



# The role of the linguistic and extralinguistic variables during the simple onset /r/ acquisition in two cities in Rio Grande do Sul

O papel das variáveis linguísticas e extralinguísticas na aquisição do /r/ em *onset* simples em dois municípios do Rio Grande do Sul

El papel de las variables lingüísticas y extralingüísticas en la adquisición de /r/ en *onset* simple en dos municipios del Rio Grande do Sul

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## Abstract

**Introduction:** During phonological acquisition, there are linguistic and extralinguistic variables that can influence the acquisition of phonemes. This study targets the /R/ produced in cities of different regions in Rio Grande do Sul. **Purpose:** To verify if the linguistic variables and the extralinguistic variable gender interfere in the /R/ acquisition in Santa Maria and Crissiumal, RS, Brazil. **Methods:** The sample consisted of 914 lexical items from 136 subjects with ages between 1:6 and 4:2 years old, all of them with typical phonological development, monolingual, Brazilian Portuguese speakers. The role of the linguistic variables tonicity, number of syllables, preceding and following context, position in the word, and of the extralinguistic variable gender were investigated during the simple onset /R/ acquisition. The data were analyzed based on the Statistical Program VARBRUL. **Results:** After the data statistical analysis, in Santa

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### Authors' contributions:

SWL: Study conception, methodology, data collection and article design.

CLM: Study conception, critical revision, orientation.

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**Received:** 01/06/2020

**Accepted:** 03/11/2020

Maria, the linguistic variables following context and number of syllables, and the extralinguistic variable gender were statistical significant for the /R/ production. In Crissiumal, the linguistic variables following context and tonicity were statistically significant. **Conclusion:** Although the variable following context was statistically significant in both cities, through the obtained data, it was possible to observe that most linguistic and extralinguistic variables interfere differently in the /R/ acquisition when it is produced as a velar/glottal fricative and as a tap and trill.

**Keywords:** Speech; Child Language; Child.

### Resumo

**Introdução:** Durante a aquisição fonológica, existem variáveis linguísticas e extralinguísticas que podem influenciar na aquisição dos fonemas. Este estudo tem como alvo o /R/ produzido em cidades de diferentes regiões do Rio Grande do Sul. **Objetivo:** investigar se as variáveis linguísticas e a variável extralinguística sexo interferem na aquisição do /R/ em Santa Maria e em Crissiumal. **Métodos:** A pesquisa contou com 914 itens lexicais de 136 sujeitos, entre 1:6 e 4:2, com desenvolvimento fonológico típico, monolíngues, falantes do Português Brasileiro. Foi investigado o papel das variáveis linguísticas tonicidade, número de sílabas, contexto fonológico precedente e seguinte e posição na palavra, e da variável extralinguística sexo na aquisição do /R/ em *onset* simples. A análise estatística foi realizada por meio do Pacote Computacional VARBRUL. **Resultados:** A partir da análise estatística dos dados coletados, em Santa Maria, as variáveis linguísticas contexto seguinte e número de sílabas, e a variável extralinguística sexo foram estatisticamente significantes na produção do /R/. Em Crissiumal, além do contexto seguinte, a variável tonicidade foi considerada significante estatisticamente. **Conclusão:** Apesar de a variável contexto seguinte ter sido significante nos dois municípios, com base nos resultados obtidos, verificou-se que a maioria das variáveis linguísticas e extralinguística consideradas interferem de forma distinta na aquisição do r-forte quando este é produzido como fricativa velar/glotal (em Santa Maria) ou vibrante simples e múltipla (em Crissiumal).

**Palavras-chave:** Fala; Linguagem Infantil; Criança.

### Resumen

**Introducción:** Durante la adquisición fonológica, hay variables lingüísticas y extralingüísticas que pueden influir en la adquisición de los fonemas. Este estudio se centra en /R/, producido en ciudades de diferentes regiones de Rio Grande do Sul. **Objetivo:** investigar si las variables lingüísticas y la variable extralingüística sexo interfieren en la adquisición de /R/ en Santa Maria y Crissiumal. **Métodos:** La investigación incluyó 914 ítems léxicos de 136 sujetos, entre 1:6 y 4:2, con típico desarrollo fonológico, monolingües, de habla portuguesa brasileña. Se investigó el papel de las variables lingüísticas tonicidad, número de sílabas, contexto fonológico anterior y siguiente, posición en la palabra, y la variable extralingüística sexo en la adquisición de /R/ en *onset* simple. El análisis estadístico se llevó a cabo utilizando el Paquete Computacional VARBRUL. **Resultados:** A partir del análisis estadístico de los datos recogidos en Santa Maria, el contexto lingüístico siguiente, el número de sílabas y la variable extralingüística sexo fueron estadísticamente significativos en la producción de /R/. En el caso de Crissiumal, además del contexto siguiente, la variable tonicidad se consideró estadísticamente significativa. **Conclusiones:** Aunque la variable contexto siguiente fue significativa en ambos municipios, en base a los resultados obtenidos, se encontró que la mayoría de las variables lingüísticas y extralingüísticas consideradas interfieren de manera diferente en la adquisición de /R/ cuando se produce como fricativa velar/glotal (en Santa Maria) o vibrante simple y múltiple (en Crissiumal).

**Palabras clave:** Habla; Lenguaje Infantil; Niño.

## Introduction

Studies considering the syllable as an important phonological unit have been the focus of analysis of Autosegmental Phonology, Metric Phonology and Optimality Theory. The onset and the rhyme (nucleus and coda) are the constituents of the syllabic segment completion. The syllabic structures CV and V are considered initial and, apparently, they constitute themselves very early in children language.

In Portuguese, CCVCC (such as in “trans”) is the syllable composed of the largest number of elements. The smallest syllable is the structure V (such as in “à”) and the canonical syllable is the CV (as in “pá”), since other structures are derived from it<sup>1</sup>.

Although early in the inventory of the children, not all phonemes fill the CV syllable position in the first years of the life of a child. A study<sup>2</sup> demonstrates that rhotic phonemes (or “r” sounds) are the last sounds to appear in the phonological system of the child, as they are the most complex ones. According to the same author, the acquisition of ‘strong-r’ (in words like “rota” and “carro”) occurs before to the acquisition of weak-r (observed in words like “hora”)<sup>3</sup>, and strong-r is acquired from 2: 6 years, considering the production of /R/ as velar fricative<sup>4</sup>. There is also a study<sup>5</sup> that verified a later domain of strong-r, which was acquired in initial and medial onset at 3:4-3:5 years.

It is important to mention that in Brazilian Portuguese (PB) the strong-r has an irregular behavior, with great variability in phonetic performance. If the term strong-r is used in a phonetic context, it does not become clear the phonetic performance that corresponds to it, since it can be produced as vibrant, tepe, fricative, approximating or retroflex<sup>6</sup>.

In relation to the performance of the rhotic phonemes, in general, in PB, there are several forms of production, which can be produced as tepe [r], vibrant [r], fricative [x, ʁ, h, ð] and retroflex [ɽ]. It is noteworthy that the choice of speakers to perform these forms is determined by the context that the segment occupies in the word. For example, in onset (as in “rabisco” and “carro”), produced as strong-r, there is a greater frequency of production of posterior fricatives from the velar. Vibrant is more restricted to use by bilinguals, especially descendants of Italians and by older monolinguals<sup>7</sup>.

The weak-r and the strong-r, generally, have the characteristic of phonological distinctiveness

in the simple onset position, as in “caro” versus “carro”<sup>8</sup>. Although there are different studies on strong-r, few of them compare the acquisition of different variants of /R/. However, studies on the dialectal influences on the production of strong-r also classify the phoneme produced as tap or multiple alveolar vibrant<sup>9,10</sup>, in addition to the superior fricative variant from the velar, which is considered more frequent according to studies on Brazilian Portuguese<sup>7,11</sup>.

Regarding the positions that the strong-r occupies in the syllable and within the word, it can be said that it is in an initial onset in words such as “rato”. In this position, the weak-r is not possible. On the other hand, in the medial onset position, the weak-r and strong-r contrast (eg.: caro versus carro). The strong-r may also be found in onset position following the consonants /S/, /N/ or /L/, as in “Is[R]ael”, “en[R]olar” and “guel[R]a”. There is also no occurrence of ‘weak-r’ in this position<sup>2</sup>.

During phonological acquisition, there are linguistic and extralinguistic variables that can influence the acquisition of phonemes. In relation to linguistic variables, some studies show that many of them are determinant in the early appearance of some phonemes and sounds<sup>12</sup>. Thus, studying the facilitating environments for the acquisition of sounds and syllabic structures is completely relevant<sup>13</sup>. Therefore, for a better understanding of the language acquisition process, facilitators of this path should be considered. Some authors<sup>5,10</sup>, in their studies on rhotics, considered the linguistic variables in the preceding context and following context, stress and position in the word. A study<sup>14</sup> on the vibrant considered linguistic variables such as position in the syllable, preceding context and following context.

In relation to the extralinguistic variable gender, it is known that it can influence the phonological acquisition of Brazilian Portuguese. This variable was chosen because it is considered relevant for phonological acquisition<sup>4</sup>.

As noted, most studies to date take into consideration the favorable environments for the strong-r produced as a velar fricative<sup>4</sup>. Few studies have analyzed the favorable environments for the phoneme produced as tap or multiple vibrant.

A study<sup>10</sup> observed the production of the strong-r produced as tap in Luzerna- SC and Panambi-RS, with a case in which the /R/ between vowels loses its contractility (eg.: aranha versus

arranha). This happens due to the influence of the German language, since the population of these cities is mostly German descent. The author analyzed the favorable environments for the production of strong-r in both places. The results of this research showed that the linguistic variables position in the word, vowel in the following context, nasality in the following context, tonicity, and the extralinguistic variables gender and age group influence the production of tap in the two referred cities.

Another study<sup>14</sup> analyzed the influence of linguistic and extralinguistic variables on the speech of adults from different cities in southern Brazil. The author verified the production of the vibrant in all positions in the syllable (medial coda, final coda, initial onset, medial onset and onset preceded by consonant) through four variants of the vibrant: anterior, posterior, tepe (tap) and retroflex. Although there are some studies on the variants of strong-r, it can be observed that there are few studies that aim to verify and compare which are the favorable environments for each variant of /R/.

Thus, this study aims to analyze the role of linguistic variables tonicity, number of syllables, phonological context and position in the word and the extralinguistic variable gender in the process of acquiring the non-lateral liquid /R/ in Santa Maria and in Crissiumal, in order to establish a comparison between the variants which were used in referred cities.

## Material e method

This research consisted of the analysis of speech data of 136 children with typical phonological acquisition, 60 children living in the city of Santa Maria and 76 children living in the city of Crissiumal. This sample number was reached by defining the age of appearance and acquisition, the establishment of two-month intervals between each age group and, finally, the number of four subjects per age group (to obtain a performance average). There were 30 boys and 30 girls in Santa Maria and 38 boys and 38 girls in Crissiumal, all monolingual speakers of Brazilian Portuguese. The age of the groups ranged from 1:6 to 4:2 years. The age groups were divided every two months, with a total of 15 in Santa Maria and 17 in Crissiumal. In each age group, speech data from two boys and two girls were used. The speech sample of the city of Santa Maria is part of a database created from

the research project approved by the Ethics and Institutional Research Committee under number 064/2004. The data collection carried out in Crissiumal, by the researcher, was approved by the Ethics and Research Committee under number 23081.011800/2010-89.

In both cities, the parents and/or guardians of the children who took part in the research were duly clarified about the objectives and procedures of the research, authorizing their participation through the Informed Consent Form.

Likewise, in both cities a speech screening was carried out to check if the children who were part of the database and the study presented typical communicative development. To this end, an investigation was carried out by a trained speech therapist in the areas of language (syntax, semantics, morphology, pragmatics and phonology). This investigation was carried out through a detailed analysis of the spontaneous speech samples of each child. Furthermore, aspects such as voice, orofacial motricity and hearing were also investigated. Children could not demonstrate evident impairment in neurological, cognitive or psychological aspects.

For the creation of the two databases (Santa Maria and Crissiumal), speech samples were collected transversally based on the instrument "Avaliação Fonológica da Criança – AFC"<sup>15</sup>. This instrument provides the spontaneous naming of 125 words, through five thematic drawings. In addition, the thematic figure of the circus was also used, rich in images that represent words with liquid phonemes<sup>5</sup>. AFC was applied individually to each of the children, with speech data recorded on a digital recorder. Afterwards, the data were transcribed by means of broad phonetic transcription and reviewed by two more judges with experience in phonetic transcription, separately.

In Crissiumal, the speech of each child was recorded individually by the main author of this research, and the data collection consisted of two stages. In the first stage, an interview was performed with parents and teachers in order to identify the variant predominantly used for the target with a strong-r, which represented the input of the child. This interview was performed through a questionnaire designed specifically for this objective, with basic questions such as name, age, and hometown. In addition, it was asked if the person has already lived in another city, if they speak

another language, if/where they work and what are their everyday activities and leisure activities.

After the application of the questionnaire, it was verified that 91% of the words with the strong-r, produced by parents and teachers, were performed with the simple and multiple vibrants. Two mothers who lived outside the city for a period and returned produced the strong-r as a velar/glottal fricative (9%). In the second stage, there was the collection of speech data, following the same method described for the city of Santa Maria. In addition to AFC, a list of 30 words with 'strong-r' in initial and medial onset was used. As example, the following words are cited: cachorro; arroz; rato; rio; carro; rádio; rainha; rede; terra; correndo; garrafa; corrida; régua; roda; torre; relógio; raio; ferro; marrom; retângulo; rua; escorregador; carreta; refri; rabo; and burro.

The words collected in the Santa Maria database (215 word corpus) and the words collected in Crissiumal (699 word corpus) containing the 'strong-r' (ex.: rato, cachorro) were categorized according to the production.

The words were typed in four forms in the Microsoft Office Access 2003 program, two for initial onset and two for medial onset, which served as input for the statistical program VARBRUL, in order to analyze the correct production in relation to the variables gender, context precedent, next context, stress, number of syllables and position in the word.

The Statistical Program VARBRUL<sup>16,17</sup> is used in sociolinguistic analysis. However, the software has been used successfully since the 1990s with language acquisition data<sup>13</sup>. VARBRUL was used due to the characteristics and objectives of the present study and the fact that it is able to provide frequencies, probabilities and select statistically significant variables on the data studied. The software does the probabilistic analysis in binary form. This means that this software, by means of statistical calculations, assigns measures relative to the variants of the independent variables, in relation to the two variants (correct and incorrect production) of the linguistic phenomenon in question, represented by the dependent variable. It should be emphasized that VARBRUL assigns values of significance to linguistic and extralinguistic variables by the interaction between them (eg. correct production versus gender). Thus, it does not assign a p value (significance value) to the variants contained within

a variable. For example, VARBRUL does not produce a significance value when comparing male and female. For these variants, relative measures are assigned, that is, the greater or lesser probability of their interference regarding the production of /R/ in simple onset. Thus, since it is a binary analysis, the investigation focuses, separately, each variable investigated in relation to the other variable, being not possible to cross two variants of the same variable.

The relative measures or probabilities of occurrence of /R/ in simple onset were removed from the statistical interaction containing all variables selected as significant by the software. Values of relative measure under .50 were considered less favorable, probabilistic values from .50 to .59 were considered neutral, and values equal to or above .60, were considered favorable.

## Results

From the statistical analysis of the collected data, it was observed that in the round of initial data of Santa Maria, the Statistical Program VARBRUL selected the linguistic variables following context and number of syllables. In relation to the following context, the dorsal vowel (eg.: rato) and the coronal vowels (eg.: risada, relógio e régua) favored correct production, with the last ones representing a greater probability of correct production of the strong 'r'. The labial/dorsal vowels (rua, rroz, rla) showed an unfavorable relative measure. In Crissiumal, this variable was not significant, but it shows that the highest frequencies of correct production of the strong 'r' also occur in contexts with dorsal (eg.: rato) and coronal (eg.: risada, relógio e régua) vowels (Table 1).

Regarding the number of syllables, a variable also selected in Santa Maria, the two syllable words (eg.: rato) are statistically favorable to correct production and the three syllable words (eg.: relógio) are unfavorable. In the city of Crissiumal, the variable number of syllables was not statistically significant, but the monosyllable words (eg.: rio) showed high frequencies of correct production (Table 1).

Based on the data which were collected in Crissiumal, the statistical program selected the linguistic variable tonicity as significant in the initial onset round. In this position, no variant presented a probabilistic value favoring the correct production, but the tonic variant (ex.: rápido) has the



highest value, with a relative neutral measure. On the other hand, the pretonic variant (eg.: remédio) is unfavorable. The linguistic variable tonicity was not selected by the statistical program in the Santa

Maria database, however, the pretonic words (eg.: remédio) were the ones that presented the highest frequency of correct production.

**Table 1.** Linguistic variables analyzed for the correct production of / r / in Santa Maria and Crissiumal in initial onset

Initial Onset		City					
		Santa Maria			Crissiumal		
Selected Variables	Variables	Oc	%	P	Oc	%	P
Preceding Context	Dorsal vowel	Single group (only the null variable) – VARBRUL does not accept					
	Coronal vowel						
	Labial/ dorsal vowel						
Following Context	Dorsal vowel	14/15	93	.87	95/45	63	
	Coronal vowel	18/20	90	.93	105/164	64	
	Labial/dorsal vowel	47/63	75	.22	43/73	59	
Number of syllables	One syllable word	1/1	100	#	28/37	76	
	Two syllable word	50/66	76	.68	132/201	66	
	Three syllable word	25/28	89	.14	80/143	56	
	Polysyllable word	3/3	100	#	0	0	
Significance		<b>p=0,808</b>					
Tonicity	Pretonic	26/29	90		86/156	54	.40
	Tonic	51/67	76		153/122	69	.57
	Postonic	Single group (only the null variable) – VARBRUL does not accept					
Significance		p= 0,017					

Caption: Oc – occurrences; % - percentage; P= probability; # - knockout; Statistical Program VARBRUL; p< 0,05.

In medial onset, in the Santa Maria data, VARBRUL did not select any linguistic variable as significant. In Crissiumal, the following contextual linguistic variable was the only statistically significant factor. Regarding this variable, it can be described that the dorsal vowel (eg.: rato, arrasta) favors the correct production in the city. The coronal vowel variant (eg. cart, laugh, watch and ruler) is unfavorable and the lip / dorsal (eg.: carrinho, risada, relógio e regua)) is considered neutral. Regarding the following context in Santa Maria, a variable not selected by VARBRUL, the highest frequency of correct production was detected when the strong-r was followed by dorsal vowels (eg.: rato, arrasta), by labial/dorsal vowels (eg: risada, carrinho, relógio and regua) and coronal vowels (eg.: risada, carrinho, relógio and regua), in decreasing order of frequency.

In Santa Maria, although the results are not significant, it can be observed, in relation to the previous context, that the labial/dorsal vowels (eg.: burro, cachorro, forra) had the highest fre-

quencies of correct production, followed by the coronal vowels (eg.: birra, erro and ferro) and dorsal vowels (eg.: carro). In Crissiumal, different from Santa Maria, the coronal vowels (eg.: birra, erro and ferro) presented the highest frequencies in a previous context, but they appeared in a non-representative amount. The vowels that follow them in terms of frequency are labial/dorsal (eg.: burro, cachorro, forra) and dorsal (eg.: carro), with very close results (Table 2).

Regarding the variable number of syllables, the polysyllable words (eg.: arrumando) presented a higher frequency of correct production in Santa Maria. At second and third positions, it was verified the two syllable words (eg.: carro) and the three syllable words (eg.: remédio), respectively. In Crissiumal, it was possible to verify that the three syllable words (eg.: remédio), presented the highest frequency of correct production of strong-r in medial onset, followed, soon after, by two syllable words (eg.: carro) and polysyllables (ex.: arrumando).



Regarding tonicity, in Santa Maria, the words in which the /R/ is located in stressed syllable (eg.: arruma) presented the highest frequency of correct production and the words in which the phoneme is in postonic syllables (eg.: carro) and pretonic (eg.: remédio) is in sequence in decreasing order

of production. In Crissiumal, the frequencies of the variants of the tonicity variable were very close, following the decreasing order of frequency: pretonic (eg.: remédio), tonic (eg.: arruma) and postonic (eg.: carro).

**Table 2.** Linguistic variables analyzed for the correct production of /r/ in Santa Maria and Crissiumal in medial onset

Medial Onset		City					
		Santa Maria			Crissiumal		
Selected Variables	Variables	Oc	%	P	Oc	%	P
Preceding Context	Dorsal vowel	63/89	71		135/206	66	
	Coronal vowel	9/11	82		3/3	100	
	Labial/dorsal vowel	17/17	100		71/106	67	
Following Context	Dorsal vowel	7/7	100		20/25	80	.66
	Coronal vowel	37/48	48		30/49	61	.39
	Labial/dorsal vowel	45/62	73		160/243	66	.51
Significance				p= 0,009			
Number of words	Two syllable	29/37	78		87/140	62	
	Three syllable	45/63	71		112/160	70	
	Polissyllable	15/17	88		9/15	60	
Tonicity	Pretonic	8/14	57		15/21	71	
	Tonic	53/67	79		74/110	67	
	Postonic	27/35	77		120/184	65	

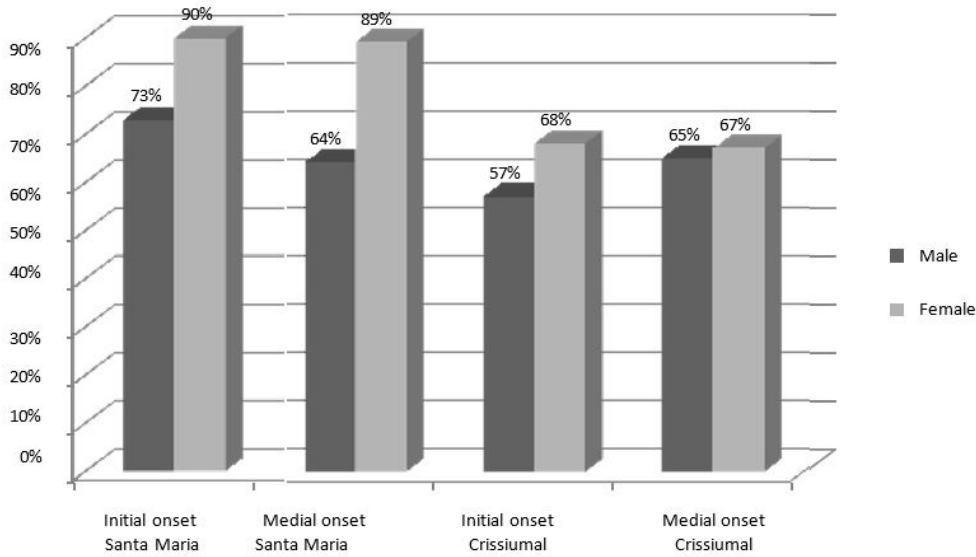
Caption: Oc - occurrences; % - percentage; P= probability; # - knockout; Statistical Program VARBRUL; p< 0,05.

The extralinguistic gender variable was selected as significant only in Santa Maria, both in initial and medial onset. In initial and medial onset, girls are more likely to produce strong-r (initial onset with .79 relative measure; medial onset with .75 relative measure), while males have relative measures with poor values regarding correct production in both positions (initial and medial onset with relative measure of .27).

The frequencies of correct production in Santa Maria and Crissiumal can be observed in Figure 1, in which females present the highest frequencies both in initial and medial onset. However, in Cris-

siumal, the frequencies of correct production of the male and female genders show very close values, when compared to the difference in percentages between the genders verified in Santa Maria.

By analyzing in detail the variables selected by the statistical program, it is possible to perceive some similarities between the municipalities. The following context variable was the only one selected in the two municipalities, in Santa Maria in initial onset and in Crissiumal in medial onset. The dorsal vowel variant (eg.: rato) favors correct production in both cities.



**Figure 1.** Frequency of correct production of the /r/ according to the gender variable in Santa Maria and Crissiumal

## Discussion

It is important to note that the data presented in this research are limited to a specific group of subjects and a statistical program. However, we believe in the scientific value of the information presented, based on the aim of this study, previously described.

During the acquisition of a language, certain words are acquired more quickly than others. To make it possible to understand the reason why this happens, various aspects of the lexical items in which the studied sound is inserted should be considered. These aspects can be the tonicity, the phonological context (preceding and following), and the number of syllables, among others<sup>13</sup>. Therefore, it is important to analyze the aspects or linguistic variables that are relevant during the acquisition of a specific phoneme. In the case of this study, the linguistic variables which were selected for analysis refer to strictly phonological factors.

In this sense, the acquisition of strong-r was researched in two different cities in Rio Grande do Sul. In Santa Maria, the Statistical Program VARBRUL selected linguistic variables in the round with the initial onset data, the following context and number of syllables and the extralinguistic variable gender. In Crissiumal, the variables tonic-

ity, in the initial onset, and the following context, in the medial onset, were selected as significant.

In Santa Maria, the vowels in the following context that favor the production of strong-r in the initial onset are dorsal and coronal. These results are in agreement with a study on rhotic phonemes<sup>4</sup> that found that rounded vowels (labial dorsal phonemes) present a favorable role in the production of strong-r in following context. Another study<sup>18</sup> on liquid phonemes is in line with the data presented here, as it verified that the phoneme was favored when the next position was completed by coronal vowels [e.i], partially agreeing with the present study.

In Crissiumal, the following context variable was not selected by VARBRUL. However, when the strong-r is followed by a dorsal and coronal vowel, the frequency of correct production is higher, when compared to the other vowels. One study<sup>10</sup> categorized vowels in the following context as coronal and non-coronal. The author observed that the coronal vowels present higher frequency and relative measure. However, the results found for non-coronal vowels were very similar. Thus, the obtained data is in agreement with the results of the present study.

In relation to the number of syllables of words produced in Santa Maria, also considered a statistically significant result in initial onset, the syllables



favor the production of strong-r. A study<sup>13</sup> verified that words with fewer syllables are easier contexts for stimulation during phonological therapy. In addition, another study<sup>19</sup> found that the erasure of unstressed syllables generally occurs in three syllable words and polysyllable words, which can demonstrate that words with a lower number of syllables favor correct production. In addition, authors<sup>12</sup> found that monosyllable words favor the production of the complex onset.

In Crissiumal, another variable which was not selected by the Statistical Program for initial onset was the number of syllables. When observing the data from the city, it was verified that the monosyllable words (eg.: rio) showed the highest frequencies of correct production, a result that is in agreement with the findings of the authors mentioned for Santa Maria<sup>12,13,19</sup>. This result may have been achieved because in Crissiumal the word “rio” is quite frequently used and commonplace, as one of the main leisure activities in the city during the summer is visiting the local rivers.

In Crissiumal, the statistical program selected the linguistic variable tonicity in the initial onset data round. The tonic and postonic variants present neutral relative measure. In Crissiumal, dialectal variation should be considered, as the strong-r is produced as a single vibrant (tap) and multiple (trill). A study<sup>10</sup> that evaluated the strong-r produced as tap considered the tonicity and atonicity variants. The author concluded that tap happens more in unstressed syllable. The referred results corroborate the findings of another study<sup>3</sup>. In addition, research on liquids<sup>18</sup> and another study<sup>13</sup> considering weak-r, which is also produced as tap, found that most correct productions were verified in stressed syllables, which partially agrees with the present study.

The linguistic variable tonicity was not selected by the Statistical Program VARBRUL in Santa Maria in initial onset. However, it was verified that the words in which the /R/ is located in pretonic syllables favor the correct production. A study<sup>20</sup> found that the weak syllable of the metric foot (eg.: carro) is the best environment for the correct production of strong-r, in agreement with the findings of Santa Maria. Some authors<sup>12</sup> verified that the complex onset followed by /r/ in the medial position is acquired previously in a pretonic position. However, according to other authors<sup>13,18</sup>, the tonic positions

favor the production of the non-lateral liquid, as mentioned in the previous paragraph.

When run the medial onset data from Crissiumal, the following context variable was selected by the statistical program, with the dorsal vowel favoring the correct production, in the same way as the data from Santa Maria for initial onset. Some authors, who were already mentioned<sup>10,18</sup>, verified that the coronal vowels are favorable environments for non-lateral liquids. In relation to the following context in Santa Maria, the dorsal vowels (eg.: rato) presented the highest frequencies. A study<sup>18</sup>, which was already mentioned, verified that the preceding position favors the vowels [ε, a, o], partially agreeing with the data found.

When run Santa Maria and Crissiumal data for the medial onset, the preceding context variable was not selected by the statistical program. However, in Santa Maria, the labial/dorsal vowels showed a higher frequency of correct production. In Crissiumal, the coronal vowels presented the highest frequencies of correct production. The findings of a cited research<sup>18</sup> is partly in agreement with the findings of Santa Maria, and partly with the findings of Crissiumal. The author found that the strong-r is more easily produced when preceded by the vowels [ε, a, o]. According to another study<sup>10</sup>, the coronal and non-coronal vowels showed the same frequencies, differently from what occurred in the present study.

Another aspect to be observed is that in Santa Maria the polysyllable words presented higher frequency of correct production in medial onset. This result corresponds to other studies<sup>12,13,19</sup> that found that the shortest words can favor correct production. In Crissiumal, in relation to the number of syllables, it is observed that the three syllable words have the highest frequency of correct production, also opposing the results found by the same researchers<sup>14,19</sup>, as previously mentioned.

The results in Santa Maria in relation to the tonicity variable reveal that the tonic syllables showed the highest frequency of correct production, in the same way as another study<sup>18</sup>, that was mentioned above. The data of Crissiumal pointed to pretonic syllables (eg.: remédio) as having the highest frequency of correct production, as well as the data obtained in Santa Maria for initial onset. This result is in agreement with the findings of another study<sup>20</sup>, as mentioned.

In addition, in a study with favorable stimulus words (PEFs), it was verified that the segments /d/, /f/, /v/, /l/ / / and /R/ are favored in the initial onset position. The words that were part of the study were “régua”; “rímel”; “rosa”; “rolo”; “rolha”; “rodo”; “roupas”; “rato”; “roxo”; “rabo”; “ralo”; “rádio”<sup>21</sup>.

The present study also considered the extralinguistic variable gender, which was selected only in Santa Maria, both in initial and medial onset. Both in the round of the initial onset and the medial onset in Santa Maria, the female gender favored the correct production. Authors<sup>3,12</sup> obtained results similar to those ones found in Santa Maria in simple onset, and concluded that girls produced the complex onset constituent more correctly than boys. Other researchers<sup>22</sup> observed a greater use of repair strategies by boys. Confirming this difference, a study<sup>23</sup> found that girls speak earlier and with fewer grammatical errors, being more precocious in acquiring language skills.

In Crissiumal, the gender variable was not statistically significant in any of the word positions. However, females showed the highest frequencies of correct production in simple onset. When observing the relation between gender variable and occurrence of repair strategies, authors<sup>2,13</sup> verified that there were no differences between women and men. Other authors<sup>24</sup> found that gender variable was neutral regarding the use of repair strategies and the order of phoneme acquisition by subjects with atypical phonological development. Corroborating these studies, a research of children of high socioeconomic class found that there was no difference between speech errors considering gender<sup>25</sup>.

A study<sup>26</sup> on phonological disorders included data from 79 boys and 28 girls, because, according to the authors, there are more boys who have communication disorders, which reflects what is in speech therapy clinics. However, the round that selected the gender variable showed a slight predominance of correct achievements by boys (78%), in comparison to girls (74%).

Contrary to the results found previously, researchers<sup>27</sup> observed a greater number of repair strategies for the female gender, while boys presented a greater number of correct productions. Complementing the given information, a research on rapid naming tasks found that female children had, on average, more errors during a test<sup>28</sup>.

The following context variable was the only common variable selected in the two cities, in Santa

Maria in the initial onset and in Crissiumal in the medial onset. The dorsal vowel variant (eg.: *rato*) favors correct production in both cities, contrary to the findings of other studies<sup>4,18</sup>.

The results of this research are quite relevant, as it was verified that the influence of linguistic and extralinguistic variables changes according to the variant used by the subjects. However, it is believed that more research<sup>29,30</sup> should be carried out, with different variants and different phonemes. In addition, it is suggested that more studies like this one should be carried out in different places that use these same variants of strong-r.

## Conclusion

In this study, it was verified that most of the linguistic variables which were considered and the extralinguistic variable gender interfere differently in the acquisition of the strong-r when it is produced as a velar/glottal or simple and multiple fricative.

For the initial onset, in Santa Maria, VARBRUL Statistical Program selected the following context variables and number of syllables as significant, whereas in Crissiumal the tonicity variable was selected. In the medial onset round, in Santa Maria, the statistical program did not select any linguistic variable. However, in Crissiumal, the following context variable was selected. Thus, in relation to linguistic variables, it was observed that in the initial and medial onset rounds the data found for Santa Maria and Crissiumal differ.

In general, in relation to the extralinguistic variable gender, there was a higher frequency of girls presenting greater phonological accuracy for strong-r. The female gender was also more likely to produce correct strong-r in simple onset in Santa Maria.

Thus, it can be inferred that, depending on the variant used by a community, the influence of linguistic variables can be diverse for determining the accuracy of the adult target during the phonological acquisition process. Therefore, Crissiumal, possibly because it is a city that has a large number of German immigrants, who use the tap variant, has a different influence from the variables studied in relation to Crissiumal, which uses the velar/glottal fricative variant.

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