

Structure-conditioned production and perception of liquids on the phonological development of Brazilian Portuguese-speaking children

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This study investigates the role of syllable structure on the production and perception of liquid consonants by children learning Brazilian Portuguese (BP) as their first language. We point out that the lateral liquid /l/ and the tap /ɾ/ could be non-contrastive depending on the syllable development of the child (i.e., whether a syllable structure is productive or not in the child phonological system). In BP, both /l, ɾ/ liquids are fully developed around 3-4 years old in simple CV syllables, but only after 5 years old in branching CCV syllables.¹ Despite their late acquisition, common words containing /l, ɾ/ in simple and branching onsets may figure as targets in child speech even before 2 years old, in words like /lɛgo/ ‘Lego’; /suʒɛra/ ‘dirt’; /pluto/ ‘Pluto’; /triste/ ‘sad’. Previous studies^{2,3} showed that in order to produce these targets, children commonly modify the segmental quality of the liquids in CCV contexts, producing C/ɾ/V as C[l]V (/bruʃa/ as [‘blu.ʃɐ] ‘witch’) or C/l/V as C[r]V (/bluza/ as [‘bru.za] ‘shirt’), also deleting the liquid to produce CCV as CV (/prato/ as [‘pa.to] ‘plate’; /plaka/ as [‘pa.kɛ] ‘sign’). In CV contexts, only /ɾ/ to [l] changes are usually observed (‘barata’ as [ba‘la.tɐ] ‘cockroach’). We raise two hypotheses to account for this liquid switch: i) children’s CCV outputs are due to an underspecified representation^{3,4} of the liquids, which becomes more detailed as the Phonology develops; or ii) liquid switches reflect adult-like representations that are affected by performance constraints. No previous study in BP examined the production and the perception of /l, ɾ/ in the same children’s data, nor compared the liquid behavior in both CCV and CV syllable contexts for the same children. We conducted a word-repetition and a mispronunciation detection tasks testing i) if liquid switches would be tolerated in speech perception similarly as in speech production; ii) if both CV and CCV contexts would equally tolerate the liquid switch; and iii) if both switch directions (/l/→[r]; /ɾ/→[l]) would be equally detected by the child. Participants (2;11 to 5;11 years old) were divided into three groups based on their CCV production pattern: children who consistently produced target-like CCV syllables (TargetCCV_{Group}); children who consistently switched the liquid consonants in CCV (SwitchCCV_{Group}); and children who consistently deleted the liquid consonants in CCV (DeletionCCV_{Group}). Results show that the control TargetCCV_{Group} can productively detect mispronunciations in both CV and CCV contexts and in both liquid directions, as expected. In DeletionCCV_{Group}, liquid mispronunciations in CCV were accepted as correct outputs of the target at a random level; CV contexts had their segmental substitutions detected in only 30% of the time, regardless the direction of the mispronunciations. These results point out that children who could not productively articulate the liquids in both CCV and CV contexts also could not detect liquid switches in these syllables. In SwitchCCV_{Group} an asymmetry is observed between CV and CCV production and perception: liquid switches were productively produced and detected in CV syllables, but not on CCV. Asymmetric patterns are also observed in the liquid mispronunciation direction: while 57% of the C/ɾ/V→C[l]V were detected as mispronounced, 70% of the C/l/V→C[r]V were considered acceptable outputs of the target, not being detected as a mispronunciation. Therefore, SwitchCCV_{Group} results show that the same consonants can be detected as mispronounced in simple onsets, but not in branching onsets; and that different mispronunciation directions have different detection rates, as /tap/→[lateral] mispronunciations were detected significantly more than /lateral/→[tap] in CCV. Similar asymmetric production and perception patterns were discussed by Fikkert and colleagues for coronal stops in Dutch^{3,4}. Following these authors, we argue that in SwitchCCV_{Group} the liquids occupying CCV syllables are not fully specified in the phonological representation of words due to the incomplete acquisition of the branching onset structure. This underspecification leads to no contrast between /l/ and /ɾ/ both in production and perception tasks. On the other hand, the same /l, ɾ/ consonants are already fully specified on simple onsets, leading to productive CV articulation and mispronunciation detection in this group. The asymmetry between /l/ and /ɾ/ is accounted for by assuming the lateral /l/ as the default liquid segment, which matches the general pattern observed in Hernandorena & Lamprecht (1997)⁴ in a naturalistic, longitudinal study: /l/ can replace not only the tap, but also all other liquids in the language (such as the palatal /ʎ/ and the archiphoneme /R/). By assuming /l/ as the default liquid segment on the phonological development of the child, we can predict a higher detection proportion on the /tap/→[lateral] substitutions (non-default→default), as it would cause an information

mismatch between the input and the underlying representation of the word; however, no information mismatch would occur on /lateral/→[tap] substitutions (default→non-default), explaining the low detection rate of this mispronunciation context. Given these results, we point out that lateral-tap variability is tied to the process of specification of the segmental properties on lexical representations and to the phonotatic development of the child. Finally, regarding the difference between the detection pattern of SwitchCCV_{Group} and DeletionCCV_{Group} (as both present underdeveloped CCV structures but different detection patterns), ongoing tests preliminarily show that CCV→CV substitutions are also not detected as mispronunciations by the latter group, pointing that maybe children initially does not categorize CV and CCV as different structures – and if children do not acknowledge the presence of the liquids in CCV compared to CV, they consequently would not present different /l/→[ɾ]; /r/→[l] detection patterns on those syllables.

References:

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