

# How Prosodic Structure Influences the Emergence of Phonological Processes in Child Language Development

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Non-linear approaches to phonology have brought a useful understanding to systematic child speech behaviours, while child phonology has contributed evidence concerning the underpinnings of phonological systems and how they manifest themselves across stages of development (Kager et al. 2004). In this paper, we explore a series of phonological contexts in the productions of Amahl, a child language learner of English (Smith 1973), also considering aspects of his phonological development at the level of prosody (syllable structure and word stress). Focusing on his development of speech sounds and sound combinations, we highlight the types of segmental units that Amahl produces during early stages of development, and show how he adapts his pronunciation of these units across different prosodic environments.

We focus in particular on the acquisition of the fricatives /f,v/ and approximant /l/ in singleton onsets and fricative-/l/ onset clusters. The labio-dental fricatives exhibit two main patterns before the mastery stage. Contrary to canonical positional stopping in English, which generally occurs in syllable onsets but not codas (Stoel-Gammon 1996; McAllister Byun 2011), both gliding and stopping happen concurrently, in a prosodically-conditioned way: as shown in (1a-c) below, gliding is the predominant pattern in stressed onsets, while stopping happens in word-medial unstressed onsets and codas. In the first stage of /l/ acquisition, Amahl’s production patterns, illustrated in (2a-b), include deletion and gliding. Considering /fl/ clusters across four time periods, the dominant pattern in the first stage is complete cluster deletion. In the second stage, deletions decrease in favour of cluster reduction, preserving /l/ but deleting /f/. In the third stage, Amahl fuses the fricative manner of /f/ and coronal place of /l/ into the coronal fricative /ʃ/, shown in (3). Finally, Amahl articulates the two segments faithfully in the fourth stage. We also note similarities between the development of /fl/ and /sl/ clusters, despite their syllabic structural differences (Spencer 1986; Goad & Rose 2004). This description is qualitative for clarity purposes; we provide the relevant quantitative data as part of our presentation, including in all contexts where variability is observed.

We formalize our observations using the A-map model, within which patterns of phonological development can be analyzed as phonologically determined, acoustic-articulatory mappings of perceptual categories identified by the learner (McAllister Byun, Inkelas & Rose 2016), with emphasis on place and manner of articulation as independent phonetic dimensions to be acquired. This is implemented within Harmonic Grammar (Smolensky & Legendre 2006), a theory of non-linear computation in which a harmonic mapping is maintained between possible output candidates and input dimensions are evaluated through a weighted set of constraints. In singleton onsets, in line with the tenets of the A-map, we hypothesize that the child’s productions result from two pressures: being segmentally accurate, and articulatorily reliable. Building on Goad & Rose’s work (2004), we hypothesize that during the fusion stage, Amahl did not have the syllable structure to license both positions in the onset clusters. Through fusion, he arrived at a harmonic mapping of the phonetic information despite limitations in syllable structure.

Table 1: Phonological patterns in Amahl’s speech

	<b>Process</b>	<b>Orthography</b>	<b>Target</b>	<b>Actual</b>	<b>Prosodic Position</b>	<b>Age</b>
(1) /f/	a) gliding	finger	[ˈfɪŋgə]	[ˈwɪŋə]	stressed onset	2;02.02
	b) stopping	careful	[ˈke:fəl]	[ˈkeptu]	unstressed onset	2;06.17
	c) stopping	after	[ˈa:ftə]	[ˈa:ptə]	coda	2;04.14
(2) /l/	a) deletion	lollipop	[ˈlɒli: pɒp]	[ˈɔli:]	stressed onset	2;02.02
	b) gliding	label	[ˈleɪbəl]	[ˈwe:bu]	stressed onset	2;04.14
(3) /fl/	cluster fusion	flower	[ˈflæwə]	[ˈlæwə]	stressed onset	2;08.18
(4) /sl/	cluster fusion	slicer	[ˈslaisə]	[ˈlaisə]	stressed onset	3;01.14

## References

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