THE INTERVENING VARIABLES IN THE PRODUCTION OF CONSONANT CLUSTERS BY SYLLABIC ANALYSIS

As variáveis intervenientes na produção do onset complexo mediante uma análise silábica

Carolina Lisbôa Mezzomo [(1)], **Diéssica Zacarias Vargas** [(2)], **Lilian Kopp Cuti** [(3)], **Silvana Gonçalves Lopes** [(4)]

ABSTRACT

Purpose: to verify and to compare the repair strategies and the influence of linguistic (syllabic and prosodic) and extralinguistic variables in the production of consonant clusters by children with typical and atypical phonological development. **Method**: it was analyzed the speech of 48 children, 24 with typical phonological development and 24 with atypical phonological development, similar in relation to sex, and age between 2:6 to 5:5;29 (typical group) and 5:0 to 7:11;29 (atypical group). The samples were collected transversely, based on the instrument *Avaliação Fonológica da Criança*. It was analyzed the words presented as target consonant clusters, with a corpus of 278 words of typical development and 460 of atypical development. The correct production, C^2 deletion, C^1 deletion, syllable deletion, epenthetic, metathesis and idiosyncrasies were considered as variants of the dependent variable. The extralinguistic factors such as age, sex and development type, and linguistic variables the number of syllables, next precedent syllabic context, the position in the word, the complexity of the onset in the syllable and metrical foot were considered as independent intervening variables. The speech data were statistically analyzed through VARBRUL. **Results**: the statistical program selected as significant for the correct production and other types of repair strategies in the consonant clusters the variables sex, age, development type, position in the word, metrical foot and precedent syllabic context. **Conclusion**: it was found that the linguistic and extralinguistic variables significantly influence the production of consonant clusters in children with both developments. The most widely used repair strategy was the deletion of C^2.

KEYWORDS: Language Development Disorders; Language Development; Phonetics

(1) Speech Language Pathologist, Assistant Professor from the Speech Language Pathology course, Federal University of Santa Maria – UFSM, Santa Maria, RS, Brazil; PhD in Applied Linguistics from the Catholic University of Rio Grande do Sul, Porto Alegre, RS, Brazil.

(2) Speech Language Pathologist; Master by the Postgraduate Program in Human Communication Disorders from the Federal University of Santa Maria, UFSM, Santa Maria, RS, Brazil.

(3) Undergraduate student from the Speech Language Pathology Course at the Federal University of Santa Maria, UFSM, Santa Maria, RS, Brazil.

(4) Undergraduate student from the Speech Language Pathology Course at the Federal University of Santa Maria, UFSM, Santa Maria, RS, Brazil.

Study carried out at the Federal University of Santa Maria – UFSM, Santa Maria RS, Brazil.

Conflict of interest: non-existent

INTRODUCTION

The phonological acquisition, along with the other modules of language development occurs throughout childhood, with the overall maturity of the child, including acquisitions and simultaneous developments[1,2].

In most children, the domain of the standard phonological system is reached spontaneously in a continuously and gradually way from four or five years old. Although this domain occurs in a very similar way among children, it is found that acquisition is nonlinear and there are individual variations – such as the age of acquisition and the repair strategies used[2,3].

The domain of the phonological system of a language is when a child can establish it in a consistent way with the target-adult of the community in which the child is. The maturation of phonological knowledge results in the establishment of a system consistent with this *input*[3,4].

When there is difficulty in the eligibility of the received *input*, occurs what is called phonological disorder, i.e., it is difficult to properly use the language sounds of contrastive form[5].

The main difference between the typical and atypical acquisition, or normal deviant is in the timing and time of development. In typical acquisition there are variations that occur within a pattern of rapid and dynamic change to the phonological system to stabilize. In the atypical acquisition, however, its changes remain the same for a longer period of time, causing a delay in the stability of the phonological system which consequently prevents the production of correct speech[6].

The Brazilian Portuguese phonological system (BP) consists of 19 consonants (/p, b, t, d, k, g, s, z, ʃ, ʒ, m, n, ɲ, l, ʎ, r, R/) and 7 vowels (/a, e, ɛ, i, o, ɔ, u/)), and when combined they form syllables and words. The syllable may be comprised of three components: onset, nucleus, and coda, the core being a mandatory element. The possible syllabic structures in Portuguese are V, CV, CCV, CVC, CCVC, VCC, VGC, CVCC, CVGC, and the maximum possibility is CCVCC[6,7].

The CV structure is the first to be acquired during the process of phonological acquisition. Studies[4, 8] refer to the following order of acquisition syllable: CV, V> CVV> CVC> CCV.

The complex onset (CO) has the possibility of 8 obstruents consonants (/p, b, t, d, k, g, f, v/) occupy the position C^1 and two liquid consonants (/l, r/) the C^2 position. The possibilities of initial onset with liquid /l/ can be /pl, bl, gl, fl, kl/, and the liquid /r/ can be /pr, br, tr, dr, kr, gr, fr/. In medial onset, with /l/ the possibilities are /pl, bl, tl, kl, gl, fl/, and with /r/ is /pr, br, tr, dr, kr, gr, fr, vr/. This structure, for the highest degree of complexity, is the last to be acquired in the BP, but on the acquisition way there is no intermediate stages, i.e., the child passes through the simplification of OC to the correct prodution[6,9,10]. The CO domain occurs around the age of five, independent from the segments that compose it. Furthermore, in the presence of phonological structure it appears as the most affected structure[6,9].

In the process of stabilization of the phonological system, the child makes use of repair strategies in an attempt to get closer to the sound or syllable structure target, being an occurrence in normal or deviant children[3,11]. These strategies are used instead of the production segment and/or syllable structure that children do not know or whose production does not dominate. In the case of CO as aforesaid, simplifying the feature is most often adopted. Besides this, it is mentioned as an example of repair strategies on target CO syllable omissions (e.g. plástico – [ˊtʃiku]), epentheses (e.g. bruxa – [buˈɾuʃa]), coalescence/ fusion (e.g. cravo – [ˊdavu]), compensatory lengthening (e.g. planta – [ˊpã:ⁿta]) and metatheses (e.g. prato – [ˈpaɾtu])[3].

Studies have shown that extralinguistic and linguistic variables can influence the segmental phonological acquisition. Linguistic variables constitute up to factors such as previous and following context, tone and number of syllables. Regarding the extralinguistic variables, research on the subject refers to factors such as age or gender, verifying that these may or may not influence the phonological domain of BP[12, 13].

There were found studies in the literature mentioning the influence in the field of segmental phonology, however, there are few studies that verify the influence of syllabic or prosodic variables in the acquisition of a particular template (template syllabic), independent segments that occupy it[10,14].

Therefore, this study aims to check and compare the repair strategies and the influence of linguistic variables (syllabic and prosodic) and extralinguistic in the production of the syllable with CO in children with typical and atypical phonological development.

METHOD

This research presents a transversal, exploratory and quantitative character. The sample was comprised of data from 48 children, divided into two groups: typical and atypical acquisition, each group consisting of 12 girls and 12 boys, monolingual speakers of BP.

To make up the database used in this study, after parental consent by signing the free and informed consent and oral assent of the children, these were submitted to speech screening, receiving a diagnosis of phonological disorder or typical phonological acquisition.

To be part of the sample, participants should not be receiving or have undergone any type of speech therapy and should not present hearing loss and changes evident in the neurological, cognitive and psychological aspects.

Speech samples were collected based on the instrument "Phonological Assessment of Child – Avaliação Fonológica da Criança: AFC"[15], in which it uses the spontaneous nomination of 125 words represented through five themed designs, or toys that reproduce the list of AFC (in the case of the younger children). A recording of the speech sample

from each child was transcribed by the researcher through the restrict phonetic transcription, and then reviewed by two judges, scholars of the last year of Speech Language Pathology.

For this study, only words that had targeted CO were gathered, being as criterion, a correct performance of CO by two children, of two consecutive age groups. The criterion to consider the acquired phoneme was 80% correct performance of CO[16]. In the group of children with typical development, the *corpus* consisted of 278 words, and in the group of children with atypical development the *corpus* was composed of 460 words, totaling 738 words.

After gathering the CO words, the words were coded according to their production. This coding was done by typing in the form of Microsoft Access program and served as input for the statistical program. It was considered intervening variables for the realization of the statistical analysis both the linguistic variables: *syllabic repair strategies* (dependent variable), *tonicity, number of syllables, syllabic contexts preceding and following, position in the word, complexity of the syllable itself* and position on the *metrical foot* accent. The extralinguistic variables considered were *gender, age and type of development*.

For both groups, the variants considered as dependent variable: correct production of the syllable independent of segmental accuracy (e.g. cravo – [ˈkravo], [ka:vu], [klavu]), deletion of C^2 (e.g. : bloco – [ˈbɔku]), deletion of C^1 (e.g. claro [ˊlaro]), deletion of syllables (e.g. plástico – [ˊtʃiku]), epentheses (e.g. bruxa – [buˈɾuʃa]), metathesis (e.g. prato – [ˈpaɾtu]) and other forms of production, such as compensatory lengthening and idiosyncratic substitutions.

For the analysis of variable *age* of both groups it was considered six age groups. The typical acquisition group comprises children aged 2:6 to 5:5, 29, and atypical acquisition comprises children aged 5:0 to 7:11; 29. In both groups there is the counting of age groups every 6 months, two boys and two girls in each age group. As to the variable *gender*, the analysis included 12 girls and 12 boys in each group, as previously mentioned.

Regarding the variable *tonicity*, considered variants were: pre-pre-tonic (e.g. profe**s**sora), pre-tonic (e.g. tra**t**or), tonic (e.g. pra**t**o), post-tonic (e.g. li**v**ro) and post post-tonic (e.g. pálpe**br**a). The *number of syllables* was analyzed as monosyllabic (e.g., cru), disyllable (e.g. trigo), trisyllable (e.g. criança) and polysyllabic (e.g. triângulo).

The variable *precedent syllabic context* had as variants zero/null (e.g.: **br**oto), open syllable and simple onset (e.g.: li**v**ro), syllable locked with simple coda and simple onset (e.g. com**p**ra), syllable locked with complex coda and simple onset (e.g. mons**tr**o), syllable locked with complex coda and without onset (e.g. ins**tr**umento), syllable locked and CO (e.g. pros**tr**ado), syllables without onset (e.g. a**tr**iz) and syllables without onset and simple coda (e.g. as**tr**onauta). The variable *following syllabic context* was analyzed for variations zero/null (e.g. li**v**ro), open syllable and simple onset (e.g. **tr**igo), syllable locked with simple coda and simple onset (e.g. **pr**etos), syllables without onset (e.g. **tr**iagem), syllables without onset and simple coda (e.g. **tr**iângulo), syllable locked with simple coda and CO (e.g. impró**pr**ia).

In the condition of *position in the word*, the words are categorized as at the initial position (e.g. **pr**eto), medial (e.g. ca**br**ito) and final (e.g., com**p**ra). The complexity of the onset in the very syllable had its classification as a complex onset with no coda (e.g. **pr**ato), CO with simple coda (e.g. **br**anco), CO with locked coda (e.g. **tr**ans**p**orte).

For the position as the foot metric of the accent it was assigned variants such as extrametric syllable (e.g. (pál.pe).**br**a), head of the metrical foot (e.g. (fral.da), the weak part of the metrical foot (e.g. : (li. vro), outside the metrical foot (e.g., **tr**ans.(por.te)). It was also considered the extralinguistic variable *type of development* with typical and atypical variations.

Speech samples which were collected and analyzed in this study are part of the database of two research projects of the institution, both approved by the Ethics Committee in Research of the institution under numbers 064/2004 and 046/02, respectively.

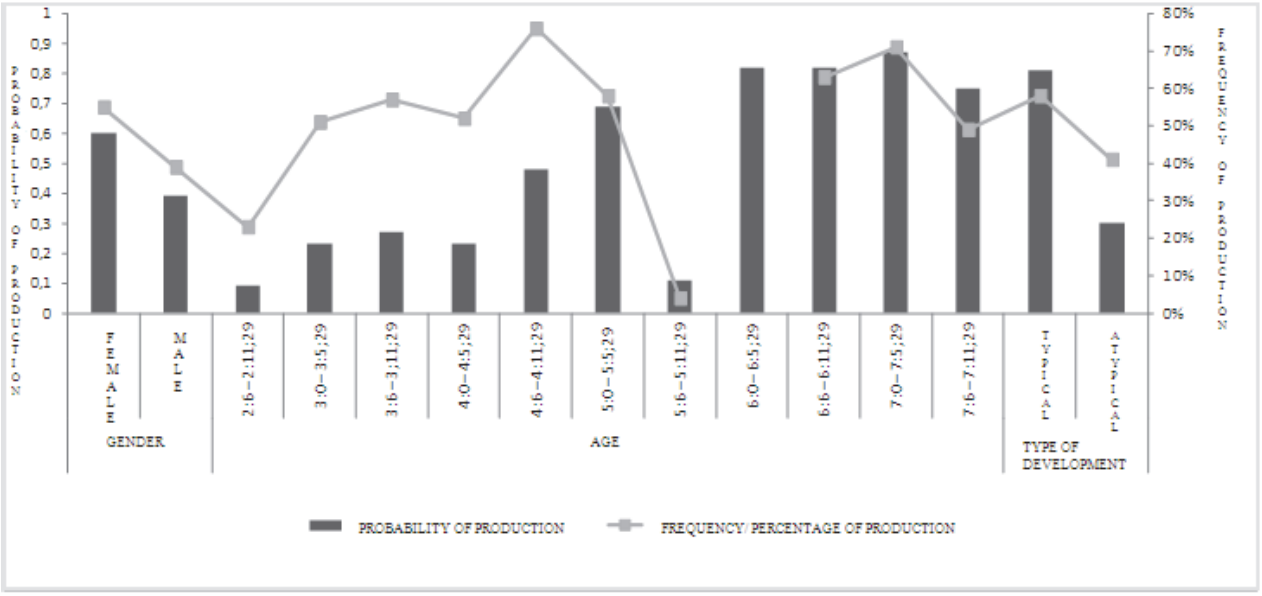
The statistical program used was Computational Package VARBRUL[17] for Windows known as Varbwin[18]. This program has been widely used, with data from language acquisition because it provides frequencies and probabilities of the studied phenomena, in addition to select the relevant variables in the process of phonological acquisition[3]. The program makes the probabilistic analysis in binary form, assigning relative weights to variants of the independent variables, to both variations (producing correct and incorrect) the linguistic phenomenon in question, represented by the dependent variable. We emphasize that the Varbwin assigns values of significance to linguistic and extralinguistic variables through the interaction between them (e.g. gender versus age; tonicity versus number of syllables). Thus, this software does not assign *p*-value to variants contained within a variable. For example, the Varbwin does not generate a significant value in the comparison between male and female. For these variants, it was assigned relative weights. The relative weights or probabilities of occurrence of the studied phenomenon (CO acquisition) will be removed from the statistical interaction that will

contain, together, all variables selected as significant by the program. Thus, probabilistic values between .50 and .59 are considered neutral, the acquisition of the phonemes in the CO. Values which were equal or higher than .60 will be considered favorable and lower values below .50 are considered unfavorable to the studied phenomenon.

RESULTS

The statistical program, analyzing typical and atypical data together, revealed as statistically significant variables for the correct production of the CO, the variables *age, gender and type of development*. When analyzing *age*, there was a higher probability of correct production in the age group 7:0 –7:5 29. As for the variable *type of development*, the results showed a higher probability of correct production in typical development. In regards to *gender*, it was found that the *female* variant has a greater likelihood of correct production (Figure 1).

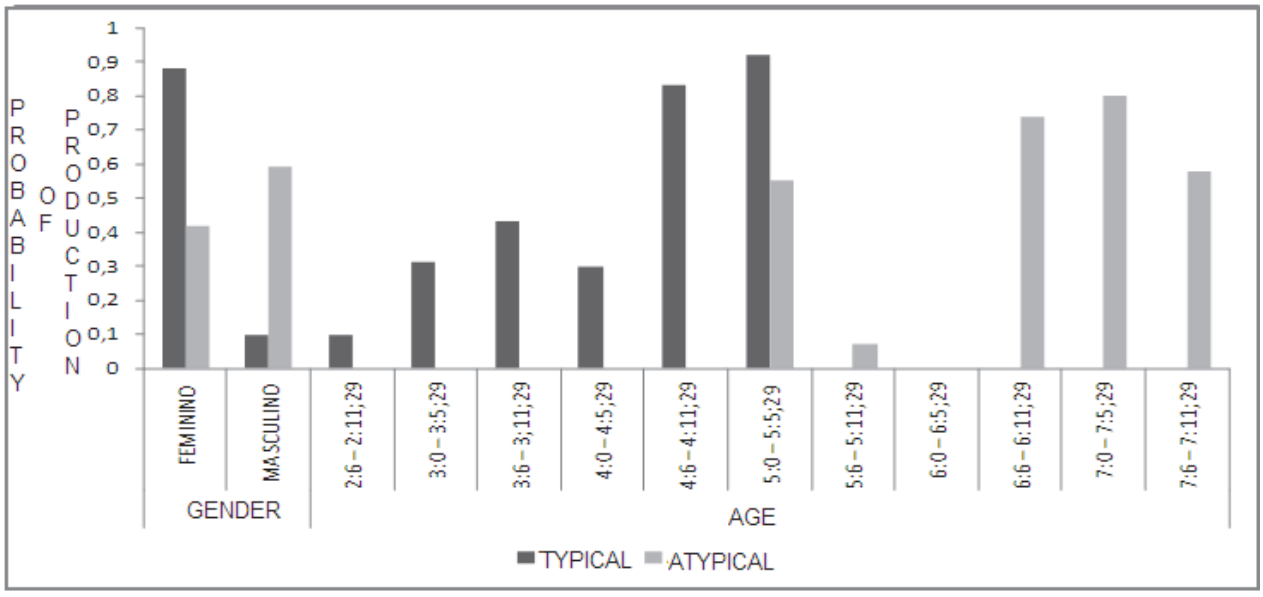
In the statistical analysis involving typical and atypical data isolated, it turns out that both for the normal development and for the atypical development, the *age* and *gender* extralinguistic variables proved to be significant. In relation to *gender* in typical development, it was found that girls are more likely to correct production. In the atypical development, the more likely correct production variation has occurred in *males*.



Legend: Statistical program: VARBRUL; Significance: 5% (p <0.05)

Figure 1 – Relevant variables to the correct production of the complex onset in single group

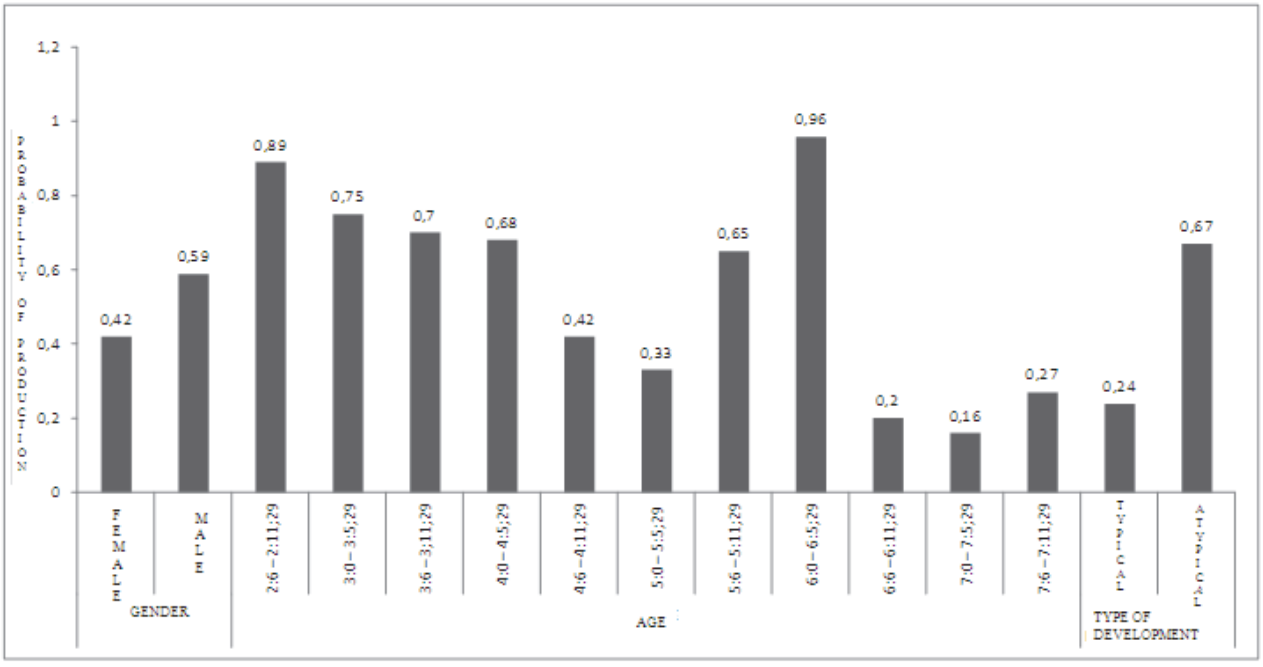
When analyzing the *age* variable in typical development it was observed a higher probability of correct production gradually with age, being more favoring the age period 5:0 – 5:5 29. In atypical development, the probability of correct production was not increasing age, and the age range of 7:0 –7:5; 29, was most likely to correct production (Figure 2).



Legend: Statistical program: VARBRUL; Significance: 5% (p <0.05)

Figure 2 – Comparison of the significant variables to the correct production of the complex onset in typical and atypical development

By analyzing the repair strategy of *deletion of C²*, the results of the statistical analysis, considering one group (typical and atypical), showed that the *age, type of development and gender* were significant. In the analysis of the age variable, there was a higher probability of deletion of C² aged 6:0 – 6:5 29. As for the variable *development type*, the results demonstrated a greater probability of deletion of the C² in thenatypical development. As for the *gender* variable, it was found that the *male* variant has a higher probability of deletion of C² (Figure 3).



Legend: Statistical program: VARBRUL; Significance: 5% (p <0.05)

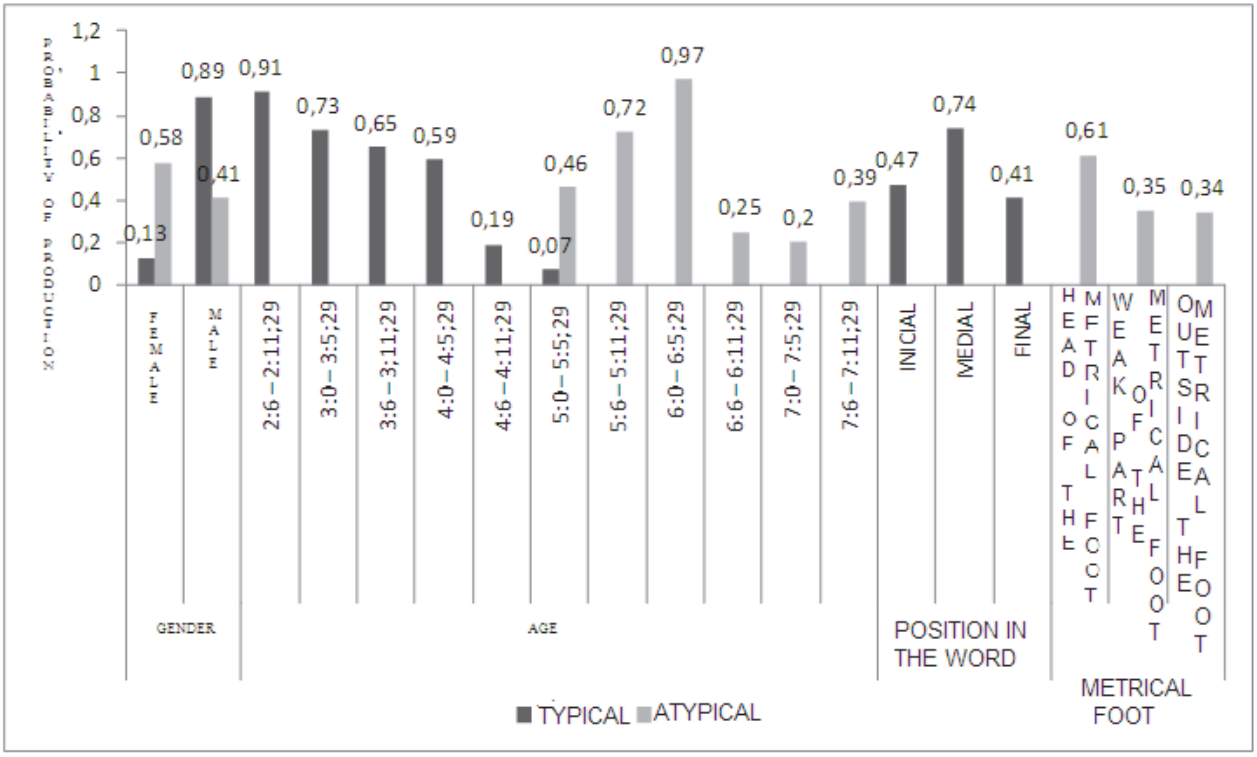
Figure 3 – Variables that favor the deletion of the C² in the group only

As statistically significant variables for the *deletion of the C²* of the CO in typical development were selected extralinguistic variables *gender* and *age*, and linguistic variable *position in the word*. In the atypical development selected variables were *age, sex and metrical foot*.

In regard to *gender* in typical development, it was found that the variant has a higher probability *male* deletion of C² unlike what was observed in atypical development in which most likely occurs in the C² *female* deletion variant.

In the analysis of the *age* variable, the typical development showed higher probability of deletion of C² in the initial age group (between ages 2:6 – 2:11, 29). In atypical development, the probability of C² deletion occurred in middle age range of 6:0 – 6:5; 29.

The linguistic variable *position in the word*, selected as favoring the deletion of C² in typical development, was most likely to occur when the CO occupies the medial position (e.g. que**br**ado). In the development of atypical syllable position in relation to the *foot metric* showed favoring the C² deletion occurring when it occupies the "head" of the metric foot (Figure 4).



Legend: Statistical program: VARBRUL; Significance: 5% (p <0.05)

Figure 4 – Comparison of statistically significant variables in the deletion of C² in typical and atypical development

Regarding the dependent variable metathesis, the joint data analysis of typical and atypical development, as a single group, there was the influence of the variables *following syllabic context, age* and *type of development* in the production of this resource.

In variable *following syllabic context* it was observed that the complex onset is more likely to be targeted of metathesis when followed by syllable locked with simple coda and simple onset.

Referring to *age*, the age of 5:6 – 5:11; 29 presented favoring the realization of metathesis, i.e., in the ages which understand the atypical data. The *typical* development stood out as one that has a higher occurrence of metathesis during the process of acquisition of CO (Table 1).

Table 1 – Variables statistically significant in achieving the metathesis in the target with onset complex in single group and typical development

METATHESIS							
VARIABLES	VARIABLES	BOTH DEVELOPMENT			TYPICAL DEVELOPMENT		
		RELATIVE WEIGHT	FREQUENCY	%	RELATIVE WEIGHT	FREQUENCY	%
GENDER	FEMALE	-	-	-	.33	2/146	1
	MALE	-	-	-	.68	6/132	5
AGE	4:0 – 4:5;29	.44	4/52	8	.64	4/52	8
	4:6 – 4:11;29	.24	2/51	4	.37	2/51	4
	5:0 – 5:5;29	.32	2/124	2	.51	2/42	5
	5:6 – 5:11;29	.80	2/91	2	-	-	-
	7:0 – 7:5;29	.63	1/92	1	-	-	-
TYPE OF DEVELOPMENT	TYPICAL	.84	8/278	3	-	-	-
	ATYPICAL	.27	3/460	1	-	-	-
FOLLOWING SYLLABIC CONTEXT	ZERO/NULL	.30	1/210	0	-	-	-
	OPEN SYLLABLE AND SIMPLE ONSET	.49	3/400	1	.30	1/118	1
	SYLLABLE LOCKED IN CODA SIMPLE AND SIMPLE ONSET	.85	7/110	6	.87	7/55	13
SIGNIFICANCE		0,015			0,029		

Legend: Statistical program: VARBRUL; Significance: 5% (p <0.05); – variables not selected as statistically significant

In round individual statistic, considering the typical development, the selected variables were significant *as following syllabic context, gender* and *age*, in order of statistical significance, respectively.

Regarding variable *following syllabic context*, it was found that the metathesis is most likely to occur when the CO is followed by syllable locked with simple coda and simple onset. It was also observed a higher probability to utilize the metathesis in the *male* variant and age group between 4:0 and 4:5; 29.

It was not possible to separate analysis of the metathesis resource of atypical data, due to limited number of occurrences.

In round involving *idiosyncratic* substitutions in atypical development it was selected variables *age* and *gender* as statistically significant. The age range of 5:6 – 5:11, 29 was the most favoring to the realization of idiosyncrasies, as well as males (Table 2).

It was not possible to make the analysis of idiosyncratic substitutions in the data of the single group (typical and atypical), due to the non-occurrence of these substitutions in typical development.

In figure 5, it is seen the distribution of the percentages of production of the dependent variables (correct production, deletion of C^2, deletion of the syllable, epentheses, metatheses, idiosyncrasies) for typical and atypical development. It was observed that in typical development there is a higher percentage of correct production, while the atypical development corresponded to the highest percentage of C^2 deletion.

Table 2 – Variables statistically significant in the production of idiosyncrasies on target with selected complex onset for the group with atypical development

VARIABLES	VARIABLES	ATYPICAL DEVELOPMENT		
		RELATIVE WEIGHT	FREQUENCY	%
GENDER	FEMALE	.43	7/245	3
	MALE	.57	10/215	5
AGE	5:0 – 5:5;29	.29	1/82	1
	5:6 – 5:11;29	.84	12/91	13
	6:0 – 6:5;29	.44	1/49	2
	6:6 – 6:11;29	.33	1/75	1
	7:6 – 7:11;29	.48	2/71	3
SIGNIFICANCE		P<0,015		

Legend: Statistical program: VARBRUL; Significance: 5% (p <0.05)

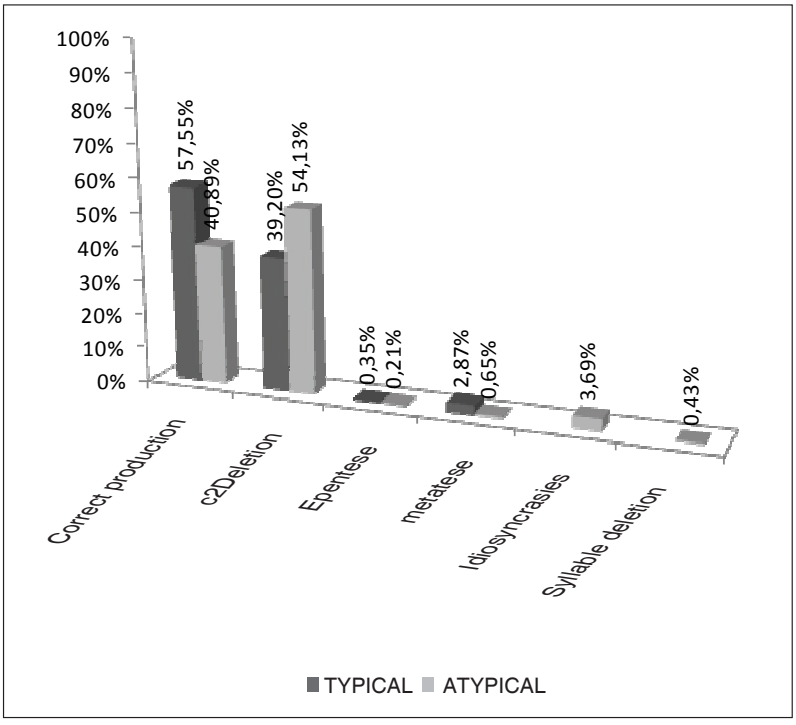


Figure 5 – Comparison of the percentages of correct production and repair strategies in typical and atypical phonological development

It was also observed that the atypical development uses a greater number of repair strategies (n = 5) compared to typical group (n = 3), being the idiosyncrasies and deletion of the syllable of exclusive use from the atypical group. The other strategies were common to both types of development, with only differences in frequency of occurrence.

Due to the restricted number of occurrences of the variable epentheses, the same has not been selected by the VARBRUL computer program as statistically significant. Regarding the variable deletion of C[1], it is stressed that there was no occurrence in the studied groups.

DISCUSSION

The discussion will be held in accordance with the repair strategies used by children with typical and atypical phonological development of speech, checking the similarities and differences found from the analysis of the selected variables and considered statistically significant at VARBRUL program.

Analyzing typical and atypical data together as a single group, the statistically significant variables for the **correct production** of the CO was *age, gender and type of development*. The variable *age* had a higher probability of correct production at the age of 7:0 to 7:5, 29, belonging to atypical data, demonstrating that in the phonological disorder there is a significant delay in phonemic acquisition when compared to the normal development[6]. This fact was also verified when the program selected the variable typical development.

In regards to *gender* in both developments, it was found that the *female* variant is more likely to correct production and is compatible with a study[10] that talks about the difficulty in the phonological acquisition in males.

Both for normal development and for atypical development, the extralinguistic variables *gender* and *age* proved to be significant for the *correct production* of the CO. In typical development, girls were more likely to *correct production*, agreeing with the findings of a study on phonological acquisition[19]. In another study[10], mentioned earlier, the author said that speech disorders are more prevalent in male children, which agrees with the analysis of atypical development.

As the child's age advances, it tends to stabilize the correct production; it means that the phonological system gets closer to the adult[20,21]. It was proved correct when analyzing the variable *age* in typical development, as there was a greater benefit for correct production gradually with increasing age. In the atypical development, the probability of correct production did not occur gradually with age, showing that children with phonological disorders exhibit instability in correct production CO[9].

In phonological disorder, the most affected structure as to the correct production is usually the CO[6, 9], agreeing with the findings that the highest probability of correct production occurred in typical development.

By analyzing the repair strategy **deleting of C²** of the OC in single group (typical and atypical), the variables *age, type of development* and *gender* were significant for the realization of this strategy. In the analysis of the *age* variable, the highest probability of C² deletion occurred between the ages of 6:0 to 6:5, 29, belonging to the atypical development, and this development was also selected as the most favorable to use the strategy. It is expected that as the age increases, there is less occurrence in the use of strategies[22] and it is noted that in the studied *corpus* the selected age belongs to the atypical group. The occurrence of this strategy is similar in both groups, confirming what the literature says that in the atypical development there is higher frequency in the use of this resource when trying to produce the target syllable, with no continuous pattern acquisition[6,21].

In regards to the *gender* variable, the literature is not specific in addressing the influence of this variable on *deletion of C²* strategy, reporting higher rates of phonological disorders in children of the male gender[23, 24], was found in this study that the *male* variant has a higher probability of deletion of C². As influential variables for the *deletion of C²* in typical development, selected variables were: the extralinguistic variables *gender* and *age*, and linguistic variable *position in the word*. In the atypical development, there is the influence of the variables *age, sex* and *metrical foot*. *Age* proved to be favorable to *the deletion of C²* whereas in earlier ages there is a high incidence of this strategy, reducing the aging years to complete acquisition of CO[21]. However, in the case of phonological disorder, this linearity did not occur in the acquisition, as peaks were observed in the use of this strategy. In relation to *gender*, in typical development a higher occurrence of the studied strategy occurred in boys, and in contrast, the most atypical occurrence was observed in girls. As previously mentioned, the literature states that in males occur more cases of phonological disorders, but it is also observed in another study[25], there may be a higher prevalence of speech disorders in female children.

The position of the syllable in relation to *metrical foot* showed favorable to the C² deletion, occurring when it occupies the "head" of the metrical foot. In a recent study, it was found that when the liquids of CO were in the position of "head" of the metrical foot, there was a deletion of the same strategy[26].

The medial position was verified as favoring the deletion of C2 in typical group. In a survey[27] about simple onset and coda, it was found that this same position was identified as favoring the strategy of semivocalization of liquid and the omission of the coda, respectively.

Regarding the dependent variable **metathesis**, in the joint data analysis of typical and atypical development, as a single group, there was the influence of the variables *following syllabic context, age* and *type of development* in the production of this resource. In the group with typical development it was selected in addition to the variables *following syllabic context* and *age*, the *gender* variable. This extralinguistic variable showed that boys use more this feature. This gender difference is consistent with a study that says that there are differences in verbal abilities between boys and girls. It is observed in general that the girls speak earlier and with greater grammatical accuracy, being more precise in language skills[28].

Regarding to the variable *following syllabic context*, it was found that the metathesis is most likely to occur when the CO is followed by syllable lock ((C) VC) with simple coda and simple onset (e.g. pretos). This variant was not exclusive of typical group, suggesting that actually sets the variable favoring the production of metathesis in different types of development is the variable age.

The age in the typical was the most relevant age group before the single group, confirming that the use of metathesis takes place in separate periods of developments, namely the use of metathesis typically developing in the group can be considered a stage prior to the complete acquisition of the complex structure and atypical development group may be regarded as a repair strategy performed in the inability of the target.

The variable *type of development* was always selected when the typical and atypical data ran together, showing no difference between the types of development.

Moreover, it was not possible to analyze the strategy metathesis in the group of children with atypical development for the low number of occurrences. This fact disagrees with a comparative study between children with typical and atypical phonological development in which only the atypical group performed the repair strategy metathesis[26].

The **idiosyncrasies** strategy occurred only in the group with atypical development, with low frequency for the selected extralinguistic variables (gender and age). The variant male and the group age 5:6 – 5:11, 29 (first track with atypical data) are more favorable to the realization of idiosyncrasies. This way, atypical is characterized by the presence

of distinct features in the phonological system and can use unique processes or idiosyncratic, such as slurred speech beyond five years of old[29,30] which corroborates the findings of this research.

Still, in this study, it was possible to analyze the **percentages of correct production and repair strategies in typical and atypical phonological development**. In typical development there is a higher percentage of correct production, whereas atypical development in the deletion of C^2 showed a higher percentage. It was found that, as mentioned above, given the impossibility of performing the CO children prefer to produce only the obstruent of this onset, or use the strategy of deletion of C^2 [13].

Thus, it was found that in the course of acquiring the complex onset, deletion of C^2 was the repair strategy more frequent in children with typical and atypical development[26].

In a study[31] on the repair strategy of epentheses it was observed both in typical phonological development as in the speech of children with phonological evolutive disorder, this type of resource. The author also raises the hypothesis that an attempt would be that the epentheses would be a tentative of organization of the phonological system, mainly in typical phonological development, as this acquisition is governed by syllable structure. The results of this research are in the mentioned study[31], in which both groups used this feature in equal percentages.

Although with a reduced number of occurrences, it was observed that in the atypical development, there was also, as the typical group, the occurrence of metathesis. This finding agrees with the one obtained in another study that observed a very low productivity of metathesis strategy for children with disorder[6].

It was noticed that atypical development uses a greater number of repair strategies in relation to the group with typical development. According to a previous study data[32], due to the complexity of syllable structure CCV, most children with phonological disorders could not properly do it until the expected age, producing the same repair strategies that younger children do in normal phonological acquisition.

The repair strategies, syllable deletion and idiosyncrasies were of exclusive use of the atypical group. This data of idiosyncrasies corroborates with other studies[29, 30].

CONCLUSION

It was found, from the results of this study, that the selected extralinguistic variables *gender, age* and *type of development*, and the linguistic variables *position in the word, syllable metrical foot* and *following syllabic context* influenced the production of OC in the analyzed *corpus*. It is noteworthy that as the data were obtained with a small sample; it was not possible to complete their generalization.

It was observed that there are differences in speech development in children typical and atypical in regard to the production of OC, as the variable type of development was selected in every round statistics on which the data were analyzed as a single group. However, considering the separate analysis of the two corpus, the extralinguistic variables (age and gender) were similar to the correct production and other types of strategies used in the two types of phonological development – typical and atypical, influencing both in production and in the correct use of repair strategies.

The intention of this study is to contribute to the existing bases for the elaboration and implementation of a more effective therapy in children with atypical development of speech. At the moment prosodic variables and syllabic favoring the correct production of the OC are known, they aid in the choice of target words, putting the best OC in the context of production, seeking to shorten the therapeutic process.

RESUMO

Objetivo: verificar e comparar as estratégias de reparo e a influência das variáveis linguísticas (silábicas e prosódicas) e extralinguísticas na produção da sílaba com Onset Complexo em crianças com desenvolvimento fonológico típico e atípico. **Método:** foi analisada a fala de 48 crianças, 24 com desenvolvimento fonológico típico e 24 com desenvolvimento fonológico atípico, equiparados em relação ao sexo, entre 2:6 a 5:5;29 (grupo típico) e 5:0 a 7:11;29 (grupo atípico). As amostras foram coletadas transversalmente, com base no instrumento Avaliação Fonológica da Criança. Foram analisadas palavras que apresentaram como alvo o onset complexo, com um *corpus* de 278 palavras do desenvolvimento típico e 460 do desenvolvimento atípico. Foram consideradas como variantes da variável dependente a produção correta, apagamento de C^2, apagamento de C^1, apagamento de sílaba, epêntese, metátese e idiossincrasias. Como variáveis independentes intervenientes consideraram-se os fatores extralinguísticos idade, sexo e tipo de desenvolvimento e as variáveis linguísticas tonicidade, número de sílabas, contexto silábico seguinte e precedente, posição na palavra, complexidade do onset na própria sílaba e pé métrico. Os dados de fala foram analisados estatisticamente por meio do VARBRUL. **Resultado:** o programa estatístico selecionou como significante para a produção correta e para os outros tipos de estratégias de reparo do onset complexo as variáveis sexo, idade, tipo de desenvolvimento, posição na palavra, pé métrico e contexto silábico seguinte. **Conclusão:** verificou-se que as variáveis linguísticas e extralinguísticas influenciam significantemente na produção do onset complexo em crianças com ambos os desenvolvimentos. A estratégia de reparo mais utilizada foi apagamento de C^2.

DESCRITORES: Transtornos do Desenvolvimento da Linguagem; Desenvolvimento da Linguagem; Fonética

REFERENCES

1. Pagan LO, Wertzner HF. Análise acústica das consoantes líquidas do Português Brasileiro em crianças com e sem transtorno fonológico. Rev. soc.bras.fonoaudiol. [periódico na internet]. 2007. [acesso em 2011 Abril 15], 12(2):106-13. Disponível em: http://www.scielo.br/scielo.php?pid=S1516-80342007000200007&script=sci_arttext

2. Mota HB, Silva APS, Mezzomo CL. Mudanças fonológicas na terapia de sujeitos com desvio fonológico utilizando 'contraste' e 'reforço' do traço [voz]. Letras de Hoje [periódico na internet]. 2008. [acesso em 2011 Abril 16],43:7-14. Disponível em: http://revistaseletronicas.pucrs.br/ojs/index.php/fale/article/view/5603

3. Lamprecht RR. Antes de mais nada. In: Lamprecht R.R. (Org.). Aquisição fonológica do português: perfil de desenvolvimento e subsídios para terapia. Porto Alegre: Artmed; 2004.p.17-32.

4. Lamprecht RR. A aquisição da fonologia do português na faixa etária dos 2:9 – 5:5. Letras Hoje.1993;28(2):99-117.

5. Mota HB, Kaminski TI, Nepomuceno MRF, Athayde ML. Alterações no vocabulário expressivo de crianças com desvio fonológico. Rev.soc.bras. fonoaudiol. [periódico da internet] 2009. [acesso em 2011 Abril 17],14(1):41-7. Disponível em: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1516-80342009000100009

6. Ribas LP. Onset complexo nos desvios fonológicos: descrições, implicações para a teoria, contribuições para a terapia. [tese] Porto Alegre (RS): Pontifícia Universidade Católica do Rio Grande do Sul; 2006.

7. Levelt C, Schiller N, Levelt W. The acquisition of syllable types. Language Acquisition. 2000; 8(3):237-64.

8. Keske-Soares, M, Blanco APF, Mota HB. O desvio fonológico caracterizado por índices de substituição e omissão. Rev.soc.bras.fonoaudiol.2004; 9(1): 10-8.

9. Ribas LP. Sobre a aquisição do onset complexo. In.: LAMPRECHT, R.R. (Org.). Aquisição Fonológica do Português: perfil de desenvolvimento e subsídios para terapia. Porto Alegre: Artmed, 2004.p.151-64.

10. Galea DES. Percurso da aquisição dos Encontros Consonantais, Fonemas e Estruturas Silábicas em crianças de 2:1 a 3:0 anos de idade. 2008. 226 f. [tese]. São Paulo (SP): Faculdade de Filosofia, Letras e Ciências Humanas da Universidade de São Paulo; 2008.

11. Giacchini V, Mota HB, Mezzomo CL. Diferentes modelos de terapia fonoaudiológica nos casos de simplificação do onset complexo com alongamento compensatório. Rev. CEFAC. [periódico da

internet] 2011.[acesso em 2011 Abril 17],13(1):57-64. Disponível em: http://www.scielo.br/scielo.php?pid=S1516-18462011000100008&script=sci_arttext
12. Hahn LH, Quednau LR. A lateral pós-vocálica no português de Londrina: análise variacionista e estrutura silábica. Letras de Hoje. [periódico da internet] 2007. [acesso em 2011 Abril 17],42(3):100-13. Disponível em: http://revistaseletronicas.pucrs.br/ojs/index.php/fale/article/view/2794
13. Athayde M, Baesso JS, Dias RF, Giacchini V, Mezzomo CL. O papel das variáveis extralinguísticas idade e sexo no desenvolvimento da coda silábica. Rev.soc.bras.fonoaudiol. [periódico da internet] 2009. [acesso em 2011 Abril 17],14(3):293-9. Disponível em: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1516-80342009000300003&lng=en&nrm=iso&tlng=pt
14. Ribas LP. Aquisição das líquidas por crianças com desvio fonológico: Aquisição silábica ou segmental? .Rev. Letras (UFSM).[periódico da internet] 2008. [acesso em 2011 Abril 17],36:129-49. Disponível em: http://w3.ufsm.br/revistaletras/artigos_r36/artigo6.pdf
15. Yavas M, Hernandorena CLM, Lamprecht RR. Avaliação fonológica da criança. Porto Alegre: Artes Médicas, 1991.
16. Mezzomo CL. Aquisição da coda no Português Brasileiro por crianças com desenvolvimento fonológico normal. 2003. [tese] Porto Alegre (RS): Pontifícia Universidade Católica do Rio Grande do Sul; 2003.
17. Cedergren HJ, Sankoff, D. Variable rules: performance as a statistical reflection of competence. Language. 1974;50(2):333-55.
18. Amaral L. Criando um formulário no Microsoft Access. Pelotas: UFPel, 1998.
19. Cavalheiro LG. A prevalência do desvio fonológico em crianças de 4 a 6 anos de escolas públicas municipais de Salvador-BA. 2007. [dissertação] Santa Maria (RS): Universidade Federal de Santa Maria; 2007.
20. Hernandorena CLM. Relações implicacionais na aquisição da fonologia. Letras de Hoje.1996;31(2):67-79.
21. Mota HB. Aquisição segmental do Português: um modelo implicacional de complexidade de traços. Letras de Hoje.1997;32(4):23-47.
22. Ribas LP. Onset complexo: características da aquisição. Letras de Hoje.2003; 38(2):23-31.
23. Ckmann A, Dores A, Vidor D, Lima P, Isolan R, Agustini R. A influência do tratamento fonoaudiológico na aquisição das líquidas não-laterais do português. Letras de Hoje.2001;36(3):729-34.
24. Wertzner HF, Oliveira M. Semelhanças entre os sujeitos com distúrbio fonológico. Pró-Fono R. Atual. Cient.2002;14(2):143-52.
25. Shevell M, Majnemer A, Webster RL, Platt RW, Birnbaum R. Outcomes at school age of preschool children with developmental language impairment. Ped. Neurol.2005;32(4):264-9.
26. Rechia IC, Ramos APS, Mezzomo CL. Processos de apagamento na fala de sujeitos com dispraxia verbal. Rev. CEFAC. [periódico da internet] 2010. [acesso em 2011 Maio 26],12(2):421-6. Disponível em: http://www.scielo.br/pdf/rcefac/v12n3/40-09.pdf
27. Baesso SJ. O uso de estratégias de reparo nos constituintes coda e onset complexo por crianças com aquisição fonológica normal e desviante. [dissertação] Santa Maria (RS):Universidade Federal de Santa Maria; 2009.
28. Shaywitz BA, Shaywitz SE, Pugh KR, Constable RT, Skudlarski P, Fulbright RK et al. Sex differences in the functional organization of the brain for language. Nature. 1995;373(6515):607-9. Comment in: Nature. 1995;373(6515):561-2.
29. Ramalho MSSC. Desvios fonológicos em pré-escolares no município de Porto Velho – Rondônia : um estudo transversal. [dissertação] Brasília (DF): Universidade de Brasília, Faculdade de Ciências da Saúde, 2011.
30. Pagliarin KC, Keske-Soares M. Abordagem contrastiva na terapia dos desvios fonológicos: considerações teóricas. Rev. CEFAC.[periódico da internet] 2007. [acesso em 2011 Out. 23], 9(3):330-8. Disponível em: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1516-18462007000300006
31. Ramos-Pereira A, Henrich V, Ribas LP. Dados com epêntese em alvos com onset complexo na aquisição fonológica: argumentos a favor do desenvolvimento silábico. Rev. Verba Volant . [periódico da internet] 2010. [acesso em 2011 Nov. 03],1(1). Disponível em: http://letras.ufpel.edu.br/verbavolant/ananda.pdf
32. Attoni TM, Albiero JK, Berticelli A, Keske-Soares M, Mota HB. Onset complexo pré e pós-tratamento de desvio fonológico em três modelos de terapia fonológica. Rev. soc. bras. fonoaudiol. [periódico da internet] 2010. [acesso em 2011 Nov. 03], 15(3)395-400. Disponível em: http://www.scielo.brscielo.php?script=sci_arttext&pid=S1516-80342010000300014&lng=en&nrm=iso&tlng=pt

Received on: December 08, 2011
Accepted on: February 13, 2012

Mailing Address:
Silvana Gonçalves Lopes
Rua Justino Couto,260 Ap.216
Santa Maria – RS
CEP: 97070-500
E-mail: silvana-fono@hotmail.com