

The Acquisition of Variable Coda (r) in the Speech Community of Rio de Janeiro

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1 Introduction

Language acquisition has been addressed in theoretical frameworks that exclude language variation from the scope of the grammar. On the other hand, research on language variation and change has mainly focused on adults' data (Roberts 2002) with some sparse research using child production. Fisher (1958) and Romaine (1978) examined variation in school children while Kovac and Adamson (1981) observed variation in pre-school children. But recently there has been more research on acquisition of socially structured variation based on data of pre-school children. As stated in Weinreich, Labov and Herzog 1968, language variation is part of the linguistic system, and knowledge of variation must be part of the individual's grammar. Hence, acquisition of variable patterns is part of the process of language acquisition (Chambers 1995, Labov 1989, Roberts and Labov 1995, Foulkes, Docherty, and Watt 2005, Kerswill 1996, Smith et al. 2009, Diaz-Campos 2011, among others).

It is assumed that variation is representational as stated in usage-based models (Bybee 2001, Pierrehumbert 1999, 2003). The storage of linguistic forms is not an unanalyzed list of words, but a network of lexical connections based on similarities of sound and meaning. The stored lexical items contain all the redundant acoustic information related to the speaker's experience to produce and process words in different linguistic and social contexts. Thus, all the variants related to a word are stored in the lexicon and are represented on different levels. According to Foulkes and Docherty (2006:426), sociophonetic variation is better captured in exemplar models (Goldinger 1997, Johnson 1997, Pierrehumbert 2001, Pisoni 1997). Since the acoustic detail in lexical representation contains all aspects of the speaker's voice, exemplars also encode non-linguistic aspects indexed in speech such as sex, age, etc.

Studies on language acquisition have demonstrated a close relationship between lexical and phonological development. Ferguson and Farwell (1975:36) first observed that "a phonic core of remembered lexical items and the articulations that produce them is the foundation of individual's phonology." In other words, children must know enough different words in order to abstract structural categories away from individual words. Studies on language acquisition have also provided evidence that lexical representations change in the course of acquisition due to child exposure to the input and the acquisition of new lexical items. Children start with a holistic representation of the sound properties of words (Hallé and Boysson-Bardier 1996, Vihman and Velleman 2000) and, as the lexicon increases and new vocal motor schemes are acquired, children's phonology emerges (Vihman and Kunnari 2006) and patterns of properties of words become part of representation.

Considering the constant reorganization of the lexicon in expansion, differences in frequency distributions of sociophonetic variants in child production across age levels can be seen as reflexes of the way the variants are being stored or the way the word-forms are being modified in order to conform to the sociolinguistic environment in which the child is embedded. In addition, since variants are competing phonetic forms of the same word and, in some cases, they also reflect competing phonological patterns, it is reasonable to assume that sociophonetic variation plays a role in modeling abstract phonological patterns. According to Docherty and Foulkes (2000) there is no reason to establish a dichotomy between acquisition of socially structured variation and conditioned phonological variation. In the process of acquisition, children are not only acquiring knowledge about lexical contrast but they are also acquiring the production mechanisms that make them members of a given speech community.

This paper focuses on the emergence of complex syllables with coda consonant (r) by chil-

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dren in the speech community of Rio de Janeiro, Brazil.¹ The phonetic variants range from an alveolar trill to a laryngeal fricative which alternate with the absence of the coda. Acquisition of words containing complex syllabic types implies the diminishment or abandonment of a CV pattern, but what happens when the competing variable forms alternate between different syllable shapes? Children acquiring Brazilian Portuguese in the speech community of Rio face a variable input that must be acquired as part of the linguistic knowledge they are abstracting.

In relation to the status of variation in the grammar, it is assumed, as mentioned above, that the variants can be viewed as part of the representation of the word in the lexicon, which is conceived as a cloud of instances based on children's experience in hearing and producing variably the lexical items that contain a coda (r). The observed distribution for each variant across ages can be related to developmental stages and to the acquisition of variable patterns as well.

2 The Sociolinguistic Variable

Several studies about coda (r) in Brazilian Portuguese were developed under the standard procedures of Labovian sociolinguistics and consider variation a process, although the studies differ in the way they conceive the variable process. These studies have shown that the absence of internal coda (r) is less frequent than when the coda is word final.

Votre (1978) posited a retention rule whereas Callou, Moraes, and Leite (1997) and da Hora and Monaretto (2003) treated it as a case of (r) deletion. The studies analyzed internal codas such as *cerveja* ~ *ceØveja* 'beer', and final codas such as *beber* ~ *bebeØ* 'to drink' and *amor* ~ *amoØ* 'love', separately. All final codas were grouped regardless of their grammatical class. In Votre's research about the speech community of Rio de Janeiro, retention of (r) is favored when the following context is a vowel, while pause disfavors retention more than consonants. The word's size also constrains the process in such a way that retention is slightly favored in monosyllables.

Oliveira (1981, 1983) was the first to propose that in Brazilian Portuguese final verb codas (infinitives like *cantar* 'to sing' and some inflected forms like *quer* 'she or he wants'), internal codas (*morfologia* 'morphology', *perceber* 'to perceive'), and final noun codas (*mar* 'sea') should be treated as different processes due to the almost categorical absence of (r) among verbs in data collected from a sample of the speech community of Belo Horizonte, the capital of the state of Minas Gerais. According to Oliveira, (r) absence in word final position in verbal forms is not the result of a deletion rule, since its almost categorical absence points to a stage of completion of a change. As a consequence the underlying forms of verbs must be treated as not having an underlying coda. Realized final verb codas are cases of an insertion rule controlled by the following segment and speech style. On the other hand, Oliveira proposed a deletion rule that handles (r) deletion in medial and final noun codas constrained by following context, preceding vowel and syllable stress. Oliveira's results for following context replicated Votre's results: vowels tend to favor the coda (r) whether the process is considered a retention or a deletion rule.

Callou (1987) detected a change toward the lenition of the coda (r) among university speakers in the speech community of Rio de Janeiro (NURC Sample – 1970). The tendency is the replacement of a uvular vibrant by several types of articulations, ranging from an alveolar tap to velar/glottal fricatives. The phonetic variants alternate with the absence of coda. Callou (2008) revised Callou 1987 and adopted Oliveira's proposal of analyzing final verb codas separately. She observed that coda (r) is more frequent when the syllable is verb final (81%) among university speakers, followed by noun final codas (43%) and internal codas (3%). Among elementary and high school speakers verb final codas are almost categorically absent (Censo Sample – 1980).

It seems that Oliveira's treatment of variation is the most adequate to handle the variable use of coda (r) in Brazilian Portuguese. Thus, the analysis of acquisition data also took into account the morphological class of the lexical item, separating final verb coda from the other types. We also decided to analyze internal codas separately from final noun codas since studies about the acquisition of codas in Brazilian Portuguese indicate that internal codas are acquired later than final codas (Mezzomo 2004).

¹This case study is part of a broader project focusing on the acquisition of sociolinguistic variables by children in the speech community of Rio de Janeiro.

3 Results

Data were collected from the AQUIVAR/PEUL/UFRJ sample, designed specifically to study the acquisition of sociolinguistic variation in the speech community of Rio de Janeiro. AQUIVAR is a cross-sectional sample of thirty-six typically-developing children from high and low middle classes, distributed between 1;9 to 5;2 years old. Interviews were conducted by an observer in the presence of the primary caregiver or in kindergarten. Figures, toys, and children's books were used to elicit conversation. This study is based on a subsample of eleven children (Table 1) distributed in age levels, with ages ranging from 2;1 to 5;0, but not by gender or social class, as there is no stigma associated with the absence of coda (r). Goldvarb X was used for statistical analysis. Although there is a range of different phonetic variants for coda (r) in Rio, the dependent variable represents the absence versus the presence of the coda, with presence as the application value.

Children	Age
E.	2;1
C.	2;6
A./ I.	3;0
B./ M.	3;3
G.	3;6
R.	3;10
J.	4;5
L./ T.	5;0

Table 1: List of children.

Data were grouped according to the proximity of ages—E. and C. (2;1, 2;6); A., B., I., and M. (3;0, 3;3); G. and R. (3;6, 3;10); J., L., and T. (4;5, 5;0)—although individual differences were considered in the analysis.

The tokens were grouped according to the position of the syllable in the word and grammatical class. In other words, we examined three groups of codas: verb final, noun final, and medial codas. We obtained 169 tokens of verb final codas. Table 2 shows the distribution of verb final codas across ages (infinitives such as *cantar* 'to sing', *brincar* 'to play', *escrever* 'to write', and the 3rd singular person of *querer* 'to want', *quer* 'she or he wants'). As can be seen, coda (r) is almost categorically absent in all ages. The few occurrences (12/169 or 7%) were produced by two children (M. 3;3 and T. 5;0) when they were singing or telling stories. For all the independent variables considered (following context, preceding vowel, size of the word in syllables, stress, sex, and age), coda (r) is almost categorically absent. In other words, there is no linguistic or social control of the remaining variation in verb final position. The children's behavior can be interpreted as a reflex of a final stage of change towards the loss of coda in verb final position in the speech community of Rio de Janeiro. Taking the usage-based approach, we propose that the central representation of infinitives and 3rd person of *querer* has a final stressed syllable with a long vowel without a coda, although instances with a coda can still be part of the word's exemplar in the lexicon.

Age groups	App/N	%
2;1, 2;6	0/16	0
3;0, 3;3	4/60	6.5
3;6, 3;10	0/20	0
4;5, 5;0	8/73	9.5

Table 2: Distribution of final verb coda by age group.

Although there were few occurrences of noun final codas (55 tokens), the data were submitted to a Goldvarb run and following context and age were chosen at step up. The results showed (Table 3) that vowels tend to favor the occurrence of the coda and that younger children produce

fewer noun final codas. The results for final codas can be due to the fact that in resyllabification, final codas followed by a vowel can retain the consonant that is produced as the onset of the following syllable. The behavior of the younger children might also reflect developmental characteristics not only related to the acquisition of this sociolinguistic variable but related to the acquisition of phonological patterns of words containing codas. Benayon (2010) observed the same behavior for young children (from 1;9 to 2;3 years old) in the acquisition of fricative codas in the speech community of Rio de Janeiro, using the same sample. The percentages observed for children 3;0 years old and up reproduce the ones observed for adults in the speech community (Callou 1997, 2008).

Following Context			
	App/N	%	R. Weight
Vowel	05/07	71	.72
Pause	17/42	40	.46
Age			
2;1, 2;6	01/10	10	.11
3;0, 3;3	05/10	50	.51
3;6, 3;10	06/08	75	.76
4;5, 5;0	16/27	59	.61

Table 3: Independent variables chosen by Goldvarb for final noun codas.

Finally, we obtained 234 tokens of medial codas. Table 4 presents the results for the chosen variables, word size and age.

Word Size			
	App/N	%	R. Weight
2 syllables	89/115	77	.57
3 syllables	73/94	78	.51
Up to 4 syll	14/25	56	.19
Age			
2;1, 2;6	06/24	25	.07
3;0, 3;3	51/71	72	.35
3;6, 3;10	28/44	64	.27
4;5, 5;0	91/95	96	.83

Table 4: Independent variables chosen by Goldvarb for medial codas.

Children aged 2;1 and 2;6 years old presented fewer occurrences of medial codas than observed for noun final codas, while the occurrence of medial coda increases substantially among older children, especially for 5-year-old children. These children reflect the pattern observed for adult speakers in the speech community (Callou 1987). These results indicate that medial coda (r) is the main representation for words such as *árvore* 'tree', *sorvete* 'ice cream', *jornal* 'newspaper'. Word size effect can be attributed to the acquisition of words by children and the emergence of phonology. As the vocabulary grows, bigger words become part of the mental lexicon that children are acquiring. It was observed that among the younger children, four syllable words are not frequent. We found *tartaruga* 'turtle', *colherzinha* 'little spoon', and *borboleta* 'butterfly' among the younger children, and also *mergulhando* 'diving', *carneirinho* 'diminutive of sheep' and *adormecida* 'sleepy' for children between 3;0 and 3;10.

Figure 1 summarizes the distribution of realized codas across ages and the three types of coda studied.

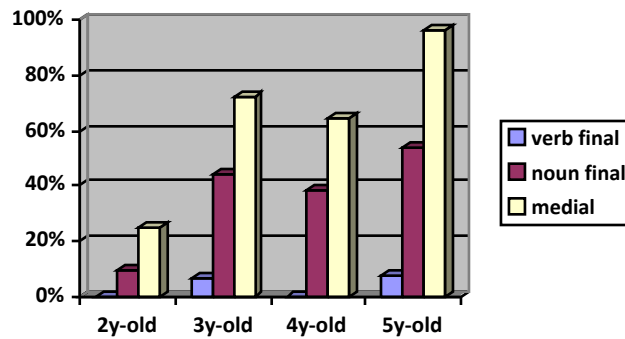


Figure 1: Distribution of the three types of coda across ages.

The distribution of frequencies according to age levels revealed that coda (r) is almost categorically absent in verb final position at all age levels, which can be taken as evidence that children are abstracting a CV pattern as the main representation of infinitives and the form *quer*. Although noun final codas increase with age, it is not clear that there is a tendency in the same direction observed for verb final coda. Finally, children's behavior for medial codas is more consistent with a CV (r) pattern as the central representation for all ages.

4 Conclusion

This study provided more evidence in favor of the incorporation of sociolinguistic variable patterns observed in the speech community in the study of language acquisition. It is necessary to consider variability in children's speech production in order to achieve full comprehension of the acquisition of phonological patterns of a language. Variation observed in child production during first language acquisition can be related to developmental aspects of acquisition and to the socially structured variation present in the input to which children are exposed as well.

It was demonstrated that children are not acquiring an invariable phonological pattern (CVC). On the contrary, they are incorporating distributions of tokens they encounter in their experience of hearing and producing words as a reflex of the sociolinguistic dynamics of the speech community to which they belong. The different distributions of the three types of coda across ages revealed that children are not abstracting away the same structural pattern for words that belong to different classes from the different phonetic possibilities of the word-forms.

The observed behavior of children for verb final codas can be seen as the end of a process of (r) lenition captured in the study of Callou (1987) for the speech community of Rio de Janeiro, the completion of a change. In the input provided by the speakers in the speech community there is no robust information regarding phonetic variants of final verb codas, thus its almost categorical absence and less systematic use in child speech.

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