, Lemos, & Alves, 2015; Vasconcelos, & Pereira, 2015) and the late entry into the hearing (re)habilitation program (Bicas, Guijo, Delgado-Pinheiro, 2017; Oliveira, Penna, & Lemos, 2015; Tabaquim et al., 2013), which were factors verified in the sample and which should be considered in the development of strategies for phonological work.

Even so, all the children in this study demonstrated advances in their skills, which could be observed in the analysis of the results of the sessions, a fact that also corroborates the research on the phonological intervention for children with hearing impairment with greater or lesser access to sounds (Bergeron et al., 2009; Gamba-Yoshida, 2017; Goldberg & Lederberg, 2015; Lederberg, Schick, & Spencer, 2013), highlighting the primacy of phonological skills for the acquisition of written code, so fundamental for strengthening language development and

cognition, among other skills in the hearing-impaired child (Harris, Terlektsi, & Kyle, 2017; Lemes & Goldfeld, 2008; Mahapatra, 2015).

The skills that had a minimum index of adaptations, since the beginning of the program, decreasing with the passing of the days were: grapheme-phoneme and phoneme-grapheme correspondence, according to the analysis of the daily plans and observation sheets, a result compared to the study by Nakeva von Mentzer et al. (2013), in which the improvement in the phoneme-grapheme ratio was considered moderate to strong, as well as the study by Werfel, Douglas, & Ackal (2016), who reports the children's gain at the beginning of the grapheme-phoneme skills program, to later observe improvement in the ability to rhyme.

It is also noteworthy that there is little research that reports the perception of education professionals in relation to the work of phonological intervention for children with hearing impairment. It was noted that the perception of the pedagogues participating in this study was limited to the children's difficulties, without the use of technical terms for its definition, which directs attention to the need for specific training of educators involved in (re) habilitation programs of hearing-impaired children (Bevilacqua & Formigoni, 2012; Moret, 2017) for working with phonological skills, as reported by Messier and Jackson (2014) and Spencer et al. (2008) and, who warn about the need for proficiency in phonological awareness of educators who work with children with hearing impairment.

## 5 CONCLUSION

It was concluded that the phonological intervention program for children with hearing impairment required adaptations regarding the instructions offered to the groups, the strategies themselves, as well as the materials used, highlighting the importance of the detailed records of the results of the program sessions of this group, given the importance of analyzing strategies for the development of increasingly effective and efficient interventions for this population.

Based on the observations made for the children in this research, it is recommended to continue the studies that propose to validate intervention programs aimed at the development of reading for children with hearing impairment and that the auditory (re)habilitation services consider, in their planning, specific instruction with phonological skills, given their relevance for the acquisition and development of reading and writing, adding to the child the mastery of other linguistic and cognitive skills, important for their full inclusion. In addition, the concern to train professionals who develop this work with children, especially in the group setting, stands out.

The main limitations of this study referred to the sample's characteristics, such as: number of subjects, the age group of the groups worked, as well as its application in a single hearing (re)habilitation service, with the need to expand the sample number, the stratification of the analysis of the phonological intervention strategies applied to children of different age groups, as well as the evaluation of the implementation of these interventions by professionals of the specialized pedagogy in hearing (re)habilitation programs.

The novelty of this type of study is highlighted and the potential of this research is the construction and detailed analysis of the applied intervention material, with the possibility

of becoming a reference for the development of phonological skills training programs in group therapeutic framework, specific to the population of children with hearing impairment.

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