SYLLABLE POSITION EFFECTS WITH FRENCH AND SPANISH /l/

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ABSTRACT

Gradient reduction in coda consonant articulation occurs cross-linguistically. We investigate here the possibility of lesser constriction in French and Spanish lateral codas compared to onsets, conditioned by syllable context and language variety. Anterior and posterior contact in syllable-initial and -final singleton /l/ and in labial-/l/ or /l/-labial clusters produced by four French (2 each from France and Quebec) and seven Spanish speakers (5 Argentine, 1 Cuban, 1 Peninsular) was measured in isolated words and carrier sentences using electro-palatography (EPG). Reduction in anterior contact occured only with the Quebec French speakers. A greater degree of syllable-final posterior contact reduction was observed, consistently for Quebec but not European French speakers and for all Spanish speakers. These findings reveal gradient onset-coda /l/ asymmetries in both languages with Quebec French differing from the other Romance varieties studied in degree of weakening. Furthermore, at least for Spanish, coda /l/ lenition differs from that of other consonants.

Keywords: syllable position, gestural reduction, lateral, French, Spanish.

1. INTRODUCTION

1.1. Syllable position effects

Consonant articulations are known to be subject to gradient reduction in syllable-final position [5, 20]. This phenomenon, referred to as gestural 'syllable position effects' [5], has been attributed to the different ways onset and coda consonant gestures are coordinated with following versus preceding vowels – in-phase (synchronously) versus out-of-phase (sequentially), respectively [4, 23]. While typically variable and non-perceptible, these small-scale differences can develop diachronically into larger-scale positional allophonic variation. One of the most-studied examples of this phenomenon is English /l/ allophony, where the syllable-initial 'clear' lateral is produced with a full alveolar closure (and little or no velarization), while the syllable-final 'dark' variant shows a weaker, or even absent, alveolar closure (and considerable velarization/retraction of the tongue back) [5, 15, 36, 38]. Much less articulatory work has been done on positionally conditioned lateral variation in Romance languages, with cross-language articulatory studies pointing to relatively much smaller-scale differences as well as language- or dialect-particular patterns [14, 30, 32, 33]. This contrasts with abundant theoretical and dialectological research that documents that French and Spanish coda /l/ may vocalize, be elided or fully assimilate to a following consonant (see 1.2 & 1.3).

We examine here possible onset-coda lateral constriction asymmetries in these two languages, both of which are described as having a clear /l/ in onsets but which differ in the way in which singleton /l/ and /l/ in clusters is realized (rhotacization and vocalization in Spanish varieties but not in French; [17]). Specifically, we use electropalatography (EPG) to investigate differences in the amount of linguopalatal contact for onset and coda lateral variants. Based on previous research, we hypothesize that /l/ in both languages will exhibit reduction in contact syllable-finally conditioned by syllable type (larger reduction in word-medial clusters than in singleton word-final codas) and dialect (more reduction in Quebec than European French and in Caribbean than non-Caribbean Spanish).

1.2. French /l/

The French lateral has a wide positional distribution, occurring in both onsets (e.g., *lapin* 'rabbit', *aller* 'go') and codas (e.g., *final* 'final') including in consonant clusters (e.g., word-initial: *classer* 'sort'; word-medial: *conflit* 'conflict', *filtrer* 'filter'; word-final: *film* 'film'). Articulatory studies have shown that /l/ is primarily apico-alveolar [6, 9, 34, 37]. Little variability in the articulation of the French lateral is typically reported [12]. In terms of place of articulation, there is no English-type allophonic variation with French /l/ being described as 'clear' or 'light' (e.g., [39]) and acoustic analyses revealing no major effects of syllable or word position on F2 ([1, 6, 25, 31]). However, effects of flanking consonants and vowels on the degree of anteriority have been reported including relatively fronted realizations before a high front vowel or next to alveodental /t d n/ [9, 25, 31, 34] and effects of the anteriority of the preceding vowel on mean F2 [1]. Finally, weakening has been reported including deletion before /j/ (e.g., *milieu* /miljø/, [mijø] 'milieu'; [39, 40]),

intervocalically in fast speech (e.g., *allez* /ale/, /ae/ 'go'; [40]), and syllable-finally in functional words and obstruent-liquid clusters (e.g., *il* /il/ [i] 'he'; *table* /tabl/ [tab] 'table'; [11]).

1.3. Spanish /l/

The Spanish lateral also has a wide distribution. Singleton /l/ is found in word-initial and -medial onsets (e.g., *lana* 'wool'; *sala* 'room') and word-final codas (e.g., *sal* 'salt'). Obstruent-lateral and lateral-consonant clusters occur in syllable onset (e.g., *blanco* 'white') and coda (e.g., *caldo* 'broth'), respectively, with the latter being restricted to word-medial position. As opposed to English, coda /l/ is not velarized [24, 31] but assimilates in place to a following coronal consonant with full assimilation resulting in gemination in Caribbean dialects [16, 17]. Coda /l/ realization varies widely across Spanish dialects including possible rhotacized and vocalized variants [2, 17]. Obstruent-lateral clusters are usually realized as such, however, medial epenthetic vowels have been reported, albeit at lower frequencies than in obstruent-rhotic clusters [7]. Finally, laterals followed by a high vowel (e.g., *utensilio* 'utensil') palatalize in some dialects [35, 44], although such articulations differ from that of the language's palatal lateral [22]. Acoustic studies reveal that the lateral has a more constricted articulation in word-initial than in word-medial and -final positions and that it is more fronted in tonic and initial positions when compared to unstressed final position [26]. Weakening in final position has been confirmed by articulatory studies [28] and has been shown to be gradient, with greater weakening in word-medial codas than in absolute word-final position. In onsets, the Spanish lateral tends to be alveolar [22, 29]. Place of constriction is affected by flanking vowels with more retracted articulations in back-vowel contexts [22].

2. METHOD

2.1. Speakers

The data come from a corpus of previously collected EPG recordings [18]. The current sample includes 11 speakers – four for French and seven for Spanish. All but one (SPA5) were female. The French speakers were 25–29 years old, the Spanish speakers 23–42 years. Among the French speakers, two were from France (FRF1: Cherbourg, FRF2: Clermont-Ferrand) and two from Quebec, Canada (FR1Q1: Chicoutimi, FR2Q2: St-Jean-sur Richelieu). The Spanish participants were from Buenos Aires, Argentina (SPA1-5), Havana, Cuba (SPC1), and Madrid, Spain (SPS1). All participants lived in Canada at the time of testing (mean years of residence: European French 10; Spanish 5) and spoke English as a second language. However, they all continued to speak their L1 at home, at work (the majority were teachers/translators of their native language), and in social situations.

2.2. Materials

Target /l/ appeared syllable-initially and -finally as a singleton consonant or in a cluster with a labial consonant. As the materials were drawn from an existing corpus of EPG recordings, the number of items was not fully balanced across conditions. For French, the list consisted of 20 lexical items: 9 words with singleton onset /l/ (e.g., *lapin* 'rabbit', *collègue* 'colleague'), 7 words with /l/ in an onset cluster (e.g., *flocon* 'flake', *meubler* 'furnish'), 3 words with singleton coda /l/ (e.g., *final* 'final'), and a single word with coda /l/ in a cluster (*illisible* 'illegible'). For Spanish, the list consisted of 27 lexical items: 9 words with singleton onset /l/ (e.g., *laca* 'lacquer', *absoluto* 'absolute'), 9 words with /l/ in an onset cluster (e.g., *flaco* 'thin', *Biblia* 'Bible'), 5 words with a singleton coda /l/ (e.g., *final* 'final'), and 4 words with a coda /l/ cluster (e.g., *calmante* 'calming'). Each word was produced in isolation and in a carrier phrase (French: *Dis__encore une fois* 'Say__again'; Spanish: *Digo__otra vez* 'I say__again'). The French utterances were produced 4-6 times (839 total tokens; 210 tokens per speaker on average). The Spanish carrier phrase utterances were produced 9 times, while isolated words were produced twice (1479 total tokens; 211 tokens per speaker on average). Adjacent vowel context and stress were not controlled for but were examined in the statistical analysis.

2.3. Instrumentation and analysis

EPG is a common method for investigating contact patterns in coronal consonants including laterals [28, 32, 36]. The recordings for the study were made using the WinEPG system [43] at a sampling rate of 100 Hz. A custom-made palate with 62 electrodes was made for each participant. Those for French participants were of the Articulate model [42] whereas those for the Spanish speakers were of the older Reading-style. While the former palate can have somewhat better coverage of dental and velar places, both devices are similar at measuring contact differences within places [19]. Both artificial palates have a grid of 62 electrodes that can be represented with 8 columns and 8 rows (with the first row containing only 6 electrodes). The first four rows correspond to the denti-alveolar region where /l/ is typically produced [13].

The data were annotated based on the waveform and spectrogram using the Articulate Assistant

software [43] with boundaries for /l/ marked at the onset and offset of the closure. For each token, linguopalatal contact values ('1' or '0' for each electrode) were automatically extracted from the frame of maximum contact. Following [28], we examined two variables, namely, the amount of contact in the first and last four rows of the palate, Qa4 and Qp4 (Quotient of maximum activation over the anterior or posterior regions of the palate, from 0.00 to 1.00), calculated as the number of contacts activated divided by the total number of contacts in the region (30 and 32, respectively).

The data were analysed using linear mixed effects regression (LMER) models implemented with the lme4 package [3] using R [27] separately for Qa4 and Qp4. Fixed factors were Language (French, Spanish), Position (onset, coda), Type (isolated word, carrier sentence), and Structure (singleton, cluster); random intercepts were included for Vowel Context (front, back), Word, and Speaker. In cases of non-convergence, the model was simplified by removing Vowel Context. For each analysis, likelihood ratio tests were used to compare the full model to a nested model excluding the factor of interest, employing the Anova() function of the lmerTest package [21]. Pairwise comparisons and posthoc tests (with a Bonferroni correction for multiple comparisons) were performed using the phia package [10].

3. RESULTS

3.1. Positional differences in anterior contact: Between-language comparison

To examine patterns in the amount of contact in the anterior part of the palate (Qa4), we submitted the data to an LMER model containing interactions of the full set of fixed factors (Language, Position, Type, Structure). The model produced significant interactions of Language and Position (p <.05), Language and Type (p <.05), Type and Structure (p <.05), and Position and Type (p <.0001). The top panel of Figure 1 illustrates the variation in Qa4 as a function of these factors. Given the significant interactions with Type, we performed separate analyses for isolated words and those in carrier phrases. The first model produced significant effects of Structure (more contact in singleton /l/ than in clusters; p <.05) and a significant Language and Position interaction. The latter was due to Spanish speakers producing more contact in the anterior region than French speakers, however, only in codas (p <.05). There were no other significant differences. The model for the carrier phrases produced a significant effect of Position (p <.0001) and a significant interaction of Language and Position (p <.05). A posthoc test showed that positional differences were limited to French speakers, who produced /l/ with less contact in the anterior region in codas than onsets (p <.0001).

3.2. Positional differences in posterior contact: Between-language comparison

A full model for the amount of posterior contact (Qp4) produced a 4-way interaction of Language, Position, Type, and Structure (p <.0001). Qp4 differences among these factors are illustrated in the bottom panel of Figure 1. As with Qa4, we performed two separate analyses by Type. The model for isolated words produced a significant effect of Position (p <.0001): /l/ was produced with less contact in the posterior region in codas. There were no other significant effects or interactions, indicating that positional differences held for both language groups and both syllable structure conditions. The model for carrier phrases resulted in significant effects of Position and Structure (both p <.0001). Again, the lateral was realized with less contact in codas than in onsets; in addition, /l/ was produced with less contact in clusters than as a singleton consonant. The lack of interactions with Language suggest that these differences held for both groups.

3.3. Individual positional differences in Qa4 and Qp4

As discussed above, the French group showed the expected positional effect in both the anterior (in carrier phrases) and posterior portions of the palate, while onset-coda asymmetries were observed for the Spanish group in the posterior portion alone. A closer examination of individual results, however, showed that the French positional effect was due to the Quebec speakers. Specifically, FRQ1 and FRQ2 exhibited relatively large-scale coda reduction in anterior (Qa4 0.21 and 0.15, respectively) and posterior contact (Qp4 0.18 and 0.16). In contrast, European French speakers FRF1 and FRF2 produced no such differences in Qa4 (in fact, negative -0.03 and -0.08) and relatively small differences in Qp4 (0.07 and 0.08). Individual models testing for Position, summarized in Table 1, revealed that differences were significant for the Quebec speakers but not for their European counterparts. The same analyses for the Spanish group showed relative uniformity. There were no significant positional effects in anterior contact for any of these speakers (with overall differences ranging from -0.02 to 0.05, approaching significance for SPA2 and SPS1). At the same time, these speakers showed the expected significant positional differences in posterior contact, albeit not as high in magnitude (ranging from 0.06 to 0.11) as for the Quebec French speakers.

Figure 1: Boxplot of anterior (Qa4; top) and posterior contact (Qp4; bottom) by Position and Type by Language group (FR = French, SP = Spanish).

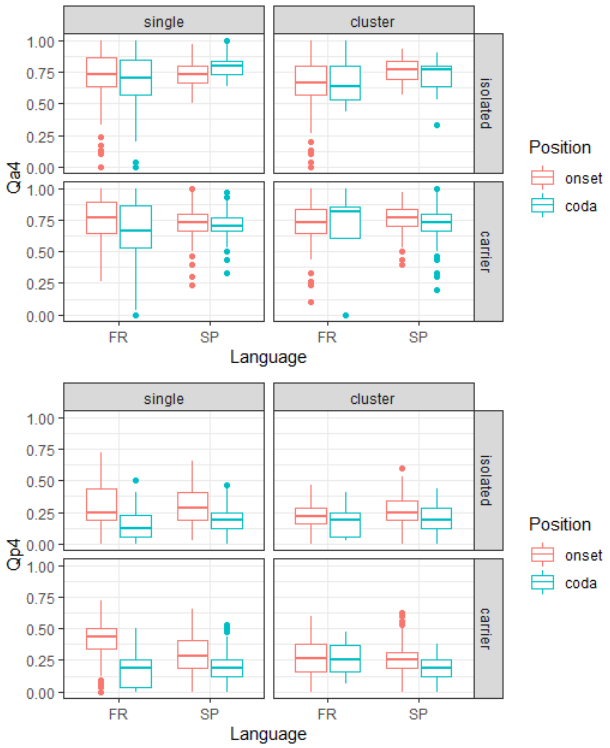

Table 1: A summary of individual model comparisons for Position in anterior (Qa4) and posterior contact (Qp4); '***' <0.001, '**' <0.01, '*' <0.05, 'n.s.' = not significant.

Speaker	Position	
	Qa4	Qp4
FRF1	n.s.	n.s.
FRF2	n.s.	n.s.
FRQ1	*** (onset > coda)	** (onset > coda)
FRQ2	** (onset > coda)	*** (onset > coda)
SPA1	n.s.	* (onset > coda)
SPA2	n.s.	* (onset > coda)
SPA3	n.s.	* (onset > coda)
SPA4	n.s.	* (onset > coda)
SPA5	n.s.	** (onset > coda)
SPC1	n.s.	** (onset > coda)
SPS1	n.s.	** (onset > coda)

4. DISCUSSION

For the Quebec French and non-European varieties of Spanish but not the European French speakers, the present findings are consistent with the proposed cross-linguistic existence of gradient gestural syllable effects as well as with language-specific patterns of coda consonant reduction. The absence of differences among our Spanish speakers is surprising given previous reports of full assimilation of laterals to following consonants in Caribbean varieties [16] and the overall tendency for higher rates of coda consonant reduction in Argentine and Cuban Spanish vis-à-vis Peninsular Spanish [17]. The present study also reveals the possible effects of speech type (isolated versus contextualized), phonetic context (singleton versus clusters), and language variety. The effect of type is in keeping with much previous research that has regularly shown greater lenition in more fluent, contextualized speech [e.g., 41]. The finding of less posterior contact in clusters than with singleton /l/ in carrier phrases is consistent with reports of shorter duration and partial devoicing of laterals in voiceless-obstruent-lateral clusters [8, 25]. In the future, a more balanced dataset would allow to determine whether such differences are related to obstruent voicing or rather syllabic structure.

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