

The Emergence of Turkish Approximant Frication*

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Abstract: This study examined acoustic realizations of Turkish /l/ and /r/ in various phonetic contexts. The results revealed that, not only /r/, but also /l/ are produced with frication in word-final position, especially before a high front vowel /i/. On this basis, a natural class uniting /r/ and /l/ is proposed. The proposal is consistent with the Emergent Feature Theory by Mielke (2004) who argues that phonological features are abstract categories based on generalizations that emerge from phonological patterns rather than the other way around.

1. Introduction

The status of /r/ and /l/ as members of the same natural class of liquids is controversial among phonologists due to variations in their phonological behaviors cross-linguistically as well as their differing phonetic characteristics, rendering the notion that both are ‘smooth’ sounds or sounds that ‘flow easily’ insufficient for their unification. In addition, laterality is considered oversimplified and inadequate to reflect their articulatory differences (e.g., Hamid and Alhjouj, 2013). Specifically, besides lateral air channeling, the production of /l/ also involves ‘a radical obstruction’ (Chomsky and Halle, 1968, p. 302) along the center of the tongue. In contrast, the approximation between the tongue and the alveolar or post-alveolar regions for the production of various allophones of /r/ is not amount to a constriction, with air being allowed to flow freely through the center of the oral cavity.

According to Mielke (2004) the contradicting gestures between a central occlusion and an alternative free passage along the side of the tongue in /l/s’ production may lead them to align with both [-cont] sounds, characterized by an occlusion, and with [+cont] sounds whose articulation involves a free passage. This suggests that features are not necessarily absolute, and that there is the possibility for both the presence and absence of features that may have once been thought to be unable to co-occur. Mielke argues that features are simply abstract generalizations that can be made based on certain phonological patterns. From this, one can assume that boundaries of so-called natural or unnatural classes (the grouping of two or more natural classes) are perhaps not as rigid as the terms (i.e., natural versus unnatural) may suggest, and that featural classification of speech sounds depends on language-specific acoustic realizations and phonological patterning rather than on innate, universal features. The inconsistency in the categorization of the /l/ and /r/ from language to language is, therefore, not a surprise, as acoustic realizations of these two sounds and their phonological environments may vary. This study argues for the class of liquids in

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Turkish. Specifically, we will provide acoustic data to show that, similar to /r/, /l/ is also lenited in the same environments.

2. /l/ and /r/ lenition in Turkish

According to Kirchner (2013), lenition refers to both synchronic alternations and diachronic sound changes, whereby a sound becomes "weaker," or where a "weaker" sound bears an allophonic relation to a "stronger" sound (p.1). For consonants, this articulatorily involves "reduction in constriction degree or duration" (Kirchner, 2013, p.1) as manifested in a number of phonological processes including degemination or reduction of long to a short consonant, flapping or reduction of a stop to a flap, spirantization or reduction from a stop or an affricate to a fricative or an approximant, etc. The focus of this study is the spirantization of Turkish /r/ and /l/ in a variety of phonetic contexts.

While Turkish phonology has received some attention in the past, allophonic realizations of Turkish sounds have not been thoroughly discussed by past research. In particular, there has been little past insight into the allophonic realizations of Turkish liquids, namely /r/ and /l/. Turkish IPA charts represent /l/ and /r/ as shown below—the former sound being a lateral alveolar, the latter being an alveolar tap/flap (/r/).

Place Manner	Bilabial		Labio- dental	Alveolar		Palato- alveolar		Palatal	Velar		Glottal
Stop	p	b		t	d				k	g	
Nasal	m			n							
Fricative			f	s	z	ʃ	ʒ				h
Approximate											
Central			v					j			
Lateral					l						
Flap/tap					r						
Affricate						tʃ	dʒ				

Figure 1 Turkish IPA chart

The few scholars that have described these two sounds (Yavas and Topbas, 2003; Yavuz and Balci, 2011) detail the allophonic status of the /r/ such that it has three main allophones: [r], [r̥], and [r̄]. According to previous observations, [r] occurs in intervocalic environments (e.g., ‘ara’[ara], ‘kere’ [kεrε], ‘sira’ [sira]). While the voiced fricated alveolar flap [r̄] occurs in word-initial position (e.g., ‘resim’[r̄esim] ‘rahat’ [r̄rahat], ‘rende’ [r̄endε]), and the voiceless fricated alveolar flap [r̥] occurs in word-final position (e.g., ‘bir’ [bi̥r̥], ‘dar’ [dḁr̥], ‘ber’ [be̥r̥], as seen in Yavuz and Balci, 2011, p. 25).

Although the frication of the word-final [r] has been observed previously, the lateral alveolar, on the other hand, has only been described as having two allophones, namely [l] and [ɫ], a ‘light’ [l] and a ‘dark’ [ɫ], respectively (Yavas and Topbas, 2003). This paper will argue that Turkish does not only have alveolar flap frication but also has lateral frication. Therefore, in

addition to Yavuz and Balci, 2011’s description of the phenomenon being alveolar flap frication rule, it should be noted that Turkish has an approximant frication rule.

In order to substantiate this claim, many environments of the two approximants in Turkish were recorded by a Turkish native speaker, and each of these environments were analyzed using PRAAT, as will be shown below. The theoretical implications of this study will be further examined in the discussion section.

3. Methodology

Due to the lack of phonetic description of Turkish approximants, a thorough environment set has been created by following the previous literature (Yavuz and Topbas, 2003). In addition to the environments that were used in the previous literature, a geminate consonant environment and an environment in which both approximants follow each other across morpheme boundaries were created. This yields seven different environments for both approximants, /r/ and /l/.

Environments	/r/	/l/
Intervocalic	V r V	V l V
Post-vocalic	V r C	V l C
Word-initial	# r V	# l V
Post-consonantal	C r V	C l V
Repetition	_ r r _	_ l l _
Post-liquid	_ l r _	_ r l _
Word-final	V r #	V l #

Table 1 All the environments tested in this paper. Note that all these environments were paired with both high and low vowel to avoid any confounds due to vowel quality

In order to control for the effect of different vowels, all environments found in the table were recorded using both front and back vowels, namely /i/ and /a/. Table 1 shows all the environments for this study.

The sound files were created such that there was neither a listing effect nor prosodic information on the words to prevent any other acoustic effects on the production of the approximants. In total, there were 28 recordings made, 14 for each approximant with seven paired with the front vowel /i/ and seven with the back vowel /a/. The stimuli were produced by a male native speaker of Turkish from Izmir. The recordings were completed in the United States in a

quite room with a Logitech USB desktop microphone. The sound files were recorded at a sampling rate of 44,100 Hz and an amplitude resolution of 16 bits.

4. Results and Discussion

The results show that similar to /r/, /l/ also becomes fricated when it occurs both in word-final position and in word-initial position when preceding the front vowel /i/. These environments can be seen in Figure 2 below:

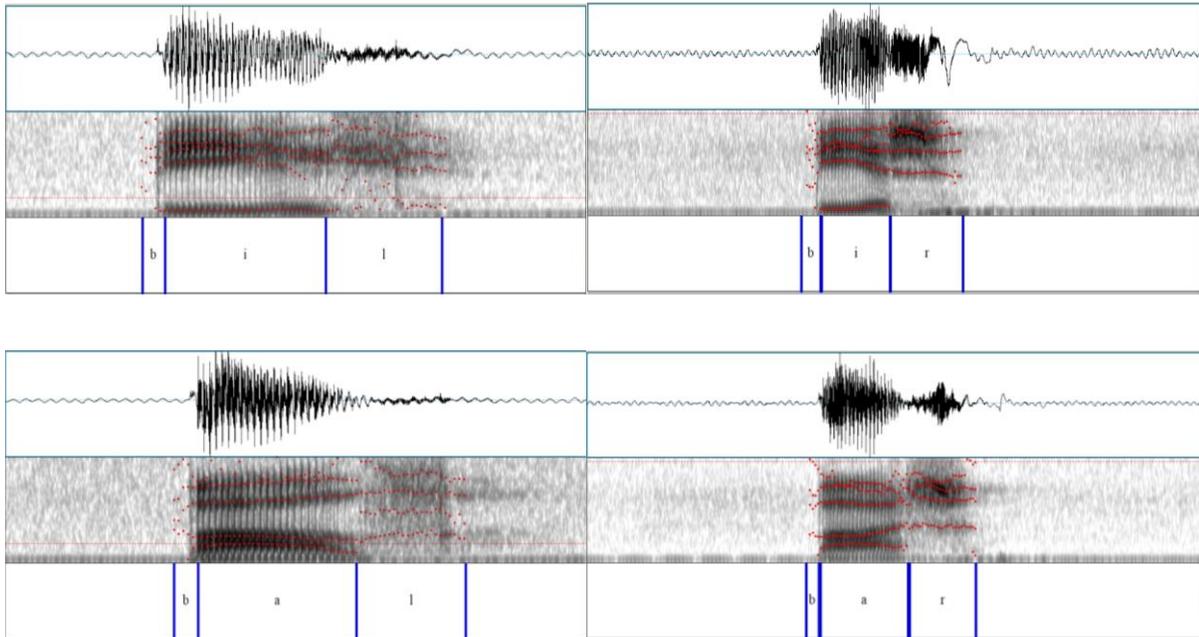


Figure 2 /l/ and /r/ frications in word final positions in [biX] and [baX] minimal pairs

In comparison to all other contexts, frication seems to be stronger when these approximants occur with the high front vowel /i/ (See Appendix A for all the results for each environment). Additionally, the frication of the /r/ is more acoustically concentrated, being both shorter in duration and appearing darker (darkness correlating with acoustic intensity) than the frication of the /l/.

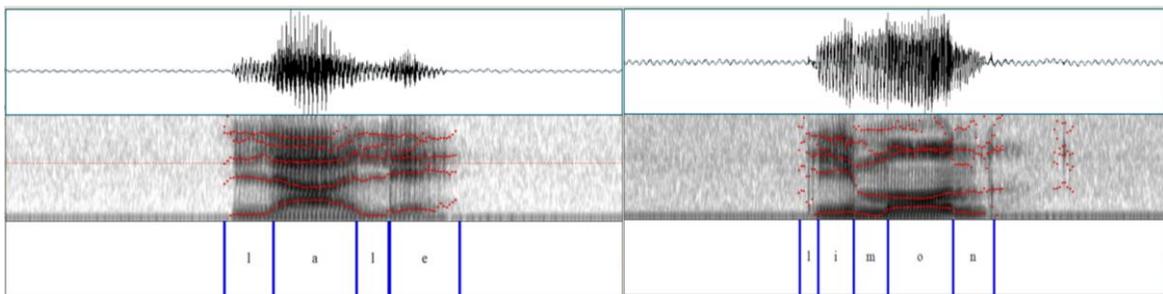


Figure 3 /l/ frication is stronger before a high front vowel [i]

The fact that the frication occurs before the vowel /i/ rather than the back vowel /ɑ/ are consistent with those of previous studies on palatalization (e.g., Bhat, 1974; Picard, 1987; Justeson, 1985; Guion, 1996). According to Bhat (1974, cited in Justeson, 1985), palatalization involves three processes: tongue fronting, tongue raising and spirantization (i.e., frication). Furthermore, these processes are hierarchically implicated such that “tongue raising is involved only if frication is involved and frication is involved only if tongue fronting is involved” (Bhat, 1974, cited by Justeson, 1985, p. 316). In other words, tongue fronting implicates frication and frication implicates tongue raising. According to this account the fricativization of Turkish /l/ and /r/ results from the tongue fronting gesture (or palatalization) induced by the (anticipatory) coarticulatory effect of the following high vowel /i/.

A number of studies have suggested that palatalization in the front vowel context is motivated by acoustic similarity between its target and outputs (Krämer & Urek, 2016). For instance, [ki] and [ti] have been shown to exhibit similar formant transitions (e.g., Plauché, 2001 and reference therein). Ohala (1978) reported that second formant (F2) transition of palatalized labials is more similar to that of dentals than to that of plain labials. Furthermore, turbulent noise created when a plosive is released into a high vowel is similar in duration to the release noise of affricates and fricatives (Kim 2001; Čavar & Hamann 2003; Hall et al. 2006). In addition, Guion (1998) reported a significant perceptual confusion rates between velar plosive [k] and postalveolar affricate [tʃ] when followed by a high front vowel, particularly in a noisy listening condition. In contrast, Bateman (2007) argued that palatalization is the results of temporal overlap between vocalic and consonantal articulatory gestures. In other words, two gestures employing the same articulator, i.e. the tongue, but aiming at different constriction locations resulted in gestural blending. Additional research is needed to explain whether the fricativization process of Turkish /r/ and /l/ are acoustically, perceptually or articulatorily motivated.

5. Conclusion

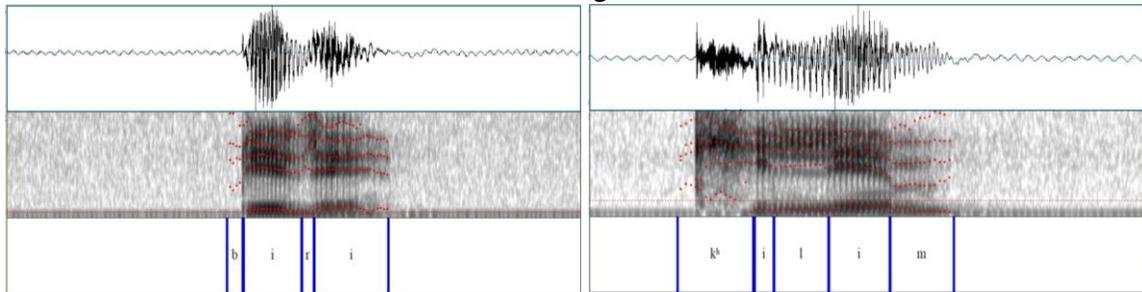
/l/ and /r/ in various positions revealed that both of them are lenited (i.e., spirantized) in the same environment, namely before a high vowel /i/ in word final position due to the palatalization process. Even though the phonetic motivation for Turkish /r/ and /l/ palatalization remains to be investigated, we propose that unlike Arabic, for instance, Turkish /l/ and /r/ should share the same feature and belong to the same natural class. This proposal is consistent with Mielke’s (2004) Emergent Features Theory which, in contrast to the Chomsky and Halle’s (1968) Sound Pattern of English Theory, argues that “features are abstract categories based on generalizations that emerge from phonological patterns rather than the other way around” (p.7).

6. References

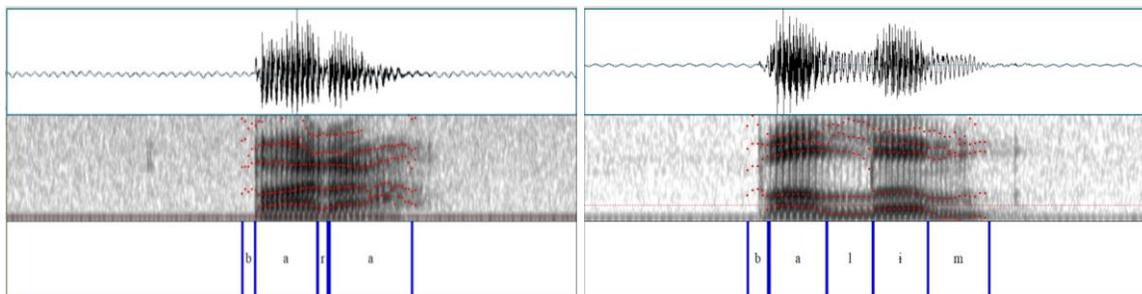
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Appendix

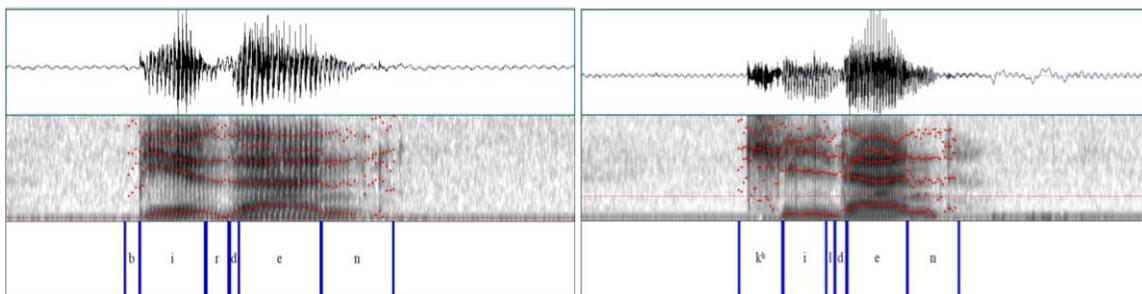
Intervocalic environment for /r/ and /l/ with high front vowel [i]



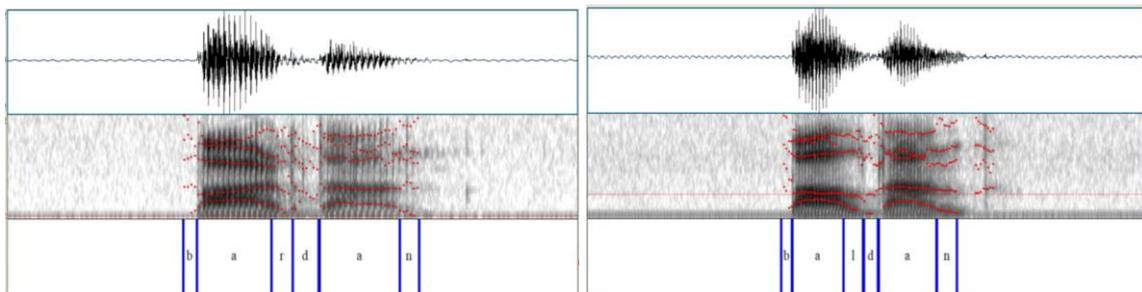
Intervocalic environment for /r/ and /l/ with low back vowel [a]



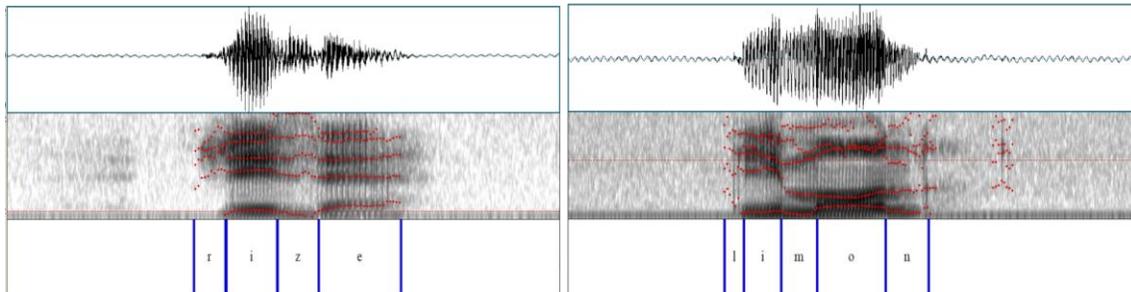
Post-vocalic environment for /r/ and /l/ with high front vowel [i]



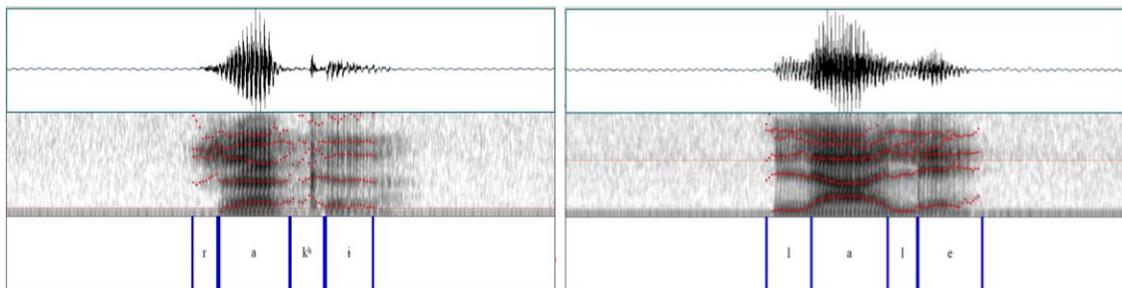
Post-vocalic environment for /r/ and /l/ with low back vowel [a]



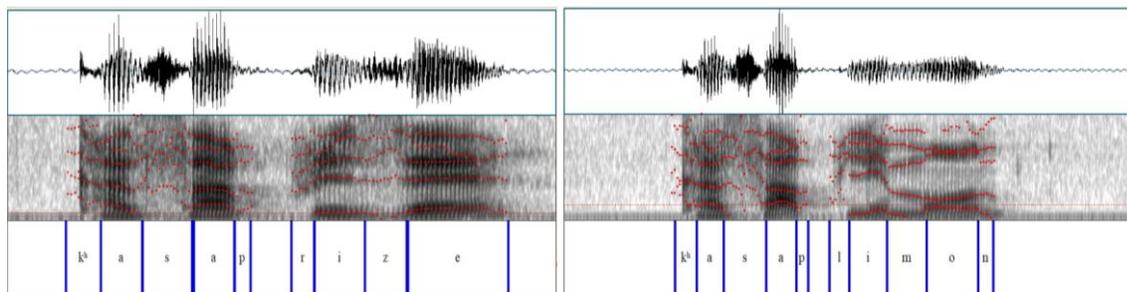
Word-initial environment for /r/ and /l/ with high front vowel [i]



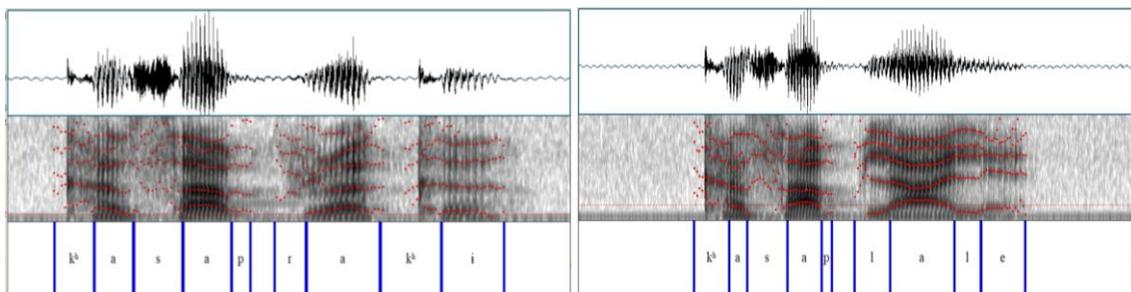
Word-initial environment for /r/ and /l/ with low back vowel [a]



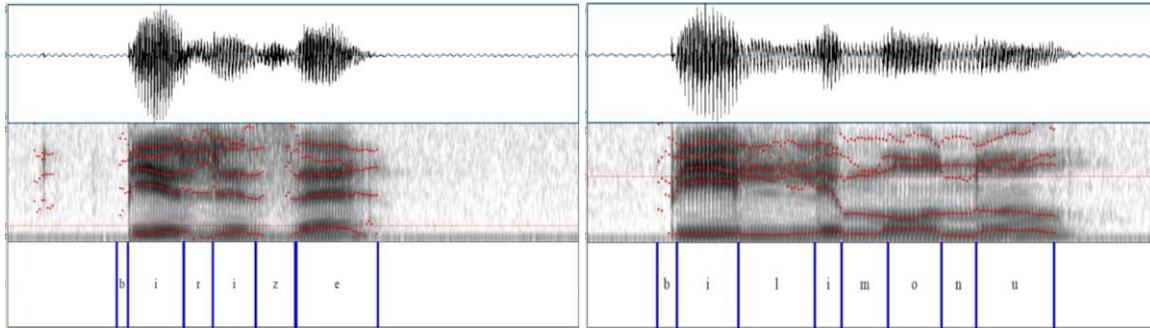
Post-consonantal environment for /r/ and /l/ with high front vowel [i]



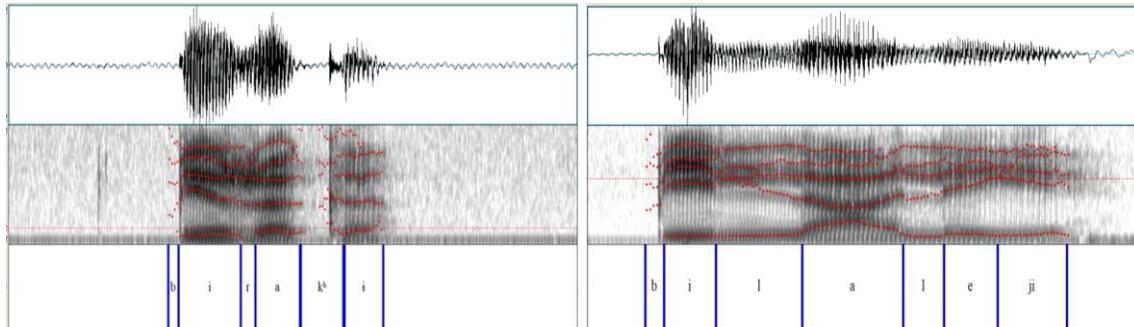
Post-consonantal environment for /r/ and /l/ with low back vowel [a]



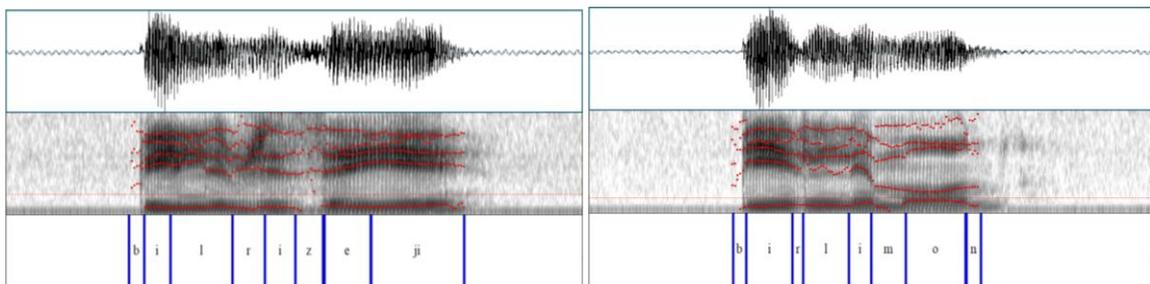
Repetition environment for /r/ and /l/ with high front vowel [i]



Repetition environment for /r/ and /l/ with low back vowel [a]



Post-liquid environment for /r/ and /l/ with high front vowel [i]



Post-liquid environment for /r/ and /l/ with low back vowel [a]

