STRATEGIES USED BY CHILDREN WITH TYPICAL AND ATYPICAL PHONOLOGICAL DEVELOPMENT DURING THE BLOCKED SYLLABLE ACQUISITION

Estratégias adotadas por crianças com desenvolvimento fonológico típico e atípico no domínio da sílaba travada

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ABSTRACT

Purpose: to study the use of repair strategies by children with typical and atypical speech development through an analysis guided by the syllable from a target with simple coda. **Methods:** speech data from 24 children with typical speech development and from 12 children with atypical speech development were analyzed. The children's ages were between 1:0 and 4:0 and between 4:1 and 7:0, respectively. The analyzed dependant variable included the following syllabic variants: syllable omission, coda omission, epenthesis, metathesis, and coalescence. The statistical analysis was accomplished through the use of the Statistical Program VARBRUL. **Results:** it was possible to verify the use of repair strategies such as coda omission, coalescence, epenthesis, and metathesis in the children with speech disorders. The group with typical speech development presented higher occurrence of syllable omission. The variable age was significant for coda omission. When observing the variable sex, the girls with atypical speech development seem to use repair strategies more frequently, while the boys omit coda more often. Both groups tend to preserve the word final position. The extrametrical positions were more favorable for coda omission in the group with atypical speech acquisition. The post-stressed position is more favorable for coda omission and the stressed position is favorable for syllable omission in the group with typical development. **Conclusion:** the groups used different repair strategies during the blocked syllable acquisition. The group with typical acquisition prefers to omit the syllable, while the group with phonological disorders used the other analyzed repair strategies.

KEYWORDS: Speech; Speech Disorders; Language; Child Language; Child

INTRODUCTION

Since the beginning of their speech productions, children face a conflict between the adult target phonological system and the limitations about their abilities of categorization, articulation and motor planning, as well as phonological memory and auditory processing[1].

Moreover, during this period of language acquisition, in order to acquire the sounds which are part of their environment's language, the learner uses some repair strategies. These strategies are used as an attempt to adapt the performance of the target-system to their phonological system, simplifying their productions in a natural movement of adaptation of the output with their skills[1,2].

The children with typical acquisition use these repair strategies for a certain period, according to the characteristics of each phoneme[1,2]. However, when the use of those strategies remain beyond the period of typical acquisition there is phonological disorder[3,4].

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Conflict of interest: non-existent

The blocked syllabic structure, formed by consonants, is one of the last structures to be acquired during the period of language acquisition. It occurs because of its level of complexity. Based on performed studies, in Brazilian Portuguese, the acquisition of syllabic structures happens in the following order: V, CV > CVV à CVC à CCV[5-7].

Regarding the acquisition of syllable structures, the theoretical perspective from the natural phonology recognizes the following repair strategies: cluster reduction, omission of non-stressed syllable, omission of final fricative, omission of final liquid, omission of liquid between vowels, omission of initial liquid, metathesis and epenthesis[8].

Several researches had the purpose of verifying the intervenient variables during the acquisition of the segment which is in the coda position, by children with typical phonological development[4,9,10]. Considering the syllabic complexity of the blocked structure, it is believed that intervenient factors may influence the hold of this structure[1,11]. Those intervenient factors, which are detailed and exemplified in the method may be linguistic (tonicity, number of syllables, precedent phonological context, following phonological context, word position, complexity of the syllable onset, segmental complexity of the coda element, position of the (C)VC syllable in relation to the metrical foot, type of phonological development) and extralinguistic (gender and age).

However, such aspects were not investigated yet, because researches focus mainly the study of segmental acquisition, not syllabic acquisition. Because of this, it is important to perform this study, which has the purpose of studying and comparing how children with typical and atypical phonological development use repair strategies through a syllable guided analysis (phonology and acquisition basic unit) in targets with simple coda.

METHODS

The speech data of the sample were selected from two data bases of a university. The research projects were approved by the Research Ethics Committee, n. 052/2004 and 064/2004.

To perform this study, the sample consisted of two groups, the first with children with typical phonological acquisition (24 children) and the other group with phonological disorder (12 children), with ages from 1:0 to 4:0 and 4:1 to 7:0, respectively. This age difference between the groups occurred because it is only possible to diagnose the phonological disorder in children with more than four years old[3].

As inclusion criterion, the children who participated in this study could not receive or be receiving speech-language therapy; neither present neurological, psychological or cognitive alterations. Besides, the parents and/or responsible for the children authorized, through Informed Consent term, the use of the speech samples of their children in researches about language and speech acquisition and development.

For both groups, it was performed speech-language screening, including language, voice, orofacial motricity evaluation and auditory screening[12]. To collect the data, the used instrument was the Children Phonological Assessment – CPA, through which it was possible to observe and to evaluate all present phonemes and syllables of Brazilian Portuguese[8].

The investigated dependent variable included the following variants, without segmental precision: correct production of the blocked syllable (*porta* (door), pojta, polta); syllable omission (*porta* – [‘ta]), coda omission (*porta* – [´p ta], epenthesis (*porta* - [p ´rota], metathesis (*porta* – [´pr ta] and coalescence (*calça* (pants) – [´k sa].

In this study, it will be referred data about the repair strategies, not the correct production of the blocked syllable.

The considered intervenient variables were:

- Age: age group from 1:0 to 3:11;29 for typical data and from 4:0 to 6:11;29 for the atypical data, with intervals of six months.
- Gender: female and male.
- Tonicity: pretonic (*carteira* - wallet); tonic (*carta* - letter); post-tonic (*garagem* - garage).
- Number of syllables: monosyllables (*mar* - sea); disyllables (*colar* - necklace); trisyllables (perfume); polysyllables (*tartaruga* - turtle).
- Precedent syllabic context: zero (*carta* – letter); open syllable with simple onset (*lápis* - pencil); open syllable with complex onset (*pratos* - plates); blocked syllable with simple coda and simple onset (*pastas* - folders); blocked syllable with simple coda and complex onset (*fraldas* - diapers); blocked syllable with complex coda and simple onset (*caixas* - boxes); blocked syllable with complex coda and complex onset (*transporte* - transportation).
- Following syllabic context: zero (*flor* - flower); open syllable with simple onset (arma - gun); open syllable with complex onset (*filtro* - filter); blocked syllable with simple coda and simple onset (*também* - also); blocked syllable with simple coda and complex onset (*compras* - shopping); blocked syllable with complex coda and simple onset (*irmão* - brother).
- Word position: initial (*árvore* - tree); medial (*espanta* - frighten); final (*lápis* - pencil).

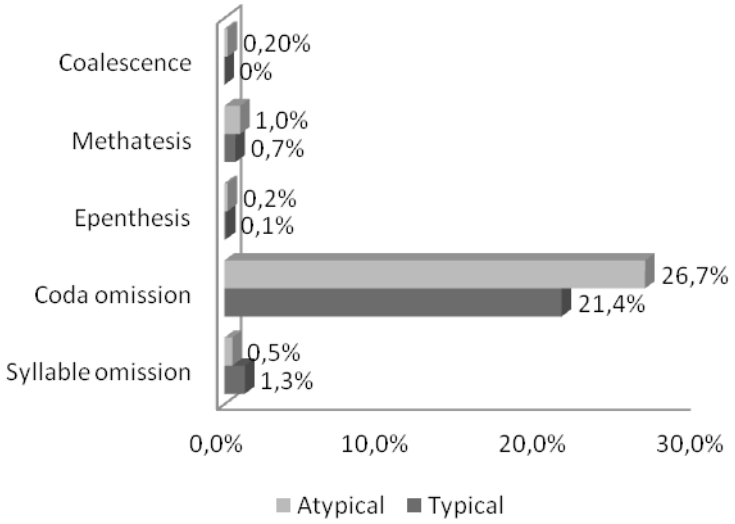
- Onset complexity in the syllable: complex onset (*fralda* - diaper); simple onset (*pasta* - folder); syllable without onset (*erva* - herb).
- Segmental complexity of the coda element: nasal (*doente* - sick); lateral (*talco* - talc); non lateral (*carne* - meat); fricative (*espera* - wait).
- Position of the (C)VC syllable in relation to the metric foot: extrametrical syllable ((**ar**.vo)<res> - trees); extrametrical ((**la**.pi<s>) - pencil); head of the metrical foot ((**por**.ta) - door); out of the metric foot (esco(**var**) - brush).
- Type of phonological development: typical or phonological disorder.

It is useful to emphasize that in Brazilian Portuguese (BP), the metrical foot refers to the way the accents are attributed. Authors refer that the BP presents a syllable-timing, which is a binary foot with the head (strong syllable of the foot) with predominance to the left. The paroxytone pattern accent in BP is presented by the metrical foot and this mapping occurs from the right to the left, and it can be sensitive to the syllabic weigh[13].

It was obtained a corpus with 2029 words, 1033 from the typical development and 996 from the atypical development. These words are related to the blocked syllable production, which were categorized through a form at Microsoft Access. Then, it was performed an analysis through the Statistical program VARBRUL in Windows environment – Varbwin, with 5% margin of error. The VARBRUL performs probabilistic analysis in binary way, designating relative weighs (probability). The relative weighs or probabilities of repair strategies occurrence regarding blocked syllables come from statistical interaction. Values with relative weigh under .50 ware considered as unfavorable to the analyzed item, probability numbers from .50 to .59 were considered as neutral and values equal or above .60 were considered as favorable.

RESULTS

The results obtained through this study showed that there is higher frequency of use of repair strategies such as coda omission, metathesis and syllable omission by children with phonological disorder. About the group with typical phonological acquisition, it was detected higher frequency of coda and syllable omission.



*Statistical analysis: Statistical program VARBRUL ($p \leq 0.05$)
**For this study, the correct production was not considered

Figure 1 – Frequency of repair strategies

Besides, when analyzing the extralinguistic variables which influenced the coda omission, it was perceived that in the group with typical phonological acquisition the initial age groups are the most favorable – from 1:0 to 2:6, while in the group with atypical development the intermediate age groups – 4:6 to 5:6 – are the most susceptible to coda omission (Table 1).

Table 1 – Selected variables in the strategy coda omission

Variables	Variants	Typical			Atypical		
		Frequency		Relative weight	Frequency		Relative weight
Age	1:0-1:6						
	1:6-2:0						
	2:0-2:6						
	2:6-3:0	1/3	33%	.95			
	3:0-3:6	26/69	38%	.88			
	3:6-4:0	51/189	27%	.62			
	4:0-4:6	44/167	26%	.46	28/166	17%	.37
	4:6-5:0	40/277	14%	.34	47/118	40%	.76
	5:0-5:6	51/289	18%	.48	58/150	39%	.69
	5:6-6:0				49/237	21%	.26
	6:0-6:6				51/179	28%	.65
	6:6-7:0				29/122	24%	.45
Gender	Female	76/533	14%	.35	149/488	31%	.60
	Male	137/461	30%	.67	113/484	23%	.40
Tonicity	Pretonic	79/267	30%	.47			
	Tonic	121/657	18%	.44			
	Post-tonic	13/70	19%	.94			
Word Position	Initial	185/625	30%	.70	208/567	37%	.63
	Medial	6/89	7%	.44	19/172	11%	.63
	Final	22/280	8%	.14	35/233	15%	.16
Onset complexity	CO	1/85	1%	.13			
	SO	190/763	25%	.56			
	Syllable without onset	22/146	15%	.45			
Segmental complexity	Nasal	16/444	4%	.18	11/396	3%	.10
	Lateral	10/68	15%	.58	6/76	8%	.36
	Fricative	30/165	18%	.53	53/206	26%	.64
	Non lateral	157/317	50%	.88	192/294	65%	.94
Position in relation to the metrical foot	Extrametrical syllable				3/8	38%	.93
	Extrametrical coda				16/79	20%	.76
	Head of the metrical				112/572	20%	.41
	Out of the metrical foot				131/313	42%	.58
Significance				0.025			0.001

* Statistical analysis: Statistical program VARBRUL ($p \leq 0.05$)

In relation to the variable gender, girls with phonological disorders seem to use more repair strategies – coda omission – than boys with this impairment, because in the group with typical acquisition the boys are more favorable to the analyzed item (Table 1).

Regarding the variable tonicity, this item was selected only for the group with typical acquisition, with the post-tonic position as favorable for coda omission.

About the word position, this item seems to act in a similar way for both groups, because the final position tends to be the most preserved, not being target for omission (Table 1).

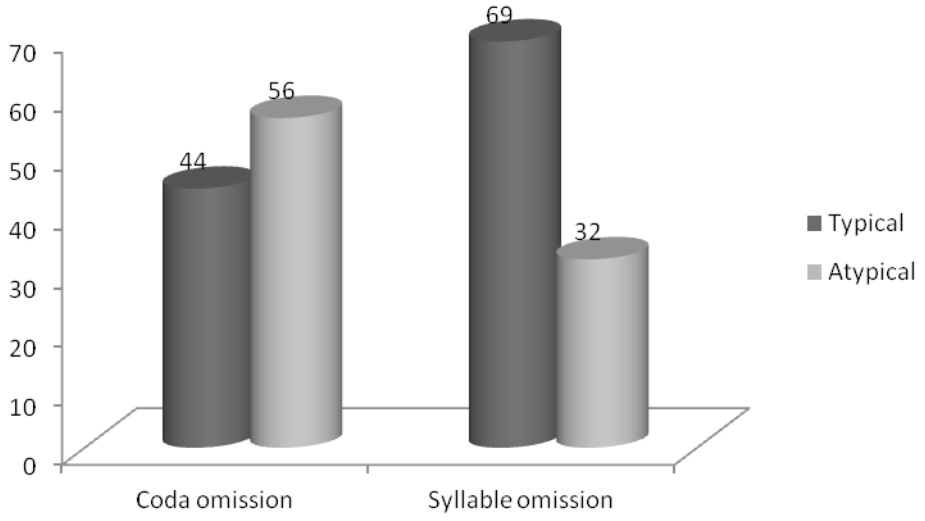
In relation to the onset complexity, only for the group with typical acquisition the structure simple onset was the most favorable for coda omission. About segment complexity, the nasals and laterals were the most preserved in both groups. They were less probable to be omitted, with low relative weighs (Table 1).

Regarding the metrical foot, this item was selected only for the group with atypical acquisition. The extrametrical positions are the most favorable for coda omission (Table 1).

Considering the syllable omission, it was evidenced that the typical group suffers more the

influences of the studied variables, as it is observed in Figure 2.

The variable tonicity was selected only for the group with typical phonological development. The post-tonic position is favorable for the coda omission, while the tonic position is favorable for syllable omission. Moreover, for syllable omission the age was a relevant factor for the group with typical acquisition, and the initial age groups (1:6 to 2:6) are the most favorable for this item (Table 2).



* Statistical analysis: Statistical program VARBRUL (p≤ 0.05)

Figure 2 – Probability of occurrence of coda omission and syllable omission

Table 2 – Variables selected in the repair strategy syllable omission

Variables	Variants	Typical			Atypical	
		Frequency		Relative weight	Frequency	
Age	1:0-1:6					
	1:6-2:0					
	2:0-2:6					
	2:6-3:0	0/3	0%	-		
	3:0-3:6	6/28	21%	.92		
	3:6-4:0	4/50	8%	.59		
	4:0-4:6	2/54	4%	.57	2/167	1%
	4:6-5:0	1/84	1%	.22	0/118	0%
	5:0-5:6	0/297	0%	-	2/155	1%
	5:6-6:0				0/240	0%
	6:0-6:6				0/183	0%
	6:6-7:0				0/125	0%
Tonicity	Pretonic	11/125	9%	.14	3/305	1%
	Tonic	2/91	2%	.92	0/625	0%
	Post-tonic	0/72	0%	-	1/66	2%
Position in relation to the metrical foot	Extrametrical syllable	0/6	0%	-	1/8	13%
	Extrametrical coda	0/67	0%	-	0/82	0%
	Head of the metrical	1/91	1%	.02	0/588	0%
	Out of the metrical foot	12/125	10%	.95	3/318	1%
Significance				0.038		

* Statistical analysis: Statistical program VARBRUL (p≤ 0.05)

DISCUSSION

In Figure 1 it was possible to verify that there are similar repair strategies used by the group with typical as by the group with atypical acquisition. It agrees with literature which mentions that it is possible observe similar strategies for both groups[14,15].

Regarding the repair strategy coda omission, it was detected that the age is statistically significant for this item. The group with typical acquisition in the initial age groups is the most favorable and also the group with phonological disorders in intermediate age groups. These results seem to agree with literature, because the probability of using coda is higher as children get older. Some transitory decreases are possible during its production[4,10].

Besides, the variable gender also influences the coda omission, because in phonological disorder girls are more susceptible to use this repair strategy. This fact agrees with studies in which boys with phonological disorders presented better results in metalinguistic abilities[16,17]. In the group with typical acquisition, boys are more favorable for coda omission, what agrees with a study in which boys with typical phonological development presented a tendency of phonological precision, with higher probabilities of coda correct production[10].

The syllable tonicity favors the completion of the coda position, by the segments which may occupy such position in typical phonological development[4,9], agreeing with data obtained in this study about coda omission, because for this same group the tonic syllable is the most preserved for this item.

About word position, the initial positions in both groups are the most favorable for coda omission, agreeing with other studies, because even for the coda acquisition, the final position is first acquired because it is a more salient and marked structure[18,19]. According to the results obtained in this study, this position tends to be more preserved as well.

In relation to onset complexity in the group with typical acquisition, the structure simple onset was the most favorable for coda omission, agreeing with literature, because this is one of the first structures to be acquired[5,7]. As the nasal as the lateral sound classes were the most preserved regarding the use of repair strategies in both groups, because they are also the first structures to be acquired. When it is observed the emergence of the segments which are in coda, it is detected that the lateral liquid is the first to emerge in final position, when children are 1:2[11]. This evidence reinforces the results obtained in this study about the acquisition of the blocked syllable and its word position.

Agreeing with the literature[1], the fricative and non-lateral liquids sound classes are the most favorable for coda omission in phonological disorders. In the group with typical acquisition, only the non-lateral liquid was favorable for this item.

Regarding the metrical foot, this variable was selected only for the group with phonological disorders, in which it was detected that the extra-metrical positions are the most favorable for coda omission, agreeing with studies performed with subjects with verbal dyspraxia, in which the head of the metrical foot also tends to be preserved[20,21].

In relation to the syllable omission, some items were similar to the coda omission, such as the age, which also influences the group with typical acquisition, acting in a similar way. In this case, the initial age groups are the most favorable for omission[4,10].

It disagrees with literature[4-5,22,23], in which the syllable that presents the accent in Brazilian Portuguese usually favors the articulatory precision because of stronger acoustical characteristics. In this study, the tonic syllable was favorable for syllable omission in the group with typical acquisition. In relation to the metrical foot for the same group, the "head" was preserved, because it is unfavorable for syllable omission, while the syllable which is out of the metrical foot was favorable for omission.

Besides, as it is observed in figure 2, it was verified that there is higher probability that the group with typical acquisition omits the syllable, while the group with atypical acquisition favors coda omission. It may happen because individuals with typical acquisition belong to initial age groups, omitting the syllable, while the subjects with disorders, because they are older, they express better phonological knowledge[24,25] when they preserve the syllable and omit the coda.

The results of this research may help the diagnosis between the groups, because there were differences between the strategies used by children with typical and atypical acquisition. Moreover, the findings from this study may help the choice of targets to be worked in Speech-language therapy, shortening the time of treatment. It must be emphasized the individual variability, as the data presented in this study used with care in evaluation and speech-language therapy. Also, this study is restricted to the variant spoken in the south of Brazil. Other researches should be performed in different parts of the country.

CONCLUSION

According to the results of this study, it was verified that children with typical phonological development seem to use different repair strategies when

compared with children with phonological disorders through an analysis guided by the syllable. While there is higher probability that the group with typical acquisition omits the syllable, the group with atypical acquisition presents more significant probability of omitting the coda.

Besides, for coda omission, the extralinguistic variables such as gender and age influence the groups in a different way, because in the group with typical phonological acquisition the most precocious ages (1:0 to 2:6) are the most favorable for coda omission, and in the group with atypical development the intermediate age groups (4:6 to 5:6) are the most favorable for this same item. About the variable gender, it acts differently in both groups, while the male gender is favorable of coda omission for the group with typical acquisition, the female gender favors this same item for the group with atypical acquisition.

Also about coda omission, the tonicity influences the group with typical acquisition and the tonic syllable is the most preserved, as well as the metrical foot is significant for the group with atypical acquisition. In this case, the extrametrical syllables are the most favorable for coda omission. The segmental complexity acts in a similar way for both groups, because the non-lateral liquid is the most favorable for coda omission.

In relation to syllable omission, the variables were significant only for the group with typical acquisition.

It shows that this speech pathology may be characterized more as a medium disorder of phonological development than as a linguistic disorder.

RESUMO

Objetivo: estudar o uso das estratégias de reparo em crianças com desenvolvimento fonológico típico e atípico mediante uma análise guiada pela sílaba no alvo com coda simples. **Métodos:** foram analisados dados de fala de 24 crianças com aquisição fonológica típica e 12 com desenvolvimento atípico, com idades entre 1:0 a 4:0 e 4:1 a 7:0, respectivamente. A variável dependente investigada incluiu as seguintes variantes silábicas: omissão da sílaba, omissão da coda, epêntese, metátese e coalescência. Por meio do Pacote Computacional VARBRUL realizou-se a análise estatística dos dados, com margem de erro de 5%. **Resultados:** verificou-se o uso das estratégias de reparo como *omissão da coda*, *coalescência*, *epêntese* e *metátese*, nas crianças com desvio. Já no grupo com aquisição típica verificou-se maior ocorrência da *omissão da sílaba*. Para a *omissão da coda*, a variável idade foi significante. Quanto ao sexo, as meninas com desvio fonológico parecem utilizar mais estratégias de reparo, enquanto no grupo com aquisição típica os meninos parecem omitir mais a coda. A posição final da palavra tende a ser mais preservada em ambos os grupos. As posições extramétricas são as mais favoráveis para *omissão da coda* no grupo com aquisição atípica. A posição postônica é a mais favorecedora à omissão da coda e a tônica favorece a *omissão da sílaba* no grupo com aquisição típica. **Conclusão:** os grupos utilizam diferentes estratégias de reparo na aquisição da sílaba travada. O grupo com aquisição típica prefere omitir a sílaba já o grupo desviante utiliza as demais estratégias de reparo investigadas.

DESCRITORES: Fala; Distúrbios da Fala; Linguagem, Linguagem Infantil, Criança

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