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Place Specification and Segmental Distribution in the Acquisition of Word-Final Consonant Syllabification

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1. INTRODUCTION

Much of the evidence currently available from first language acquisition provides support for the role that Universal Grammar (UG) plays in constraining the child's representations. From a markedness perspective, in each context where more than one option is available in UG, only one of these options must be considered as unmarked, which is predicted to be selected by the child, unless positive evidence leads him/her to posit more marked options (e.g., Chomsky 1981). In the field of prosodic phonology, Piggott (1999) proposes that word-final consonants can be syllabified in two different ways, namely, as word-final codas (tautosyllabic with the preceding vowel), or as onsets of word-final syllables containing an empty nucleus (e.g., Kaye, Lowenstamm, and Vergnaud 1990). Given that, according to Piggott's (1999) proposal, two options are available across languages, one of these options should be considered as unmarked. This unmarked option will be the first to be entertained by the learner of a language with word-final consonants. Access to the alternative, more marked option will be possible only in the face of

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positive evidence. This approach to markedness thus appears to set the stage for a fairly straightforward investigation of the acquisition of word-final consonant syllabification across languages.

In this article, I discuss data that suggest that the situation might actually be more complex. I propose a bootstrapping approach to syllabification whereby the childa refers to segmental representation to select among the two word-final consonant syllabification options offered by UG. Focussing mainly on the syllabification of word-final consonants in the acquisition of Québec French (Rose 2000), I argue that, in fact, both syllabifications (word-final coda and word-final onset) can be considered as default, depending on the segmental representation of word-final consonants. In a nutshell, I propose that, in the unmarked case, consonants with an underlying place specification (Labial, Dorsal, as well as Coronal) must be syllabified word-finally as onsets, while consonants which are permanently placeless, that is, those which have no place features in underlying and surface representations, must be syllabified as true codas.[1]

I also propose that segmental place specification alone is not enough to determine word-final syllabification. I argue that distributional evidence plays a role in languages which have segmental restrictions in word-final position. For example, in Spanish, coronal consonants enjoy a distributional freedom in word-final position which other segments (labials, velars) do not. By virtue of being distributionally unmarked, and even if they are specified for a place feature, coronals in Spanish are predicted to be syllabified word-finally as codas, rather than as onsets, in the adult (end-state) grammar. While this analysis does not represent the default option (as place-specified consonants should, in the unmarked case, be syllabified word-finally as onsets), Spanish learners arrive at this analysis based on the distributional evidence they are exposed to.

This proposal challenges a significant body of literature on underspecification according to which coronal consonants are placeless in underlying representations (see, e.g., the contributions to Paradis and Prunet 1991). Indeed, the current proposal requires that coronals be represented with a Coronal place feature in French, as well as in Spanish. However, because coronals are distributionally similar to other, labial and velar consonants in French, while they enjoy greater distributional freedom than labials and velars in Spanish, they are predicted to behave differently in the two languages. This view, which will be supported through evidence from the acquisition of these two languages, implies that segmental unmarkedness does not arise from default settings in UG but, rather, as effects of the learner's analysis of properties of the target language. This raises the possibility that the concept

[1] The focus of this article is on the relation between place feature specification and word-final syllabification. In order to attain a complete characterization of the facts, however, other features (e.g., for voicing and sonority) should also be taken into consideration. In addition, as briefly discussed in section 6, non-representational factors such as distributional evidence also appear to play a role. A comprehensive study of how these factors interact, which extends well beyond the scope of this article, is left for further research.

of "temporary" underspecification, whereby underlyingly placeless segments are specified at the phonetic level through some feature-filling process (e.g., $\emptyset \rightarrow$ Coronal), may not apply in all cases, if ever.

The article is organized as follows. In section 2, I introduce the relevant data on the acquisition of [ʁ] by Clara and Théo, two first language learners of Québec French. As we will see, while Théo's [ʁ] was acquired in word-final position at the same time as every other target word-final consonant, Clara's [ʁ] displayed exceptional behaviour: it was acquired in word-final position several months after all of the other word-final consonants, at the same time as word-medial codas. In order to explain the difference between Clara's and Théo's developmental paths, in section 3, I survey recent proposals about the syllabification of word-final consonants across adult languages (Piggott 1999), and in phonological acquisition (Goad and Brannen 2003). Building on these works, I elaborate the current proposal, in section 4. I hypothesize that default word-final syllabification depends on segmental place specification such that, in the unmarked case, place-specified consonants must be syllabified as word-final onsets, while word-final (permanently) placeless consonants must be syllabified as true codas. Evidence in support of this proposal is provided in section 5. The evidence comes from the segmental behaviour of Clara's and Théo's [ʁ] in (non-word-final) onsets. Additional support is provided from the acquisition of Japanese codas (Ota 1999). Finally, the proposal will be discussed in light of Kehoe and Lleó's (2003) recent findings on the acquisition of syllable structure in German and Spanish, in section 6. While the German data will be incorporated as support for the general approach developed in this article, the Spanish evidence will require more discussion. As we will see, the Spanish data suggest that, in addition to evidence from segmental structure, distributional evidence from segmentally restricted syllabic positions appears to play a role in the acquisition of syllable structure. This suggests that an account of the variation found across learners both within and across languages ultimately requires a look at the interaction between a number of factors. A general summary and discussion are offered in section 7.

2. Variation in the Acquisition of Québec French [ʁ]

For all intents and purposes, Clara and Théo are acquiring the same dialect of Québec French. In this section, I describe some salient characteristics of this dialect as compared with European French. This comparison will offer an explanation for some phonetic properties found in the transcribed data below which are not found in most dialects of European French usually described in the literature, even if they are ubiquitous in Québec French.

Focussing on consonants, the phonemic inventory of Québec French, which is identical to European French, is provided in (1).

(1) French consonantal inventory (Casagrande 1984):

	Labial	Coronal		Dorsal	Uvular
		+ant	-ant		
Stops	p, b	t, d		k, g	
Fricatives	f, v	s, z	ʃ, ʒ		
Nasals	m	n	ɲ		
Liquids		l		ʁ	

However, Québec and European French differ in some assimilatory behaviour and the shape of right-edge clusters. First, in Québec French, the coronal stops (/t, d/) are affricated ([t͡s, d͡z]) before high front vocoids ([i, y, j, ɥ]; e.g., *petit* /pəti/ → [pət͡si] 'small'). This allophonic variation does not occur in the European dialects usually described in the literature (e.g., Casagrande 1984) nor in the general reference works on French.

Second, word-final obstruent-liquid clusters tend to be reduced to obstruents in Québec French (e.g., *cadre* [kɑd], *[kɑdʁ] 'frame'). The word-final [ʁ] deletion found in this context contrasts with European French, in which these clusters are usually fully realized ([kɑdʁ]). In some southern dialects of European French, word-final consonants, as well as falling- and rising-sonority clusters are typically followed by schwa (e.g., *raquette* [ʁaˈkɛt(ə)] 'racket'; *ferme* [fɛʁm(ə)] 'farm'; *perdre* [pɛʁdʁ(ə)] '(to) lose'). Optional schwa epenthesis is generally not found in Québec French, apart from situations where each syllable of a word is pronounced in isolation or otherwise emphasized.

Finally, in contexts where the consonant [ʁ] is preceded by a voiceless obstruent in branching onsets, it is realized as voiceless, phonetically identical to a voiceless uvular fricative and, at times, to a voiceless velar fricative (e.g., *trop* /tʁo/ → [tʁ̥o] ~ [tχo] ~ [txo] 'too much'). As will be discussed in section 5.5, this fact is relevant to Théo's analysis of this segment.

2.1. Data gathering and compilation

The data on Clara and Théo were recorded on analogue audio tapes in their homes, in a naturalistic setting, mainly while the children were looking at picture books or playing with toys. The collection of Clara's data started when she was 1;00,28 and ended when she was 2;07,19. During this period, 34 recording sessions took place. The data collection for Théo covers ages 1;10,27 to 4;00,00, a period during which 45 recordings were made.

The audio tapes were digitized and later imported into *ChildPhon* (Rose 2003), a computerized database specifically designed for data transcription and coding.[2]

[2]More details about *ChildPhon* can be found at:
`http://www.ucs.mun.ca/~yrose/ChildPhon.html` or on the *CHILDES* web site at: `http://childes.psy.cmu.edu/`.

All tokens were phonetically transcribed by a trained linguist and subsequently verified by at least one independent transcriber. All of the transcribers involved in this study were native speakers of the target language. In cases when the transcribers were in disagreement on some aspect of a given transcription, the point of contention was discussed and additional verifications were performed until agreement was reached.

In the next sections, I describe the behaviour of [ʁ] in Clara's and Théo's production data. In the description of these data, a structure is deemed acquired when it is present in approximately 80% of the child's attempts at this structure in a given recording session.

2.2. Clara's [ʁ]

Looking first at the data from the development of Clara's [ʁ], the central observation is that this consonant differs from all of the other consonants concerning the stage at which it was acquired in word-final position. As we can see in the data in (2), at the first stage in the acquisition of word-final consonants, all consonant types were acquired, with the exception of [ʁ].

(2) Stage 1: Acquisition of word-final consonants except [ʁ]

Orthography	Target form	Child output	Age	Gloss
botte	[bɔt]	[b̥ʌtʰ]	1;07,06	'boot'
banane	[baˈnan]	[məˈnæn]	1;07,06	'banana'
bol	[bɔl]	[pɔl]	1;07,27	'bowl'
livre	[liv]	[lɪɸ]	1;07,27	'book'
bus	[bʏs]	[bʊs]	1;10,04	'bus'

During the same developmental stage, target word-final [ʁ] underwent deletion, with lengthening of the word-final vowel, as exemplified in (3). While lengthening of the vowel preceding the deleted [ʁ] could be considered phonological (as a result of compensatory lengthening; see, e.g., Ota 1999 for evidence of compensatory lengthening in the acquisition of Japanese), this hypothesis cannot be conclusively verified, as word-final vowels, which systematically bear stress in French, are phonetically longer than unstressed vowels, especially when they are followed by sonorant consonants.

(3) Stage 1: Word-final [ʁ] deletion and V lengthening

Orthography	Target form	Child output	Age	Gloss
sorcière	[sɔʁˈsjɛʁ]	[sɔˈsjæː]	1;07,06	'witch'
canard	[kaˈnɑʁ]	[næˈnæː]	1;07,27	'duck'
Babar	[baˈbɑʁ]	[bɑˈbɑː]	1;09,29	'Babar'
encore	[ɑ̃ˈkɔʁ]	[ɛˈkɔː]	1;11,21	'again'
dehors	[dəˈɔʁ]	[dæˈɔː]	2;01,05	'outside'

Acoustic measurement of the word-final vowels in Clara's corpus during this stage of acquisition would help determine the actual status of the lengthening

exemplified in (3). This issue, however, lies beyond the scope of this article and should not detract us from the central observation that word-final [ʁ] consistently underwent deletion, as opposed to all of the other target final consonants, which were faithfully realized at this stage of acquisition, in spite of some variation in their phonetic renditions.

Important as well is the fact that, during the same developmental stage, word-medial codas also systematically underwent deletion in Clara's productions. This pattern is exemplified in (4).

(4) Stage 1: Word-medial coda deletion (until 2;03,05)

Orthography	Target form	Child output	Age	Gloss
Gaspard	[gasˈpɑʁ]	[pəˈpæː]	1;04,14	'Gaspard'
casquette	[kasˈkɛt]	[kæˈkɛt]	1;11,21	'cap'
fourchette	[fʊʁˈʃɛt]	[ɸeˈdɛtʰ]	1;09,01	'fork'
Charlotte	[ʃaʁˈlɔt]	[sæˈlɔtʰ]	2;01,05	'Charlotte'
ourson	[ʊʁˈsɔ̃]	[ʊˈsɔ̃]	2;03,05	'teddy bear'

It is only at Stage 2 that word-final [ʁ] was finally produced by Clara, more than eight months after the first systematic productions of word-final consonants other than [ʁ]. Examples of this new acquisition stage are provided in (5a). Importantly, this second stage coincides exactly with the first systematic productions of word-medial codas in Clara's productions, as can be seen in (5b).

(5) Stage 2: Acquisition of word-final [ʁ] and word-medial codas

a. Word-final [ʁ] (2;03,15–19):

Orthography	Target form	Child output	Age	Gloss
dort	[dɔʁ]	[dɔʁ]	2;03,15	'(s/he) sleeps'
chaussure	[ʃoˈsʏʁ]	[ʃœˈʃyʁ]	2;03,15	'shoe'
fleur	[flœʁ]	[flæʁ]	2;03,19	'flower'

b. Word-medial codas (2;03,19):

Orthography	Target form	Child output	Age	Gloss
Gaspard	[gasˈpɑʁ]	[gæsˈpaʁ]	2;03,19	'Gaspard'
dormir	[dɔʁˈmiʁ]	[dɔʁˈmiʁ]	2;03,19	'(to) sleep'
pansement	[pɑ̃sˈmɑ̃]	[pæsˈmæː]	2;03,19	'bandage'

2.3. Théo's [ʁ]

Turning now to Théo's acquisition patterns, we can see from the data in (6) and (7) that all word-final consonants, including [ʁ], were acquired during the same developmental stage, as opposed to what was observed for Clara.

(6) Stage 1: Acquisition of word-final consonants including [ʁ]

a. Word-final consonants:

Orthography	Target form	Child output	Age	Gloss
embarque	[ɑ̃ˈbaʁk]	[əˈbak]	2;03,20	'(he) embarks'
mitaine	[miˈtɛn]	[pəˈtɛn]	2;04,06	'mitten'
bus	[bʏs]	[b̥ɔç̟]	2;04,06	'bus'

b. Word-final [ʁ]:

Orthography	Target form	Child output	Age	Gloss
encore	[ɑ̃ˈkɔʁ]	[əˈkɔʁ]	2;03,20	'again'
voir	[vwɑʁ]	[vwɑːʁ̥]	2;04,06	'(to) see'
lumière	[lʏˈmjɛʁ]	[yˈmɥɛʁ̥]	2;04,28	'light'

During this first developmental stage, word-medial codas underwent deletion, as exemplified in (7), similar to what was observed for Clara in (4).

(7) Stage 1: Word-medial coda deletion (until 3;06,13)

Orthography	Target form	Child output	Age	Gloss
taxi	[takˈsi]	[taˈsi]	2;11,23	'taxi'
partout	[paʁˈtu]	[paˈtu]	3;02,07	'everywhere'
marteau	[maʁˈto]	[maˈto]	3;05,06	'hammer'
fourmi	[fʊʁˈmi]	[fuˈmi]	3;05,26	'ant'
coccinelle	[kɔksiˈnɛl]	[kɔsiˈnɛl]	3;06,13	'ladybug'

Target word-medial codas were in fact acquired more than 16 months later, as illustrated in (8) with the first systematic productions of consonants in this position.

(8) Stage 2: Acquisition of word-medial codas (3;07,06)

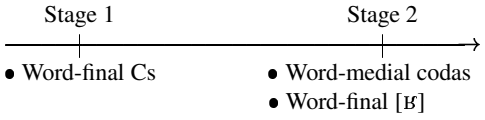
Orthography	Target form	Child output	Age	Gloss
escabeau	[ɛskaˈbo]	[ɛskaˈbo]	3;07,06	'stool'
fermer	[fɛʁˈme]	[fɔʁˈme]	3;07,06	'(to) close'
courte	[kʊʁt]	[kʊʁt]	3;07,06	'short'
tortue	[tɔʁˈt͡sy]	[tɔχˈt͡sy]	3;07,06	'turtle'
coccinelle	[kɔksiˈnɛl]	[kɔksiˈnɛl]	3;07,06	'ladybug'

When compared, the two children display a clear difference in the way that they have acquired word-final [ʁ]: while Théo's acquisition of [ʁ] is parallel to all of his other word-final consonants, Clara's [ʁ] instead displays asymmetric behaviour; it is acquired at a later stage, at the same time as word-medial codas. These two learning paths are schematized in (9).[3]

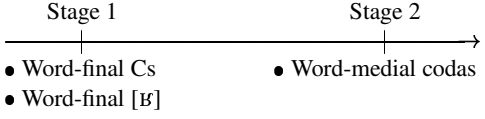
[3] As pointed out by an anonymous reviewer, the children attain the different stages described here at quite different ages. This is due to the fact that Clara was a very proficient learner while Théo's phonological development was relatively slow. Indeed, despite a difference in age of attainment, both children displayed essentially the same developmental path, except for the acquisition of [ʁ] (see Rose 2000 for more details). This observation argues in favour of a stage-based approach to acquisition, as an approach based on age would merely account for rate of acquisition.

(9) Summary of the patterns:

a. Clara:



b. Théo:



Furthermore, the two stages in (9) are clearly distinct, as they are separated by extensive periods of time (eight and 16 months, respectively). Finally, the parallel between the acquisition of Clara's word-final [ʁ] and word-medial codas is striking and must be accounted for.

In order to account for the above observations, I propose, in section 4, that the difference between Clara and Théo lies in how the two children syllabified their word-final [ʁ], and, moreover, that this difference is fully predictable, if one looks at segmental representation and its consequences for word-final consonant syllabification. In a nutshell, I argue that Clara represents her [ʁ] as placeless and syllabifies it in word-final position as a coda while Théo has a Dorsal-specified [ʁ] and syllabifies it in word-final position as an onset. In order to cast this proposal in its proper context, it is first necessary to consider the two syllabification options available in adult languages and, specifically, which types of consonants are allowed word-finally in the languages displaying each of the two available options.

3. Background: Syllabification Options for Word-Final Consonants

In this section, I review recent proposals concerning word-final consonant syllabification in adult phonology (Piggott 1999) as well as in child language (Goad and Brannen 2003). This survey will provide the relevant background and serve as the starting point for the current proposal, to be detailed in section 4.

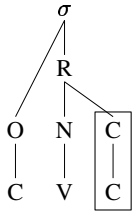
3.1. Syllabification of word-final consonants in adult languages

In the field of adult phonology, many scholars analyse word-final consonants in the same fashion as word-medial consonants which must be syllabified outside of the onset constituent as rhymal dependents (that is, as codas; see Blevins 1995:212 for a survey of different theories of syllabification). This position, however, has been challenged in the literature. For example, the tenets of Government Phonology (e.g., Kaye 1990; Kaye, Lowenstamm, and Vergnaud 1990; Charette 1991; Harris 1994, 1997) hold that word-final consonants should *always* be syllabified as onsets.

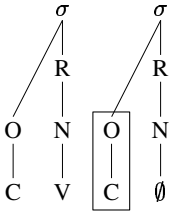
Taking a position between these two approaches, Piggott (1999) argues that word-final consonants can be syllabified in either way across languages: as true codas, depicted in (10a), or as onsets of a syllable without a phonetically realized nucleus, illustrated in (10b).

(10) Syllabification options for word-final consonants (Piggott 1999):

a. Coda:



b. Onset:



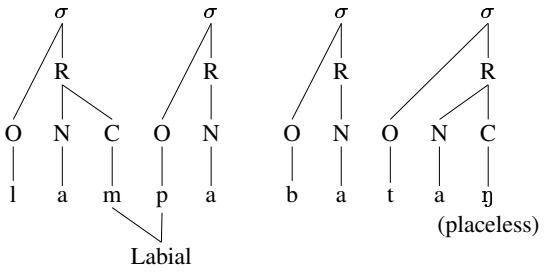
Piggott's argument in support of the two syllabification options in (10) is based primarily on distributional evidence, and is summarized as follows. First, languages such as Selayarese (Austronesian; Mithun and Basri 1986) display a distribution of word-final consonants which matches that of word-medial codas, in the sense that neither position can independently license place features. While word-medial codas are limited to glottal stops, the first halves of geminates, and homorganic nasals, word-final consonants are restricted to glottal stops and placeless nasal consonants.[4] From this parallel behaviour, these two positions are argued to be syllabified as true codas, which are weak prosodic positions unable to independently license place features in these languages; see (11).

(11) Selayarese syllabification (Piggott 1999):

	Word-medial position		Word-final position	
Consonants allowed:	• Glottal stop • First half of geminates • Homorganic nasals		• Glottal stop • Placeless nasal [ŋ]	
Examples:	[laʔba] [ballo] [lampa]	'lack of salt' 'beautiful' 'to go'	[toboʔ] [bataŋ]	'stab' 'driftwood'

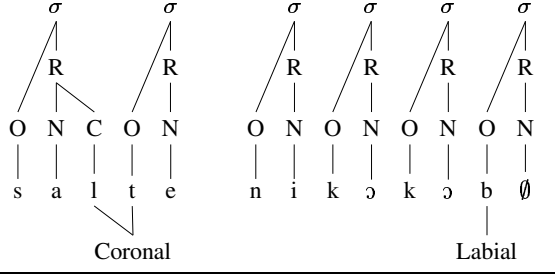
cont'd . . .

[4] On the placelessness of velar nasals, see, e.g., Trigo (1988) and Rice (1996).

Representations:	
Prosodic position:	Coda Coda

Second, languages such as Diola-Fogny (Niger-Congo; Sapir 1965) have a distribution of word-final consonants that is freer than that of word-medial codas. On the one hand, word-medial codas are restricted to nasals and liquids that are homorganic with the following onset. From this distribution, Piggott infers that, similar to Selayarese, Diola-Fogny word-medial codas cannot independently license place features. On the other hand, as opposed to what is observed in Selayarese, consonants with any place specification (Labial, Coronal, or Dorsal) can surface word-finally in Diola-Fogny. In addition, word-final consonant clusters are allowed in this language. From the stronger licensing possibilities observed in word-final position, Piggott (1999) argues that Diola-Fogny's word-final consonants are syllabified as onsets of empty-headed syllables, as illustrated in (12).

(12) Diola-Fogny syllabification (Piggott 1999):

	Word-medial position	Word-final position
Consonants allowed:	• Homorganic nasals • Homorganic liquids	• All place features • Word-final clusters
Examples:	[kundon] 'large rat' [ninennen] 'I placed' [salte] 'be dirty'	[kuɲilak] 'children' [nikɔkɔb] 'I waited' [famb] 'annoy'
Representations:	
Prosodic position:	Coda Onset	

Following the approach to markedness discussed in section 1, given that two syllabification options are available across languages, namely (10a) and (10b),

one of these options must be unmarked. Briefly addressing this issue, Piggott (1999:180) suggests that (10b) — the syllabification of word-final consonants as onsets — represents the unmarked case. His suggestion finds support in the field of child phonology, in Goad and Brannen (2003), to be discussed next.

3.2. Syllabification of word-final consonants in child language

Goad and Brannen (2003) argue that word-final consonants in early grammars pattern according to Piggott's (1999) suggestion: the child initially syllabifies such consonants as onsets, independently of the syllabification constraints of the target language. Goad and Brannen document a series of patterns found across learners which strongly support the presence of word-final onsets of empty-headed syllables. Samples of the evidence discussed by Goad and Brannen are provided in (13).[5]

(13) Evidence for word-final onsets (Goad and Brannen 2003):

a. Vowel epenthesis after target word-final consonant:
[ʌbʌ] 'up'
[hɛtɛ] 'hat' (Jacob; 20 months)

b. Final aspiration (oral release):
[mit^{h}] 'meat'
[bok^{h}] 'broke' (Hildegard; 22 months)

c. Length on final consonant:
[kekː] 'cake'
[badː] 'bad' (Mollie; 18 months)

d. Nasal release:
[dabm̩] 'stub'
[vidn̩] 'feed' (Lasan; 21–25 months)

e. Post-vocalic pause:
[sɚ.s] 'shoes' (Scott; 23 months)
[ba.kh] 'box' (Jacob; 19 months)

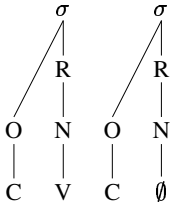
As argued for by Goad and Brannen (2003), positing word-final onsets of empty-headed syllables requires that children deal with the relative markedness of empty nuclei. Goad and Brannen thus propose that these empty nuclei receive phonetic content from either the preceding vowel or the preceding onset (the word-final consonant). No such strategy would be required if no abstract categories were present word-finally in early representations.

In sum, Goad and Brannen (2003) provide support for Piggott's (1999) proposal schematized in (14) that children acquiring a language with word-final

[5] Clara and Théo also display aspiration in early outputs, providing further support for Goad and Brannen's (2003) proposal (see Rose 2000:117ff for more details).

consonants will initially syllabify these consonants as onsets followed by an empty nucleus, across all target languages.[6]

(14) Summary: Default syllabification of a CVC word (Piggott 1999)



However, Clara's learning path for [ʁ] (see (9)) poses a problem for the unmarked status of word-final onsets. Why is Clara's [ʁ] acquired word-finally at the same time as word-medial codas, rather than at the same stage as all of the other word-final consonants? In addition, why is Clara's [ʁ] behaviour not replicated in Théo's data, despite the fact that both children are acquiring the same language? As we will see in section 5.1, the problem cannot be reduced to one of articulatory difficulty, as Clara is in fact able to pronounce [ʁ] in second position in branching onsets, in spite of the apparent complexity of this position. Evidence from the behaviour of Clara's [ʁ] across different prosodic positions will strongly suggest that the problem must be approached from a representational perspective, rather than from an articulatory one.

4. Current Proposal

In order to explain the different behaviours of word-final [ʁ] in Clara's and Théo's phonologies, I extend Piggott's and Goad and Brannen's proposals about the unmarked syllabification of word-final consonants as follows. I propose that there is an implicational relationship between segmental place of articulation and word-final consonant syllabification: default word-final syllabification can be predicted based on the place specification of the word-final consonant. As stated in (15), consistent with the dichotomy reported in (11) and (12) for the syllabification of word-final consonants in Selayarese- versus Diola-Fogny-type languages, I propose that, in the unmarked case, permanently placeless word-final consonants (e.g., laryngeals, and rhotic and nasal approximants)[7] are syllabified as true codas while place-specified word-final consonants are syllabified as onsets.

[6]The acquisition of empty-headed syllables has also been documented in European Portuguese. See Freitas (1997), Fikkert and Freitas (1999), and Freitas and Rodrigues (2003) for accounts of the acquisition of word-initial and word-final empty-headed syllables. Finally, Goad (2002) offers more examples from English as well as additional evidence from two learners of German.

[7]Motivation for the placelessness of rhotic and nasal approximants will be provided in section 5. Note, however, that determining whether a segment is placeless or place-specified

(15) Unmarked syllabification options:

a. Word-final (permanently) placeless consonants: Codas (parallel to Selayarese).

b. Word-final place-specified consonants: Onsets (parallel to Diola-Fogny).

This proposal enables us to make clear predictions with regard to the segmental representation of [ʁ] in Clara's and Théo's phonologies. One the one hand, because Clara's [ʁ] behaves like a true coda in development, it should be placeless, as stated in (16a). As opposed to this, in (16b), Théo's [ʁ], which behaves like any other — place-specified — consonant, should contain some place feature in underlying representation (Dorsal, as we will see below).[8]

(16) Predictions for the segmental representation of Clara's versus Théo's [ʁ]:

a. Clara's [ʁ]: Placeless (word-final [ʁ] acquired at the same stage as medial codas).

b. Théo's [ʁ]: Place-specified (word-final [ʁ] acquired independent of medial codas).

In the following section, I provide independent support for the two predictions in (16), which comes from the behaviour of [ʁ] in Clara's and Théo's onsets. As we will see, while Clara's [ʁ] truly behaves as placeless, as the *undergoer* of a place harmony process in singleton onsets, Théo's [ʁ] patterns as the *trigger* of velar (dorsal) assimilation in branching onsets.

5. Supporting Evidence: Variation in the Representation of [ʁ]

5.1. Clara's [ʁ] as placeless

The segmental placelessness of Clara's [ʁ] is evidenced through a comparison of its behaviour in singleton versus branching onsets. First, as can be seen in (17), Clara's [ʁ], when in singleton onsets, acquires place of articulation from another consonant in the word. For example, in (17a), target [ʁ] is realized as coronal, in agreement with the other coronal consonant in the word, and no matter in which direction harmony takes place. In (17b), target [ʁ] is realized with the place feature of the labial consonant that follows it. Finally, in (17c), [ʁ] varies in its realization. In the first variant, it takes on the place of articulation of the velar consonant that precedes it while, in the second variant, it acquires place from the coronal consonant that follows it.

in adult or child grammars can be fairly complex, as this requires a detailed analysis of how segments interact within a grammar or within a grammatical stage during acquisition. See section 5 for additional discussion.

[8]The motivation for the difference posited between Clara's and Théo's representations for [ʁ] is discussed in more detail in section 5.5, in relation to the variation observed between the two children.

(17) [ʁ] in singleton onsets: Place specification of any other consonant

	Orthography	Target form	Child output	Age	Gloss
a.	renard	[ʁəˈnɑʁ]	[leˈna]	1;07,27	‘fox’
	rouge	[ʁuʒ]	[jʊʃ]	1;11,06	‘red’
	souris	[suˈʁi]	[zʊˈji]	1;11,06	‘mouse’
b.	robe	[ʁɔb]	[wɔb]	1;10,10	‘(a) dress’
c.	carotte	[kaˈʁɔt]	[kaˈgɜt]	1;07,27	‘carrot’
			[kəˈjɔt]	2;00,02	

In sum, when in singleton onsets, [ʁ] must acquire a place feature, no matter what this feature is.[9] In branching onsets, however, no harmony takes place: [ʁ] is systematically realized in target-like fashion, as exemplified in (18).

(18) [ʁ] in branching onsets: Target-like realization

Orthography	Target form	Child output	Age	Gloss
biberon	[biˈbʁɔ̃]	[paˈpʰɰɔ]	1;09,29	‘baby bottle’
trou	[tɰu]	[tʰɰu]	1;10,10	‘hole’
gros	[gʁo]	[gʁo]	2;02,06	‘big’
pris	[pɰi]	[pʰɰi]	2;02,20	‘stuck’

Note that the data in (18) argue against any hypothesis under which the substitutions in (17) could be caused by Clara’s inability to pronounce [ʁ]. Indeed, if mere phonetic rendition of this consonant were the source of the harmony pattern in (17), it would be difficult to explain why articulating this consonant in branching onsets does not pose any problem. Rather, the data in (17) and (18) support the hypothesis that Clara’s [ʁ] is placeless in underlying representation, and that it is allowed by Clara’s grammar in dependent (second) position of branching onsets only, a weak prosodic licensor.[10] In contrast to this, [ʁ] must acquire a place feature from a surrounding consonant when it is realized in the head of the onset, a strong prosodic licensor.

5.2. Independent evidence from Migliola

The analysis proposed for Clara’s [ʁ] requires that she allow for both word-final syllabification options in (10): placeless [ʁ] must be syllabified as a coda,

[9] Unfortunately, no examples of words containing [ʁ] in singleton onsets to the exclusion of other consonants (e.g., *roue* [ʁu] ‘wheel’) could be found in the corpus. It is therefore impossible to determine the default articulation that [ʁ] would have selected in this context. This unfortunate gap in the data, however, should not distract us from the central observation that [ʁ] in singleton onsets systematically acquires its place of articulation from another consonant.

[10] The same prediction holds true of word-final coda position, which is also prosodically weak. However, this prediction cannot be tested, as Clara’s [ʁ] in singleton onsets no longer undergoes substitution at the stage when codas are acquired.

whereas all other (place-specified) consonants must be syllabified as onsets in this position. This approach is independently supported in the phonology of the Ligurian Romance dialect of Migliola (Ghini 2002),[11] a language which displays striking similarities with Clara's grammar.

Based on a set of distributional facts, Ghini (2002) convincingly argues that Migliola, like Clara's grammar, allows for both word-final codas and word-final onsets.[12] As Ghini proposes, all but one consonant in Migliola must be syllabified word-finally as onsets. However, a placeless consonant, [ŋ], whose distribution is restricted to syllable-final position, must be syllabified word-finally as a coda. The segmental behaviour of [ŋ] indicates that this segment is placeless. Indeed, [ŋ] optionally acquires a place feature in word-medial codas. In such cases, the place feature is homorganic with that of the following onset (Ghini 2002:79). This behaviour of [ŋ] as an undergoer of assimilation suggests that this consonant does not independently bear a place feature in phonological representations.

Second, still similar to Clara's placeless [ʁ], the Migliola [ŋ] must obligatorily acquire a place feature when it appears in singleton onsets. As we can see from the examples in (19a), in all cases when it appears in onset position (before a vowel-initial suffix), this consonant acquires (default) coronal place (which undergoes palatalization when followed by a high front vowel, in masculine plural forms). In contrast to this, all of the other (place-specified) nasals of Migliola keep their underlying place features, in all positions, as exemplified in (19b).

(19) Morphophonological alternations in Migliola (Ghini 2002:81):

		Masc. sing.	Masc. plur.	Fem. sing.	Fem. plur.	
a.	/ŋ/:	[ˈfeŋ]	[ˈfiɲɪ]	[ˈfɛːna]	[ˈfɛːnɛ]	'fine'
		[ˈøŋ]	[ˈyɲɪ]	[ˈœːna]	[ˈœːnɛ]	'one'
		[ˈsaŋ]	[ˈsaɲɪ]	[ˈsaːna]	[ˈsaːnɛ]	'healthy'
		[ˈboŋ]	[ˈbuɲɪ]	[ˈbɔːna]	[ˈbɔːnɛ]	'good'
b.	/m, n, ɲ/:	[ˈtunᵘ]	[ˈtunɪ]	[ˈtuna]	[ˈtunɛ]	'dumb'
		[ˈboːrɲᵘ]	[ˈboːrɲɪ]	[ˈboːrɲa]	[ˈboːrɲɛ]	'stupid'
		[ˈgɾɑːmᵘ]	[ˈgɾɑːmɪ]	[ˈgɾɑːma]	[ˈgɾɑːmɛ]	'nasty'

In sum, Clara's [ʁ] and Migliola [ŋ] are extremely similar as (a) they are the only consonants that can be syllabified as word-final codas in their respective phonologies, and (b) they must acquire a place specification in onset position. Also, the fact that Migliola allows for both syllabification options in word-final position (onset and coda) provides independent support for the proposal that Clara's grammar also allows for both options.

[11] Thanks to Elan Dresher for bringing Ghini's work to my attention.

[12] In Ghini's (2002) terms, word-final onsets in Migliola are followed by a catalectic mora, which is, for all intents and purposes, the same as positing a word-final empty nucleus as in (10b).

5.3. Théo's [ʁ] as Dorsal-bearing

Turning now to the segmental behaviour of Théo's [ʁ], we can see in (20) that this consonant surfaces in singleton onsets as target-like. These data are representative of the entire corpus.

(20) [ʁ] in singleton onsets: Target-like realization

Orthography	Target form	Child output	Age	Gloss
roue	[ʁu]	[ʁu]	2;06,12	'wheel'
roche	[ʁɔʃ]	[ʁ̥ɔç̟]	2;06,12	'(a) rock'
oreille	[ɔˈʁɛj]	[ɑˈʁ̥ɛj]	2;06,12	'ear'
roule	[ʁʊl]	[ʁʊj]	2;07,22	'(it) rolls'

In coronal-[ʁ] branching onsets, however, Théo's [ʁ] acts as the trigger of a systematic regressive dorsal assimilation targetting the preceding coronal, as exemplified in (21a). As can be seen in (21b), labials are not affected by this assimilation process.

(21) Théo's branching onsets:

a. Coronal-[ʁ] branching onsets: Dorsal assimilation

Orthography	Target form	Child output	Age	Gloss
train	[tʁ̥ɛ̃]	[kʁ̥ɛ]	2;06,12	'train'
trou	[tʁ̥u]	[kʁ̥ʊ]	2;06,30	'hole
entrer	[ɑ̃ˈtʁe]	[ɑ̃kʁe]	3;04,00	'(to) enter'
drôle	[dʁol]	[gʁol]	3;04,19	'funny'

b. Labial-[ʁ]: No assimilation

Orthography	Target form	Child output	Age	Gloss
bras	[bʁɑ]	[bʁɑ]	2;10,05	'arm'
brosse	[bʁɔs]	[bʁɔːs]	2;08,22	'(a) brush'
brun	[bʁœ̃]	[bʁ̥œ̃]	2;08,22	'brown'
pris	[pʁ̥i]	[pʁ̥i]	2;09,12	'occupied'

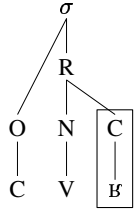
While the difference between (21a) and (21b) could suggest that coronal consonants are placeless in Théo's phonology, such a hypothesis would not account for the following facts: (a) coronals are assimilated only in contexts where they are followed by [ʁ] in branching onsets, (b) they do not undergo consonant harmony at a distance in Théo's productions (Rose 2000) and, (c) coronals behave exactly like any other (place-specified) word-final consonant in Théo's developmental path (see (6)).[13] Importantly, however, the central aspect of these data lies in the fact that the feature Dorsal affecting the target coronals in (21) must originate from [ʁ], as this assimilation takes place in a systematic fashion, irrespective of the quality of the following vowel, and in the absence of any other velar consonant in the word.

[13] As proposed in Rose (2000), these data rather suggest a feature strength hierarchy whereby Coronal is weaker than Dorsal and Labial.

In sum, the different segmental behaviour of [ʁ] in Clara's and Théo's productions provides support for the predictions in (16) about the underlying specification of this consonant in the two children's phonologies. This evidence in turn provides support for the hypothesis in (15) about the relationship between place specification and default word-final consonant syllabification: Clara's [ʁ], which is placeless, is syllabified word-finally as a true coda, as illustrated in (22a), while Théo's Dorsal-specified [ʁ] is syllabified word-finally as an onset, as depicted in (22b).

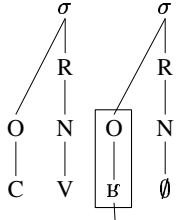
(22) Syllabification of word-final [ʁ]:

a. Clara (word-final coda):



(placeless)

b. Théo (word-final onset):



Dorsal

This difference in segmental representation, which entails a difference in syllabification word-finally, leads to an explanation for why the two children acquire their word-final [ʁ] during different acquisition stages. Théo's [ʁ] is acquired early, along with all word-final onsets, while Clara's [ʁ] is acquired at a later stage, when branching rhymes become possible in her phonology.

Finally, these two syllabifications are analogous to the syllabifications motivated independently for adult Selayarese, Diola-Fogny, and Migliola. Selayarese has word-final placeless codas, similar to Clara's word-final placeless [ʁ], while Diola-Fogny has word-final place-specified onsets, similar to Théo's Dorsal-specified [ʁ] as well as to all of the other word-final consonants reported for both Clara's and Théo's grammars (in (2) and (6), respectively): all of these place-specified consonants are acquired as word-final onsets, independently of the acquisition of word-medial codas. Finally, both Clara's system and Migliola allow for the two word-final syllabification options offered by UG. In both grammars, word-final placeless consonants are syllabified as codas while place-specified consonants are syllabified as onsets.

5.4. Additional evidence from Japanese

In this section, I discuss independent evidence which supports the current proposal about the relationship between consonant place specification and word-final syllabification. This evidence comes from Ota's (1999) investigation of the acquisition of Japanese. The syllable-related phonotactics of Japanese are very similar to those of Selayarese: in word-medial position, Japanese allows for homorganic

nasals and the first halves of geminates; that is, only consonants which share the place of articulation of the following onset. These facts indicate that Japanese codas cannot independently license place features (e.g., Itô 1986). Consistent with this, word-finally, only [ŋ], a placeless nasal approximant, can be found. As reported by Ota (1999:24), there is no consensus on the phonetic correlates of the Japanese word-final nasal approximant (for discussion, see Bloch 1950, Ladefoged and Maddieson 1996, and Huffman and Krakow 1993, as well as the relevant references in Ota 1999). This lack of consensus may support the analysis of this consonant as placeless.

Following the approach to the syllabification of word-final consonants adopted in this article, because Japanese shows the same inability to license place features in both word-medial coda and word-final position, the latter should be syllabified as codas (rather than as word-final onsets).

According to the hypothesis in (15a), if the Japanese learner posits a coda analysis for word-final [ŋ] (on the assumption that the child analyses [ŋ] as placeless), the acquisition of this consonant should take place during the same stage as word-medial codas, as the two positions are structurally identical. This hypothesis is supported. The developmental facts observed in Ota (1999) reveal a close relationship between the acquisition of word-medial codas and word-final [ŋ]. Representative examples from three children are provided in (23).

(23) Early productions of word-medial and word-final codas in Japanese (Ota 1999):

		Target form	Child output	Age	Gloss
a.	Tareku	[hantai]	[aːtai]	1;10,02	'opposite'
		[ampammaŋ]	[ammammaː]	1;10,02	cartoon character
		[waŋwaŋ]	[waːwa]	1;11,02	'doggie'
		[zoːsaŋ]	[doːtaŋ]	2;00,06	'elephant'
		[niːsaŋ]	[niːnaŋ]	2;00,06	'big brother'
		[waŋwaŋ]	[wɔ̃ːwaŋ]	2;00,20	'doggie'
b.	Hiromi	[geŋki]	[gekki]	1;11,23	'fine'
		[daŋgo]	[daːko]	1;11,23	'dumpling'
		[niːsaŋ]	[ɲiːtaŋ]	1;11,23	'big brother'
		[zoːsaŋ]	[doːtaŋ]	1;11,23	'elephant'
		[waŋwaŋ]	[waw̃waŋ]	2;00,08	'doggie'
c.	Kenta	[nanda]	[nɛda], [naːda]	1;05,19	'what's (that)?'
		[mamma]	[mama]	1;07,02	'food'
		[mamma]	[mamma]	1;07,16	'food'
		[nanda]	[naːda]	1;08,27	'what's (that)?'
		[nanda]	[nanda]	1;08,27	'what's (that)?'
		[nontaŋ]	[nonta]	1;09,11	book character

As can be seen in these data, Japanese learners start producing word-medial codas as part of geminate consonants and word-final nasals during the same two- to

three-month period.[14] While word-medial geminates are produced slightly before word-final [ŋ] by Tareku and Hiromi, the realisation of word-medial N.C clusters is acquired after the final [ŋ] by both of these Japanese learners. Ota (1999) also reports data from a third child, Kenta, who, during the last weeks he was observed, evidenced word-medial N.C cluster acquisition but no production of word-final [ŋ] (see (23c)).

The data in (23) thus demonstrate that word-medial and word-final codas in Japanese are part of very closely related stages in development. Indeed, these developmental facts are much different from the stages observed in the French data in section 2: while Clara acquired word-medial codas (and word-final placeless [ʁ]) eight months after the acquisition of word-final onsets, Théo also acquired word-medial codas after word-final onsets, with a 16-month period in between the two acquisition stages. If the Japanese placeless [ŋ] were syllabified word-finally in the same fashion as the French place-specified consonants, the developmental path would be much different: [ŋ] should be acquired earlier than word-medial codas, which is definitely not the case in the available data. While firm conclusions cannot be drawn from a population of only a few individuals, the French data suggest a much clearer demarcation of stages than what we see in the Japanese learners, with regard to the ordering between the acquisition of word-final consonants and the acquisition of word-medial codas, as well as to the smaller time differences and variation observed in the Japanese developmental paths. Finally, the data in (23) suggest that independently required constraints regulating, for example, placeless nasals, also play a role in the acquisition of Japanese, yielding variation in the acquisition of word-medial versus word-final codas.

The comparative investigation of French and Japanese acquisition of word-final consonants thus provides developmental evidence supporting Piggott's (1999) proposal that two options are available across languages for word-final consonant syllabification. As well, this evidence supports the current proposal that predicting which of the two syllabification options (coda versus onset) should be selected by the learner requires knowledge of the segmental status (placeless versus place-specified) of word-final consonants.

5.5. Why did Clara and Théo select different representations for [ʁ]?

While the proposal in (15) accounts for Clara's and Théo's learning paths, it does not explain why these two children, who were learning the same target language, opted for different segmental representations for their respective [ʁ].

[14] Unfortunately, these forms were recorded during the last few data gathering sessions on these children. Consequently, clear stages of acquisition cannot be determined with complete accuracy. However, the parallel observed between the emergence of word-medial C.C and N.C clusters and word-final [ŋ] strongly suggests that these different positions are being acquired during the same general stage.

I propose that the solution to this puzzle lies at the interface between phonetics and phonology. First, from a phonological perspective, rhotic consonants often behave asymmetrically and have thus been argued to be permanently placeless in a number of languages; see, for example, Mester and Itô (1989) for Japanese, Rice (1992) for English, Akinlabi (1993) for Yoruba, Béland, Paradis, and Bois (1993) for French, Rose (1995) based on evidence from loanwords in Kinyarwanda, and S. Rose (1997) for Muher (for generalized /r/ placelessness, see also Avery 1996, and Goad and Rose in press; cf. Walsh Dickey 1997 who proposes that all liquids are in fact represented with place structure).

Importantly, /r/ behaves as placeless in each of the languages listed above, no matter its actual phonetic place of articulation (e.g., uvular versus coronal). These cross-linguistic facts suggest that UG makes available an option where /r/ is permanently unspecified for place. Clara selected this option for target uvular [ʁ]. It is also possible that the phonological inventory of French consonants cued Clara into a placeless representation for [ʁ], as this consonant is the only uvular consonant in French (see (1)) and, as such, it does not need to be represented with a place feature.

The phonetic evidence from French [ʁ] is, however, potentially misleading. First, as an approximant, [ʁ] does not have a phonetically consistent place of articulation, as it can be realized at different points of articulation ranging from the posterior area of the soft palate to the uvula: this variation, which suggests placelessness, is found both within and across French-speaking individuals. However, French [ʁ] can also be analysed as Dorsal-specified. This analysis can especially be motivated based on the evidence from branching onsets that begin with a voiceless consonant, where, recall from section 2, [ʁ] undergoes devoicing and surfaces as a velar or uvular fricative. This misleading phonetic evidence is taken as the source of Théo's [ʁ] Dorsal specification. Théo's sensitivity to this phonetic evidence is, in essence, tantamount to that of several learners of English who assign a Labial articulator to their target [ɹ] (e.g., Bernhardt and Stemberger 1998, Gnanadesikan in press), even though the labiality of English [ɹ] is phonetic and plays no role in the phonological behaviour of this consonant in the adult language. The absence of phonological Labial on English /ɹ/ is revealed through a comparison of attested versus ill-formed branching onsets in the language. For example, while Labial + [ɹ] onsets are allowed (e.g., *prick* [pɹɪk]), Labial + [w] onsets (e.g., *[pwɪk]) are not allowed, as English forbids place identity between consonants in branching onsets.[15]

This proposal entails that different children pay attention to different types of evidence while building their grammars. Consequently, as alluded to in footnote 1, the complete story about how segments get represented in children's grammars

[15]This analysis requires that /ɹ/ in English be placeless, rather than specified for Coronal, in order to allow for Coronal + [ɹ] clusters (e.g., *trick* [tɹɪk]). On /ɹ/ placelessness in English, see Rice (1992) and Goad and Rose (in press).

and how this affects prosodification must integrate a variety of interacting factors pertaining to both the phonological and phonetic properties of the target language. In addition, as will be discussed in more detail in section 6, evidence from phonological distribution also appears to be relevant in accounting for some of the variation found across learners of different languages.

Related to this, one might wonder what tendencies are observed across French-learning children concerning the representation of [ʁ] as placeless versus place-specified. While this question can only be answered through a broad-based investigation of French acquisition, anecdotal evidence and comments to the author from caregivers and preschool teachers reveal that the velar assimilation in coronal-[ʁ] branching onsets (as in (21)) is found in a noticeable proportion of the population ranging from two to five years old. Théo, in this respect, looks like several other normally developing children. He displayed systematic velar assimilation until the last data gathering session, at age 4;00,00. This pattern ended shortly after age four; during a visit with Théo a few months after the last recording session, we (the author and another investigator involved in the project) noticed that the pattern had disappeared from his productions. Finally, concerning Clara, given the complex effects of [ʁ] placelessness observed in her outputs, only a thorough investigation of acquisition data could reveal the necessary type of evidence (e.g., that provided in (17) and (18)). It is therefore not surprising that anecdotal evidence of this sort is not readily available from non-linguists.

Finally, as mentioned in footnote 7, the question as to what consonant(s) should be considered placeless in (child or adult) grammars is a complex one, and can only be answered through a careful investigation of how segments interact within a specific grammar. In languages such as French, the child is exposed to potentially conflicting evidence, which predicts the type of variation found between Clara and Théo. In addition to the phonetic and phonological properties of the segments themselves, data from the acquisition of Spanish discussed in the next section strongly suggest that other factors such as distributional evidence also affect the way in which children arrive at their underlying representations.

6. Beyond Segmental Structure: Distributional Evidence

As suggested in the preceding subsection, phonetic evidence appears to contribute in a significant way to the variation posited between Clara and Théo in the elaboration of their respective segmental representations for [ʁ]. A strong interpretation of this explanation, combined with the evidence for word-final coda status of Japanese placeless [ɲ], would yield the hypothesis that in order to be considered as a potential word-final coda, a segment must crucially be placeless at all levels of phonological analysis.

However, data from another language, Spanish, instead suggest that the child's analysis of the distributional evidence available from the target language must also be taken into account (on the role of distributional evidence in the acquisition

of syllable structure, see also Goad and Rose in press). From a distributional perspective, Spanish can be considered to fall somewhere between Japanese and French. Word-medial codas in Spanish are fairly unrestricted; labial and velar obstruents are allowed before coronal onsets (e.g., ([ap.to] 'apt', [ak.tor] 'actor'), although word-medial nasal codas must be homorganic with the following onset consonant. Word-finally, (almost) only coronals are allowed (e.g., [mas] 'more', [sol] 'sun', *[sap]; Harris 1983). Indeed, apart from a handful of examples such as *reloj* [relox] '(a) watch', word-final consonants in Spanish are coronal. Furthermore, in most dialects of the language, /x/ is not pronounced at the end of words.

Given that word-final consonants are clearly restricted in Spanish, they should be analysed as true codas, rather than as word-final onsets, in the end-state grammar. On the other hand, the Spanish word-final consonants cannot be considered to be permanently placeless, as they invariably surface as coronal.[16] Following this logic, and in line with Chomsky's (1981) proposal that marked options are acquired through positive evidence (see section 1), it must be the case that learners of Spanish attend to distributional evidence in order to posit word-final codas, the marked option for the syllabification of place-specified consonants in (15). Indeed, if the absence of phonetic variation in coronals leads Spanish learners to treat these consonants as place-specified, then word-final coronals should be acquired earlier than word-medial codas, similar to what was observed in the French data (outside of [ʁ]). If, on the other hand, Spanish learners are sensitive to the distributional facts of their target language, namely to the place restrictions on final consonants, and thus posit a coda analysis for their word-final coronals, then we should expect word-medial and word-final codas to be acquired during closely related stages, similar to what was observed in Japanese. This conflict between UG default options and positive (distributional) evidence predicts variation across children acquiring Spanish-type languages.

A recent study by Kehoe and Lleó (2003) provides preliminary answers regarding this issue. Kehoe and Lleó report on the acquisition of syllable types in German and Spanish learners.

German allows for all places of articulation in word-medial codas, including non-homorganic nasals ([ɔp.tik] 'optics', [ak.tsi.ə] 'stock', [be.ʔam.tɐ] 'bureaucrat', [ʔɪm.kɐ] 'beekeeper'). Similarly, all places of articulation are allowed in word-final position. In addition, final clusters are permitted. Final nasal-obstruent clusters must be homorganic or /mt/; with the exception of /sk/, final obstruent-obstruent clusters must end in coronals (Hall 1992).[17]

[16] One exception to this generalization comes from Spanish dialects in which /s/ is weakened to [h] or ∅ in coda (e.g., Harris 1983). This weakening process, however, affects /s/ only, not the entire class of coronals in the language.

[17] This characterization focusses primarily on the place dimension and does not consider other facts such as the laryngeal neutralization found syllable-finally.

As Kehoe and Lleó (2003) demonstrate, German learners acquire word-final consonants before word-medial codas, with a period of about six months between the two developmental stages. (This acquisition path is comparable to the one found in the French data described in section 2.) On the other hand, two of the three Spanish learners documented by Kehoe and Lleó acquire word-medial codas before word-final consonants, with a period of approximately three months between the two developmental stages, while the third learner acquires word-final consonants before word-medial codas.[18]

While the acquisition path in German is similar to that observed in the French data (save Clara's placeless [ʁ]) in section 2, suggesting a word-final onset analysis,[19] the results obtained from the Spanish learners are variable. The first two learners, whose developmental paths are similar to that of the Japanese learners, appear to analyse word-final consonants as codas. For these learners, the Spanish distributional evidence thus seems to have overridden the fact that word-final consonants in this language are place-specified (coronal). In contrast to this, the third Spanish learner, who acquires word-final consonants before word-medial codas, behaves more like a French learner, and may have analysed the Spanish word-final consonants as onsets.[20]

The parallels between Japanese and the first two learners of Spanish, on the one hand, and between the third Spanish learner and the German and French learners, on the other hand, both support the view of syllabic acquisition favoured in this article, that the relative order of acquisition of word-final consonants vis-

[18]The time difference between the acquisition of final and medial codas is provided by Kehoe and Lleó for only one of the three Spanish learners. Note as well that the criteria used by these authors differ from the ones used in the description of Clara's and Théo's data. A structure was deemed acquired by Clara and Théo when it was produced with approximately 80% accuracy. In contrast to this, Kehoe and Lleó, who were following the criteria used in Levelt, Schiller, and Levelt (2000), deemed a structure acquired when it was produced in two different forms within a recording session. The use of different criteria across studies prevents reliable comparisons based on time periods.

[19]The same holds true of English (e.g., Smith 1973) and Dutch learners (Fikkert 1994). This is expected, as both of these languages display evidence of word-final onset syllabification, based on the fact that these languages allow for a large inventory of word-final consonants as well as final consonant clusters. The word final onset syllabification is also supported by Goad (2002), who reports on two German learners who display word-final aspiration similar to the examples in (13).

[20]An alternative analysis of the variation observed in Spanish could appeal to the fact that children sometimes display greater faithfulness to input segments when these segments appear in stressed syllables (e.g., Rose 2000). The acquisition of word-medial before final codas by two Spanish learners could support such a positional faithfulness analysis, as word-medial codas in children's early outputs will most likely appear in stressed syllables, as Spanish is a language with trochaic stress. However, as no firm conclusion can be drawn from the available data, this issue is left for further research.

à-vis word-internal codas will vary depending on the learner's analysis of these word-final consonants as being either codas or onsets.

7. Summary and Discussion

In this article, I have discussed evidence on the acquisition of [ʁ] in the phonologies of Clara and Théo, two first language learners of Québec French. From the different behaviours observed across the two children's developmental paths, and based on previous research on the syllabification of word-final consonants in both adult and child phonology, I proposed that the difference between the two learning paths lies in how [ʁ] is syllabified in word-final position by the two learners. Focussing on the segmental behaviour of [ʁ] in the children's outputs, I argued that Clara's [ʁ] must be represented as placeless and, as such, syllabified word-finally as a coda, while Théo's [ʁ] must have a Dorsal place feature and be syllabified as a word-final onset.

This proposal, which was supported with evidence from the acquisition of Japanese, was extended in light of data from Kehoe and Lleó's (2003) comparative investigation of German and Spanish acquisition. On the one hand, the German data offered independent evidence in support of the analysis of French word-final consonants (save Clara's [ʁ]) as word-final onsets. On the other hand, the Spanish data enabled an extension of the proposal which incorporates an additional component, the learner's sensitivity to the distributional evidence of the target language. While segmental structure enables us to account for the variation observed between Clara's and Théo's [ʁ], distributional evidence appears to play a role in the acquisition of Spanish word-final syllabification: the fact that Spanish restricts word-final consonants (almost exclusively) to coronal consonants enables the learner to analyse these consonants as true codas, despite evidence for the presence of a Coronal place specification.

The findings presented above also have implications for the general notion of markedness. Starting from the fact that, cross-linguistically, codas preferably host segments which are placeless, the data discussed in this article suggest that two factors must be considered for word-final consonant syllabification: segmental representation and segmental distribution. On the one hand, the data from French suggest a representational approach whereby segments which are analysed as placeless behave as unmarked, independent of distributional evidence. Indeed, while both learners of French were exposed to similar distributional cues, their different interpretations of the phonetics of [ʁ] was at the source of their respective patterns of syllabification. On the other hand, the data from Spanish suggest that the language requires an analysis that contravenes markedness based on distributional evidence, despite place feature specification. The conflict between these factors in languages such as Spanish predicts variation such as that found in the data from Kehoe and Lleó. As opposed to this, representational and

distributional factors conspire to yield word-final coda syllabification in languages such as Japanese, predicting no variation across children.

The evidence discussed in this article also has implications for markedness-based approaches to learnability according to which the presence of two options for a given entity entails that one of the two options should be considered the default one, while the other option would be available to the learner only through positive evidence. The data on the acquisition of word-final consonant syllabification discussed here rather suggest that two options can be selected as unmarked, depending on the representation of the consonants to be syllabified.

This article departs from the focus of recent research on phonological development, especially in the framework of Optimality Theory (Prince and Smolensky 1993), which has been almost entirely devoted to output representations. In contrast to this, the focus of this article is on the role that underlying segmental representations play in the acquisition of word-final syllabification. The role that UG plays in the elaboration of segmental representations was evidenced by the fact that rhotics appear to be permanently placeless in several languages. The influence of additional factors such as phonetic evidence, taken as the source of Théo's [ʁ] Dorsal specification, was also considered. Finally, distributional evidence, which leads the Spanish learner to posit word-final coronal codas, was also incorporated in the proposal. When cast in the larger context, the findings of this article suggest that input representation, as well as the factors driving it, should be considered in any account of phonological development. This article thus calls for more research on the way that children elaborate their underlying representations.

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