[ˈpɾa.tʊ], [ˈpa.tʊ], [ˈpla.tʊ], [ˈpʳa.tʊ], [ˈpa.tɾʊ], [ˈpaɾ.tʊ]: Variable outputs for CCV syllables in the acquisition of Brazilian Portuguese

Andressa Toni (andressa.toni@usp.br)
University of São Paulo

This study explores the variable production patterns observed in the development course of CCV branching onsets (Consonant$_1$+Consonant$_2$+Vowel) in Brazilian Portuguese. Branching onsets are pointed as both articulatorily and phonologically complex for language acquisition, and although these syllables are fully developed only around 5 years old,[1] common words containing CCV may figure as targets in child speech even before 2 years old: *abre aqui* 'you open here'; *obrigado* 'thank you' (1;9 years old)[2]. Until CCV is fully acquired, branching onsets are often produced by repair strategies meant to modify the CCV structure, as in (1); or to modify the CCV segmental content, as in (2):

(1) ***gru**dei* 'I sticked': [**gu**ˈdej], [**gu**ɾˈdej], [**gu.ɾu**ˈdej], [**gu**.deˈɾej];
(2) ***gru**dado* 'It's sticked' [**glu**ˈda.dʊ]; ***cla**sse* 'classroom' [ˈ**kɾa**.sɪ]; ***tra**ve* 'goalpost' [ˈ**ta.vɾ**ɪ]

Both (1) and (2) repair patterns can co-occur with adult-like CCV productions in children's speech, either in longitudinal naturalistic data or in transversal experimental data.[2] Since these strategies are systematic within and across subjects and languages, Fikkert (2010)[3] raises two different accounts to analyze these variable patterns. In one view, children's variable outputs are due to unspecified stored lexical representations, which become more detailed as the child's grammar develops. In an alternative view, these repair strategies are reflecting adult-like stored lexical forms that are affected by articulatory constraints and by an underdeveloped phonological grammar that force correct inputs into the typical child repaired outputs. Considering these two possible accounts, the goal of the present study is to discuss whether children stored forms would have specified CCV clusters. Two clues were tested in a repetition task with 49 children between 2;4-5;10 years old:

(i) phonotactical clues: type and proportion of repair strategies for balanced CCV targets;

(ii) phonological clues: CCV palatalization. In Brazilian Portuguese, /t, d/ can be palatalized to [tʃ, dʒ] when in front of coronal high vowels [i, ɪ]. In child productions, the segmental context /t, d/ + [i, ɪ] can be generated when C_2 is deleted in CCV syllables like /tɾi, dɾi/. Applying the palatalization rule in these contexts would point to the adjacency of /t, d/ and [i, ɪ] in the child's stored word form, suggesting the phonological absence of C_2.

The corpus was organized into five groups based on the percentage of CCV adult-like productions, from G1 (0-5%) to G5 (76-100%). Results show that only subjects in G1 tended to modify the CCV structure as in (1); subjects from G2 to G5 tended to modify the segmental content of CCV as in (2) (cf. Table 1). G2 presented C_2 substitutions in both liquid directions in similar proportions (/l/→[ɾ]; /ɾ/→[l], cf. Table 2), suggesting that the segmental properties of the consonant in C_2 may be initially not fully specified. Palatalization was categorically applied by only one G1 child, while categorically blocked by most of the participants. However, 9 children from G1-G4 only partially blocked palatalization, which points to instabilities in CCV structural representation. These results point towards the unspecified nature of CCV syllables in child stored words, supporting Fikkert's account for an unspecified initial representation of the input. A pilot study testing CCV perception also points to underlying instabilities in both the identification of CCV/CV minimal pairs and the detection of CCV mispronunciations. In this pilot study, structural properties of CCV were discerned earlier than specific segmental properties of C_2 consonants, endorsing the observed in the production data (cf. (3)). Therefore, the present study supports the view that there are differences between the lexical representations of children and adults: the variability observed in child outputs can be due to the process of specification of the stored lexical representations. The specification process first addresses the structure of the syllables and then accounts for the segmental properties of the C_2 consonants in CCV branching onsets.

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[2] TONI, A (2017). Representação subjacente do ataque ramificado CCV na aquisição fonológica. Master's dissertation.

[3] FIKKERT, P. (2010). Developing representations and the emergence of phonology: evidence from perception and production. In: Fougeron; Kühnert; D'Imperio (ed.), Laboratory Phonology 10: Variation, Phonetic Detail and Phonological Representation, p.227-258.

Table 1: Percentage of repair strategies for each production group

		G1 (0-5%)	**G2** (6-40%)	**G3** (41-60%)	**G4** (61- 75%)	**G5** (76-100%)	**Example** target > repaired
Structural modifying	*C_2 deletion*	70.59%	26.76%	5.8%	10.8%	6.3%	brilho '*sparkle'* [**bri**.ʎʊ] > [ˈ**bi**.ʎʊ]
	Epenthesis	0.36%	20%	30.46%	26.16%	12.71%	Pluto '*Pluto'* [ˈ**plu**.tʊ] > [**pʊ**ˈ**lu**.tʊ]
	Metathesis	0.73%	2.35%	1.72%	0.43%	0%	Pluto '*Pluto'* [ˈ**plu**.tʊ] > [ˈ**pul**.tʊ]
Content modifying	*C_2 substitution*	9.9%	42.35%	39.65%	22.36%	19.49%	bruxa '*witch'* [ˈ**bru**.ʃɐ] > [ˈ**blu**.ʃɐ]
	Transposition	0.73%	3.9%	3.45%	4.27%	0%	trave '*goalpost'* [ˈ**tra**.vɪ] > [ˈ**ta**.v**ɾ**ɪ]
	Reciprocal Movement	0%	0%	0%	0.43%	1.7%	trigo '*wheat'* [ˈ**tɾ**i.gʊ] > [ˈ**gɾ**i.**t**ʊ]
	Palatalization	31.25%	24.5%	33.33%	10.92%	0%	'triste' *sad* [**tri**s.tʃɪ] > [ˈ**tʃi**s.tʃɪ]

Table 2: Direction of the C2 substitutions for each production group

	G1 (0-5%)	**G2** (6-40%)	**G3** (41-60%)	**G4** (61- 75%)	**G5** (76-100%)	**Example** target > repaired
/l/→ [ɾ]	11.11%	47.23%	81.69%	64.15%	65.22%	'classe' *class* [ˈ**kla**.sɪ] > [ˈ**kɾa**.sɪ]
/l/→ glide	48.15%	4.64%	2.82%	0%	17.39%	'Blico' *Blico* [ˈ**bli**.kʊ] > [ˈ**bʷi**.kʊ]
/ɾ/→ [l]	25.93%	46.28%	5.63%	30.19%	17.39%	'bravo' *angry* [ˈ**bɾa**.vʊ] > [ˈ**bla**.vʊ]
/ɾ/→ glide	14.81%	1.85%	9.86%	5.66%	0%	'Draco' *Draco* [ˈ**dɾa**.kʊ] > [ˈ**dʲa**.kʊ]

(3) The pilot study tested the detection of minimal pairs and mispronunciations for CCV syllables turned into CV ([ˈpɾa.tʊ] > [ˈpa.tʊ]); CCV turned into CVC ([ˈpɾa.tʊ] > [ˈpaɾ.tʊ]); C/l/V turned into C[ɾ]V ([ˈpla.kɐ] > [ˈpɾa.kɐ]; and C/ɾ/V turned into C[l]V ([ˈpɾa.tʊ] > [ˈpla.tʊ]). Preliminary results show that children between 2 and 3 years old could not distinguish when CCV was mispronounced as CV, but could distinguish when it was mispronounced as CVC; children up to 4 years old could not distinguish when the liquids /l, ɾ/ were interchanged in CCV, but could distinguish them when in CV structures (to appear).