Prosodic prominence versus frequency effects on the acquisition of CCV branching onsets in Brazilian Portuguese

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Terken & Hermes (2000)[1] describe the quality of "being prominent" roughly as "standing out from the environment". In this study, we compare the effects of two different ways of standing out from a linguistic environment – a qualitative way, by prosody (via stress); and a quantitative way, by frequency (via number of occurrences). The comparison is addressed by observing the effects of prosodic prominence and frequency prominence on the development course of CCV branching onsets ($Consonant_1$+$Consonant_2$+Vowel) in Brazilian Portuguese (BP). In this language, most occurrences of CCV syllables are unstressed: the dictionary corpus of Viaro & Guimarães-Filho (2007)[2] presents 27,767 CCV syllables, from which 70.85% are pretonic, 10.68% are post-tonic and 18.47% are stressed. Following the same pattern, the speech corpus of Mendes (2013)[3] presents 44.25% pretonic CCV syllables, 26.56% post-tonic and less than 30% stressed CCV occurrences. The distribution on these two corpora points to opposite prominence patterns towards CCV: prosodically prominent CCV syllables are not the most frequent, quantitatively prominent occurrences of CCV. Our goal is to observe which (if any) of those prominence patterns can be reflected on the acquisition of branching onsets in BP. Branching onsets are pointed as both articulatorily and phonologically challenging for the child, being fully developed only by 5 years old[4] – although common words containing CCV syllables may figure as targets in child speech even before 2 years old[4]. Until CCV is fully acquired, branching onsets are often produced by repair strategies meant to simplify the CCV structure to CV, as in (1); or to modify the segmental content and structure of CCV, as in (2):

(1) /**gɾu**dej/ 'I sticked' → [**gu**ˈdej], [**gu.ɾu**ˈdej], [**gu**.deˈ**ɾej**]

(2) /**gɾu**dej/ 'I sticked' → [**guɾ**ˈdej]; /**gɾu**dado/ 'It's sticked' → [**glu**ˈda.dʊ]

By analyzing the frequency and stress patterns of CCV targets in child productions, we aim to observe if stressed CCV syllables (most prosodic prominent context) or pretonic CCV syllables (most frequent, quantitatively prominent context) would present higher rates of adult-like productions. We also aim to observe if different stress contexts are more likely to present different repair strategies (as in (1) or (2)). Longitudinal data from 3 children was verified with Praat and CCV productions were categorized into *Target-like*, *CCV>CV Simplification* (as in (1)) and *Other repairs* (as in (2)). Stress patterns were extracted with the FreP tool[5]. Results show that, in general, most target-like CCV syllables produced by the child are stressed, closely followed by pretonics – as well as simplified CCV>CV occurrences and other CCV repairs (cf. Table 2). This is due to the stress distribution of child CCV targets: children's productions are more equally distributed regarding lexical stress, with a difference of less than 10% stressed syllables over pretonic syllables – in comparison, the Dictionary corpus had a difference of 50 percentual points between stressed and pretonic CCV syllables, favoring pretonics. However, when compared to the Child Directed Speech of their caretakers, children's CCV targets have similar stress distributions to adult's CCV syllables (cf. Table 1). By analyzing the proportion of target-like, CCV>CV simplifications and other repair strategies on the total of stressed, pretonic and post-tonic CCV syllables (cf. Table 3), we observe that around the age of CCV acquisition, at 5;0 years old, children present 74% of target-like CCV syllables on the stressed context, while no more than 50% is presented on pretonic and post-tonic contexts. No difference related to stress is observed regarding repair strategies: CCV>CV simplification is favored on the three stress conditions. The results on Tables 1, 2 and 3 indicate that prosodic prominence stands out more than quantitative prominence on language acquisition data: frequency and stress point towards the same direction on child speech and child directed speech, and stressed CCV syllables are more likely to present target-like productions after age 5;0 compared to unstressed branching onsets.

Table 1: Distribution of CCV syllables in Brazilian Portuguese adult corpora					
Data	*Total Words*	*Total CCV*	*% stressed CCV*	*% pretonic CCV*	*% post-tonic CCV*
Dictionary[2]	150,875	27,767	18.47%	70.85%	10.68%
Speech corpus[3]	363,848	30,114	29.19%	44.25%	26.56%
Child Directed Speech[4]	-	12,799	45.63%	28.96%	25.41%
Child speech[4]	-	4,266	40.6%	33.45%	25.95%

Table 2: CCV syllables in child speech: by type of production										
Age range	*Target-like CCVs*			*CCV>CV Simplification*			*Other repairs*			*Total CCV per age*
	Pretonic	*Stressed*	*Post-tonic*	*Pretonic*	*Stressed*	*Post-tonic*	*Pretonic*	*Stressed*	*Post-tonic*	
<2;0	10	90	0	8.70	65.22	26.09	66.67	33.33	0	104
2-2;11	25	25	50	22.40	45.12	32.48	18.75	68.75	12.5	1017
3-3;11	37.58	41.61	20.81	35.46	39.92	24.63	46.15	40.66	13.19	1,653
4-4;11	49.83	38.87	11.30	38.08	34.17	27.75	37.50	45.83	16.67	1042
5-5;6	30.38	46.15	23.46	41.21	23.03	35.76	45.83	16.67	37.50	449
All ages	39.48	42.49	18.03	31.79	40.06	28.15	40.23	43.10	16.67	4,266

Table 3: CCV syllables in child speech: by stress										
Age range	*Total CCV*	*% stressed CCV*			*% pretonic CCV*			*% post-tonic CCV*		
		Target-like	*CCV>CV*	*Others*	*Target-like*	*CCV>CV*	*Others*	*Target-like*	*CCV>CV*	*Others*
<2 ;0	104	12.86	85.71	1.43	9.09	72.73	18.18	0	100	0
2;0-2;11	1,017	0.65	94.61	4.74	1.32	96.03	2.64	1.84	96.93	1.23
3;0-3;11	1,653	9.35	85.07	5.58	9.35	83.64	7.01	7.93	89	3.07
4;0-4;11	1,042	31.37	65.68	2.95	34.72	63.19	2.08	14.35	83.97	1.69
5;0-5;6	449	74.07	23.46	2.47	50	43.04	6.96	47.29	45.74	6.98
All ages	4,266	17.96	77.71	4.33	20.25	74.84	4.90	11.92	85.46	2.62
Total		**1,732**			**1,427**			**1,107**		

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