



Acquisition of the non-lateral liquid by childrens from Belo Horizonte - Minas Gerais – Brazil

Aquisição da líquida não lateral por crianças de Belo Horizonte - Minas Gerais - Brasil

Adquisición de la líquida no lateral por niños de Belo Horizonte - Minas Gerais - Brasil

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Abstract

Introduction: Studies have shown that the acquisition of the non-lateral liquids, both in the Portuguese and the English language, occurs at a later stage due to the acoustic and articulatory characteristics of those phonemes. However, there is no consensus as to the age of their acquisition. Thus, it is important to know the outcomes of research in the various geographic regions given the existing linguistic variants. **Aim:** To assess the acquisition of the phoneme /l/ by children who are speakers of the Brazilian Portuguese variant spoken in the city of Belo Horizonte (state of Minas Gerais) in simple and complex onset. **Method:** The sample comprised 86 children aged 3 years to 6 years 11 months from public and private schools with typical language development. The phoneme was considered acquired when 75% of the children produced at least 75% of the words correctly. **Results:** The phoneme /l/ was acquired at 4 years of age in simple onset and at 6 years in complex onset. **Conclusion:** The acquisition of the phoneme /l/ in simple onset by the children in our study is comparable to that observed in children from the states of Rio Grande do Sul and Rio de Janeiro. Regarding the complex onset, the age of acquisition was comparable to that of

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a study conducted in São Paulo state.

Keywords: Child; Speech; Language development; Child development; Speech articulation tests

Resumo

Introdução: Estudos demonstram que a aquisição das líquidas não laterais, tanto na língua portuguesa quanto na inglesa, é a mais tardia devido a suas características acústicas e articulatorias. Entretanto, não há consenso sobre sua idade de aquisição. Desta forma, é importante se conhecer os resultados das várias regiões geográficas devido às variantes linguísticas. Objetivo: Verificar a aquisição do fonema /ʃ/ em crianças falantes da variante mineira do português brasileiro em onset simples e complexo. Método: Amostra composta por 86 crianças de 3 a 6 anos e 11 meses de escolas públicas e privadas, com desenvolvimento típico de linguagem. O fonema foi considerado adquirido quando 75% das crianças apresentassem 75% de acertos na produção das palavras. Resultados: Observou-se que o fonema /ʃ/ em onset simples foi adquirido aos 4 anos de idade e em onset complexo aos 6 anos. Conclusão: A aquisição do fonema em questão nas crianças estudadas está equiparada à de crianças do Rio Grande do Sul e do Rio de Janeiro em onset simples. Em onset complexo a idade de aquisição se compara com a pesquisa feita em São Paulo.

Palavras-chave: Criança; Fala; Desenvolvimento da linguagem; Desenvolvimento infantil; Testes de articulação da fala.

Resumen

Introducción: Estudios demuestran que la adquisición de las líquidas no laterales, tanto en la lengua portuguesa como en la inglesa, es la más tardía debido a sus características acústicas y articulatorias. Sin embargo, no existe un consenso sobre la edad de adquisición. De esta manera, es importante que se conozcan los resultados de las varias regiones geográficas debido a sus variantes lingüísticas. **Objetivo:** Verificar la adquisición del fonema /ʃ/ en niños hablantes de la variante lingüística de Belo Horizonte (Minas Gerais) del portugués brasileño en onset simple y complejo. **Método:** la muestra estuvo compuesta de 86 niños de 3 a 6 años y 11 meses de escuelas públicas y privadas, con desarrollo típico del lenguaje. Se consideró adquirido el fonema cuando el 75% de los niños presentara el 75% de aciertos en la producción de las palabras. **Resultados:** Se observó que el fonema /ʃ/ en onset simple fue adquirido a los 4 años de edad y en onset complejo a los 6. **Conclusión:** La adquisición de este fonema en los niños analizados se equipara a los niños del Rio Grande do Sul y de Rio de Janeiro en onset simple. En onset complejo la edad de adquisición se compara a la investigación realizada en Sao Paulo.

Palabras clave: Niño; Habla; Desarrollo del lenguaje; Desarrollo infantil; Pruebas de articulación del habla

Introduction

The appearance of speech occurs during the first years of life, the period of acquisition and phonological development, which occurs gradually, following a similar chronology for most children. In this period, omissions and substitutions may occur, considering that the phase of further expansion of the phonological system happens between 1 year and 6 months and 4 years of age^{1,2}.

Regarding the order of acquisition of phonemes, the literature is divergent with respect to the age of occurrence of each phoneme. However, there is a consensus on the appearance order of the classes of sounds, first appearing the plosive, the nasal, the fricative and liquid ones, followed by archiphonemes /S/ and /R/ and finally the consonant clusters with /l/ and /l/ are acquired³. This order of phonemes emergence is also observed in English and European Portuguese^{2,4,5}.

Studies show that the acquisition of non-lateral liquids, both in Portuguese and in English, is the latter due to its articulatory and acoustic characteristics⁵⁻⁷. But there is no consensus about the age of its acquisition. In Brazil we have the reference of the studies conducted in São Paulo, which points out that the acquisition of /l/ in simple onset occurs at approximately 3 years and 6 months and in complex onset it is expected that the child completes the acquisition until 6 years and 6 months⁸. Another study carried out in Rio Grande do Sul concluded that the age of acquisition of the /l/ in simple onset is 4 years and 2 months⁹. In Rio de Janeiro, the acquisition of the phoneme /l/ has happened at 4 years in simple onset and 5 years in complex onset². Recent studies suggest that the phonological development should be practically complete at 5 years^{3,10}.

Besides the fact that the liquid consonants have later acquisition, they also suffer more repair strategies. It is worth considering that there are two liquid ones, /R/ and /l/, which are acquired earlier at the time of fricatives^{11,12}.

Due to controversies regarding the acquisition of phonemes and, in this study, specifically the non-lateral liquid consonant, it is important to conduct this research in order to clarify people's behavior for more effective clinical interventions. In addition, Brazil has continental dimensions, which results in different language variants for the Brazilian Portuguese. It is essential to know the specificities of each variant.

During clinical care, it is observed how common is to see children with difficulty in producing the phoneme /l/ both in simple onset and in complex onset. These children arrive in speech therapy clinics usually sent by the school, pediatrician and also because the family itself notes that the child cannot produce this phoneme yet. There is then a great demand of children with alterations in the acquisition of this phoneme, but with a remarkable age difference (between 3 and 7 years) in relation to the children that are conducted to the clinic. Thus a question arises: what is the best age to start therapy? To answer this question it would be necessary to identify at what age the speakers of Brazilian Portuguese, residents of Belo Horizonte, get the /l/ both in simple and in complex onset.

Thus the aim of this study was to verify the acquisition of the phoneme /l/ in children speakers of Brazilian Portuguese of Belo Horizonte (Minas Gerais) in simple and complex onset, in situation of imitation of words and naming of figures.

Material and Method

This is an analytical, cross-sectional observational study approved by the Research Ethics Committee of the institution under Protocol 0388-11.

86 children of both sexes participated in this study, aged between 3 years and 6 years and 11 months, from public and private schools in the eastern and western regions of the city of Belo Horizonte. Table 1 shows the distribution of children by age group.

TABLE 1. DISTRIBUTION OF CHILDREN OF THE STUDY BY AGE

Age Group	N
3 years	25
4 years	30
5 years	10
6 years	19

All children from the selected schools were invited to participate of the study. The children included were: the ones who presented the Informed Consent signed by the parent or guardian, according the National Council of Health (196/96); children with no family and/or school complaints of alteration in language development; the ones without complaints of neurological disorder, psychiatric illness and/or difficulty of communication on the part of the parents, educators and teachers; the ones that had not undergone earlier speech therapy; children that presented adequate performance on the vocabulary and phonology test of ABFW⁸; and the ones who resided in the metropolitan region of Belo Horizonte since birth.

Children who in the phonology test produced lower percentage to 50% of the words with the target phonemes in the study were excluded.

Aged 5 years, only 5 children answered to the naming test.

The first stage of the study consisted of sending medical history featuring open and closed questions prepared for the study. This questionnaire included questions such as: Current age; sex; which Brazilian state and city of birth; residence time in the metropolitan region of Belo Horizonte; development of speech and language; history of communication disorders, neurological and psychiatric ones; treatments carried out; history of otitis; family history of communication disorders.

In the second stage, the selected students underwent two tests:

- **Vocabulary Test of ABFW Child Language Test⁽⁸⁾**. The children named figures of nine semantic fields (clothing; animals; food; means of transport; furniture and utensils; professions; places; shapes and colors, toys and musical instruments). Answers were classified as Usual Verbal Designations (UVD), No Designations (ND) or Processes of Substitutions.

- **Phonology Test of ABFW Child Language Test⁽⁸⁾**. For testing the phonological system we used two tests: the imitation and the naming. In naming test, the child named each picture immediately after its presentation. If the child could not name them the examiner spoke the name and asked the child to speak after passing the next five figures. In imitation test, the child repeated the word spoken by the examiner. The test considers the phoneme as acquired (control of production in simple and

complex onset) if there is 75% of correct answers during production.

Data collection occurred in one or two sessions, according to the child's disposal. Each subject was assessed individually by the researcher in a room of the school complex.

All assessments were recorded with digital voice recorder for carrying out the analysis, as proposed in the tests.

After transcription and analysis of the phonology test of the children, all transcripts were subjected to analysis of agreement between judges, considering at least 90% of agreement.

For analysis of the production of the non-lateral liquid /l/, the words that presented it in the naming and imitation tests, in simple and complex onset, were selected, totaling 21 words. Emissions were classified as: correct answers, omission, substitution by /l/, replaced by /i/, inversion and others. It was found at what age there is the acquisition of non-lateral liquid in naming and imitation tests, in simple and complex onset. Furthermore, it was calculated the number of children that produced each word.

For continuous variables (percentage of correct answers in the non-lateral liquid production in the four studied conditions and type of test) the descriptive measures of mean, median and standard deviation were calculated. The Mann-Whitney test was used to verify the effect of age on the percentage of correct answers in the production of non-lateral liquid. The Wilcoxon test was used to verify the effect of the type of task (imitation versus naming). Frequency tables were constructed in order to observe the number of children that produced each one of the studied words and the number of children who presented each percentage of correct answers in the imitation and naming tests. The adopted significance level was 5%.

Results

There was no difference regarding the type of school, public/private, for any of the analyzed variables. Thus it was decided to conduct a study without distinction as to the types of school.

Table 2 shows the percentage of children who produced every word considered in the study. Here it was not taken into account the child's performance in an attempt to produce the target word.

TABLE 2. PERCENTAGE OF CHILDREN THAT PRODUCED EACH ONE OF THE ANALYZED WORDS, INDEPENDENT OF THE PERFORMANCE OBSERVED IN THE PRODUCTION ATTEMPT

	Words	f	%
Imitation	alligator, nose, serving dish, drug, carnation, weak	85	100
	zero, nail, white, thick	84	98,82
Naming Designation	chair	80	94,11
	scissors	78	91,76
	dish	76	89,41
	broom, arm	75	88,23
	giraffe	74	87,05
	book	72	84,70
	zebra	65	76,47
	tractor	60	70,58
	cup	54	63,52
cross	40	47,05	

In Tables 3 and 4 it can be observed the effect of age in the percentage of correct answers in the production of non-lateral liquid on the four studied conditions (simple and complex onset in the imitation and naming tasks). It is not observed effect of age only for the percentage of correct answers in simple onset in the imitation test. However, the p value found is below 10%, which may indicate a statistical trend. In general, there is a statistically

significant variation between the studied age extremes. In imitation test with phoneme in complex onset it is noted that there is a gradual increase in the percentage of correct answers or phoneme control. The worsening observed in the 5-year group can be considered a normal variation, because the performance is statistically similar to the one of 4-year-old children.

TABLE 3. DESCRIPTIVE ANALYSIS OF THE PERCENTAGE OF CORRECT ANSWERS IN THE PRODUCTION OF THE NON-LATERAL LIQUID BY AGE IN FOUR STUDIED CONDITIONS

Age		Imitation	Imitation	Naming	Naming
		Simple Onset	Complex Onset	Simple Onset	Complex Onset
3 year	Mean	71,53	39,88	75,60	44,10
	Median	100,00	21,43	100,00	40,00
	Standard Deviation	36,61	41,27	35,31	39,65
4 years	Mean	84,44	71,43	85,69	78,74
	Median	100,00	85,71	100,00	100,00
	Standard Deviation	29,99	37,89	28,99	34,12

5 years	Mean	76,67	57,14	80,00	64,00
	Median	100,00	78,57	100,00	100,00
	Standard De- viation	31,62	41,51	44,72	49,80
6 years	Mean	96,49	90,98	98,89	91,48
	Median	100,00	100,00	100,00	100,00
	Standard De- viation	10,51	15,22	4,71	20,65

TABLE 4. COMPARISON OF THE AGE GROUPS REGARDING THE PERCENTAGE OF CORRECT ANSWERS IN THE PRODUCTION OF NON-LATERAL LIQUID IN THE FOUR STUDIED CONDITIONS

	Chi-Square	p-value	Mann-Whitney
% Imitation Simple Onset	7,791	0,051	3 years < 6 years
% Imitation Complex Onset	19,125	0,000	3<4; 3<6; 4<6; 5<6
% Naming Simple Onset	7,983	0,046	3 e 4 years < 6 years
% Naming Complex Onset	18,410	0,000	3<4; 3<6

According to Table 3 at all ages it is observed that children have better results in words with the phoneme in simple syllable and they were also better in the naming test. Overall, the average

numbers of the naming test were higher. However, the comparison between the imitation and naming tests by age and type of onset showed no statistically significant difference (Table 5).

TABLE 5. COMPARISON BETWEEN THE PERFORMANCE IN IMITATION AND NAMING TESTS IN THE CONTEXTS OF SIMPLE ONSET AND COMPLEX ONSET

	Imitation Simple Onset	Naming Simple Onset	Imitation Complex Onset	Naming Complex Onset
Mean	81,98	78,55	65,12	64,05
Median	100	100	85,71	91,67
Standard Deviation	31,12	36,8	40,14	42,11
p-value	0,591 (Z=-0,537)		0,704 (Z=-0,379)	

What can be noted in Tables 6 and 7 is that the acquisition of the phoneme here studied occurs at 4 and 6 years in simple and complex onset, respectively.

Although it was considered acquired in the above mentioned age, it is observed that the phoneme is already produced by most children under those ages. At 3 years 54.2% of children are already able to produce the phoneme in simple onset in

the test of imitation and 60% in the naming test. In complex onset the correct production of the phoneme occurs in 33.6% of children in the test

of imitation and in 25% in the naming test. What can be observed in this study is that a minority of children still do not produce the phoneme (<25%).

TABELA 6. DISTRIBUIÇÃO DE FREQUÊNCIAS DO NÚMERO DE CRIANÇAS COM CADA PERCENTUAL DE ACERTOS NA PRODUÇÃO DA LÍQUIDA NÃO LATERAL EM ONSET SIMPLES E COMPLEXO POR FAIXA ETÁRIA NA PROVA DE IMITAÇÃO

% acertos	3 anos		4 anos		5 anos		6 anos	
	f (%)		f (%)		f (%)		f (%)	
	OS	OC	OS	OC	OS	OC	OS	OC
0	3(12,5)	9(37,0)	1(3,3)	4(13,3)	-	2(20,0)	-	-
14	-	3(12,6)		3(10,0)		1(10,0)		-
29	-	2(8,4)		-		1(10,0)		-
33	3(12,5)	-	5(16,7)	-	3(30,0)	-	-	-
50	1(4,2)	-	-	-	-	-	-	-
57	-	1(4,2)		-		-		2(10,5)
67	4(16,7)	-	1(3,3)	-	1(10,0)	-	2(10,5)	-
71	-	1(4,2)		3(10,0)		1(10,0)		2(10,5)
86	-	5(21)		8(26,7)		3(30,0)		2(10,5)
100,0	13(54,2)	3(12,6)	23(76,7)	12(40,0)	6(60,0)	2(20,0)	17(89,5)	13(68,4)

Legenda: OS (Onset Simples); OC (Onset Complexo).

TABELA 7. DISTRIBUIÇÃO DE FREQUÊNCIAS DO NÚMERO DE CRIANÇAS COM CADA PERCENTUAL DE ACERTOS NA PRODUÇÃO DA LÍQUIDA NÃO LATERAL EM ONSET SIMPLES E COMPLEXO POR FAIXA ETÁRIA NA PROVA DE NOMEAÇÃO

% acertos	3 anos		4 anos		5 anos		6 anos	
	f (%)		f (%)		f (%)		f (%)	
	OS	OC	OS	OC	OS	OC	OS	OC
0	2(8,0)	7(29,2)	1(3,4)	2(6,9)	1(20,0)	1(20,0)	-	-
17	-	2(8,3)		1(3,4)		-		-
20	-	1(4,2)	1(3,4)	-	-	1(20,0)	-	1(5,6)
25	2(8,0)	-	2(6,9)	2(6,9)	-	-	-	-
33	1(4,0)	1(4,2)	-	1(3,4)	-	-	-	-
40	2(8,0)	2(8,3)	-	-	-	-	-	-
50	-	3(12,5)		-		-		-
60	-	-	-	1(3,4)		-		1(5,6)
67	1(4,0)	1(4,2)	-	-	-	-	-	-
75	-	1(4,2)	1(3,4)	-	-	-	-	-
80	2(8,0)	-	3(10,3)	3(10,3)	-	-	1(5,6)	-
83	-	-	-	-	-	-	-	2(11,1)
100,0	15(60,0)	6(25,0)	21(72,4)	18(62,1)	4(80,0)	3(60,0)	17(94,4)	14(77,8)

Discussion

As in other studies the phoneme was considered acquired when its production was greater than or equal to 75%^{2,13-15}. Thus it is noted in this study that at 3 years most children have acquired the phoneme in simple onset, but we can not say that the acquisition of the phoneme occurs at this age, because the group has a habitual production of the phoneme, and may be competition with the phoneme it replaces. In complex onset, almost half of the children still do not produce the phoneme, but 33.6% of them have already acquired them effectively. In this case it is verified that the data found in this study do not support the studies stating that the /l/ is acquired at 3 years in simple onset^{8,16}. But supports others which also concluded that at this age children do not produce yet the phoneme in complex onset^{8,9,17-19}.

The later acquisition of the liquid in complex onset is discussed in other studies of Brazilian Portuguese and other languages, which claim that non-lateral liquid preceded from another consonant (CCV), besides being the last stage of phonological acquisition of the child, still can be considered more complex, because it requires a more developed articulation ability than in a simple syllable (CV)^{17,20}.

What was seen as the age group is that there is a gradual increase of correct production of the phoneme with increasing age. Some studies have shown that, in general, it also happens in the phonological acquisition process^{16,20}. Others did not evidence this statement^{3,21}. In the literature, studies that make this comparison only with non-lateral liquid were not found.

In Rio Grande do Sul a research on the acquisition of non-lateral liquid in simple onset, held in two towns, showed that the acquisition of the phoneme, as in others, is not linear, i.e., there is a brief regression of usage between the appearance and the acquisition. The authors justify that this regression may be caused by the reorganization of the linguistic knowledge due to the acquisition of a more complex module of language, such as the semantics, the syntax or the morphology¹⁰.

In the age group of 4 years it was verified that the phoneme was effectively acquired by the group in simple onset and continues to compete with the replaced phoneme when produced in complex onset. In this case it is noted that the acquisition of the phoneme in simple onset occurs in Belo

Horizonte in the same age group observed by the studies in Porto Alegre and Rio de Janeiro^{9,18}. What can be observed as being different in the productions in complex onset at the ages 3 and 4 years is that there is an increase in the percentage of children who have already acquired the phoneme with increasing age, observing that there is an earlier acquisition.

At 5 years it is observed a decline in the acquisition of the phoneme if compared to the group of 4 years. The results can be compared with the ones of the 3-year-old children, i.e., the group presents the phoneme in habitual production and it can be in competition with the phoneme that it replaces. However, there is a higher percentage of correct answers of 5-year-old children. As already mentioned above, this oscillation in the development of phonological acquisition, which is known as "U-turn", can occur in the period when there is a reorganization of linguistic knowledge¹⁰. Another hypothesis that can be raised is concerning the sample size of the group, which is the smallest of the studied ones. In addition, half of the children did not do the naming test. Thus the results presented here for the group of 5 years should be interpreted with caution.

Only at 6 years it is noted the effectively completed acquisition in complex onset for non-lateral liquid /l/. The study conducted in São Paulo also identified that the acquisition is performed in this age group. But in other regions (Porto Alegre and Rio de Janeiro) the acquisition of consonant clusters with the tap occurs from 4 to 5:11 years old.

However, due to problems with the group of 5 years, it cannot be said that the children can acquire it before. To get more reliable results it is necessary to have a larger number of participants per age group.

This study had as initial objective to identify the acquisition of the /l/ in simple and complex onset in the city of Belo Horizonte. Knowing the age this phoneme can be considered acquired in the 'mineiro' (from Minas Gerais) dialect can assist the speech therapist in his/her assessment, especially at the right time of the intervention. It is important that studies like these are carried out in different regions, as the linguistic variant can interfere in the process of the acquisition of phonemes. In addition, it is necessary to update this data over the years, because the generations keep on receiving different



stimuli and there may be significant differences in the evolution process of language development.

It is believed that the ages of the studied-here-phoneme acquisition are inferior to the ones that were found. Although the number of participants in the study, 86 children, is considered good, when divided into subgroups by age this number is small. It is then suggested that further studies are carried out with a larger number of participants in each subgroup of age, which can vary in months, in order to obtain answers that are closer to the acquisition in each age group.

Conclusion

By analyzing the data found what we see is that the non-lateral liquid in simple onset is acquired at age 4 and 6 years in complex onset, suggesting that the acquisition of this phoneme in the studied children is equivalent to the children of Rio Grande do South and Rio de Janeiro in simple onset. And in complex onset, the age of acquisition is compared with the research conducted in São Paulo.

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