

Against a Lenition Account of Tapping: Evidence from Yonbyon Korean

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ABSTRACT

The purpose of this study is to revisit the property of tapping, based on the data from Yonbyon Korean. Taps have been described as short segments derived from corresponding stops or trills. It is also widely assumed that tapping occurs due to lenition to minimize articulatory effort. However, Yonbyon Korean data show that taps can occur in strong as well as weak positions. The results of the acoustic experiments conducted in this study show that in syllable-onset position, obstruent taps consistently appear from the underlying laterals, while in intervocalic position, sonorant taps similar to American English taps occur. The results of this study provide evidence against the uniform account of tapping as the result of lenition.

Keywords : tap, flap, lenition, Yonbyon Korean

1. Introduction

Traditionally the tap has been treated as a segment derived from trills—more generally rhotics or even liquids—, or stops, involving contact between the tongue tip/blade and the region on/near the alveolar ridge (Ladefoged 1975; Kahn 1980; Catford 1988; Banner-Inouye 1995; Ladefoged and Maddieson 1996; de Jong 1998). Usually the tap has a very brief contact, and it might have fast movements and short contact. Thus its closure duration appears to be significantly shorter than that for the stop or the trill. The American English tap (or flap), for example, shows the following durational differences from the corresponding stop, even though different experimental studies yield slightly different results:

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Table 1. Mean closure duration of apical taps vs. apical stops (ms)

	taps		stops	
	mean	range	mean	range
Byrd (1993)	29 (all)	9-73 (oral) 8-68 (nasal)	53 (oral)	
Price (1981)	26	0-50	90 ([d])	80-110 ([d])
Wright (1994)	12		46	
Umeda (1977)		25-31 (/t/) 26-38 (/d/)		67-77 (/t/) 63-83 (/d/)
Zue & Laferriere(1979)	26.5	10-40		

(Banner-Inouye 1995: p. 8)

Table 1 shows that generally taps are much shorter than the corresponding stops, with approximately half the duration of alveolar stops. It also shows that taps show a wide range of variation. In addition, stops in American English tend to have a larger constriction area on the palate compared to taps, in terms of average 3.8 millimeters for stops and average 1.88 millimeters for taps (Saw 1993).

However, except for the alternation relationship between a trill/stop and a tap, and extra short duration of the tap, the phonetic characteristics which the tap shows are various. For example, Ladefoged (1975) points out that the tap allophone of a trill is a different articulation from the tap allophone of a stop. They are argued to be regarded as comprising a single class of "tap" only because they are auditorily similar. For this reason, the tap realized as an alveolar rhotic on the surface can be described with the feature combination [+sonorant, +continuant], distinguishable from the corresponding stops. On the other hand, the tap which is realized as a voiced alveolar stop on the phonetic representation can be described with the feature [+voice] to be distinguished from [t] and [-sonorant], from [r] (Banner-Inouye 1995; Steriade 2000).¹⁾

Despite these various phonetic characteristics the tap shows, it is uncontroversially argued to be derived from the corresponding stop or trill in terms of lenition. That is, the tap can be seen to be a weakened version of the other segment types. As the contact of the tap is brief, and thus short, the tap is considered to have a reduced oral stricture as compared to the stop or the trill. Thus this property of reduction is easily associated with lenition. American English Tapping, for example, is argued to result from some reduction in constriction degree and/or duration of an alveolar stop /t/ or /d/, to a tap (Kahn 1980; Kirchner 1998). Thus like all other segments triggering lenition, the tap occurs more readily in prosodically weak position. According to the typological survey of taps from 65

1) As a reviewer points out, both sonorant and obstruent taps are described with the same IPA symbol, [ɾ].

languages by Banner-Inouye (1995), the tap is found more often in either final or intervocalic position, typical lenition environment, but rarely in syllable-initial position.

In this study we will observe a very different type of tap in the Yonbyon Korean dialect, spoken in China. More specifically, Yonbyon Korean has two or three different types of taps from the corresponding laterals and one type of those does not look fit into the cross-linguistic pattern of the taps as discussed above. Thus the purpose of this study is to revisit the property of tapping, based on the Yonbyon Korean data, through the results of acoustic measurements and the spectrographic data.

2. Methods

2.1 Stimuli

The test tokens were constructed considering various segmental and phonological contexts in which the underlying laterals occur as shown below. Since our test words were selected from the words which are frequently used in Yonbyon Korean, we had less control over the segmental environment in which each /l/ occurs. Put simply, its adjacent segments appeared to be various.

(1) test words

a. intervocalic /l/

yulæ	'origin'	sulyæk	'hydraulic power'
kolip	'isolation'	halu	'a day'
pola	'violet (color)'		

b. word-initial /l/

lotŏŋ	'labor'	lyəmchi	'sense of honor'
lukak	'pavilion'	lakwon	'paradise'
læil	'tomorrow'		

c. post-obstruent /l/

kyækli	'isolation'	kuklo	'a national highway'
pökli	'compound interest'	hwaklyul	'probability'
siklyan	'food'	hyöpkyæk	'cooperation'
hapli	'reasonableness'	pöpkyul	'law'
pöpkyön	'law'	haplyu	'joining'

d. post-nasal /l/

tamlyæk	'courage'	simli	'mentality'
samlim	'forest'	pəmlam	'inundation'

imlyək	'lunar calendar'	sənlo	'railroad'
punlan	'disorder'	inlyu	'humankind'
kinlo	'labor'	manli	'very long way'

The phonetic realizations of /l/s in four different phonological contexts were tested and each test word was recorded in an isolated form.

2.2 Subjects and Recording

Two native speakers (one male, one female) of Yonbyon Korean participated in the recording. All speakers were born and raised in Yonbyon, China and spent less than one year in South Korea. They both had no reported history of either speaking or hearing disorders. The recording was done in a sound-proof booth at the Korea University of International Studies, using Audio Technica AT818II microphone and Sony DAT Recorder. Before recording, each speaker was asked to read a few randomly chosen test tokens to familiarize themselves with the material. Then they were asked to read each test word three times in random order, at a natural, comfortable speed. The test sentences were presented in Korean orthography. Both subjects were paid for participating in the experiment.

2.3 Analysis

The recorded data were stored as files and then waveforms and wide-band spectrograms for each token were generated; using MULTI-SPEECH (model 3700) software package. The judgments among various phonetic forms of /l/ were based on the waveforms, spectrograms and recorded sounds. Both authors of this study examined the test tokens for the portion of one repetition by both the male and the female speakers and then the first author did the rest of phonetic analysis based on their results of examination.

3. Results

3.1 Spectrographic Data

The phonetic realization of the Yonbyon Korean laterals is as follows:

/l/s in word-initial position

In word-initial position, all underlying laterals realized as "obstruent taps" (30 tokens out of 30) show a short closure with a strong release in spectrographic data as in Figure 1.²⁾ In some cases, a short duration of frication noise follows the release.

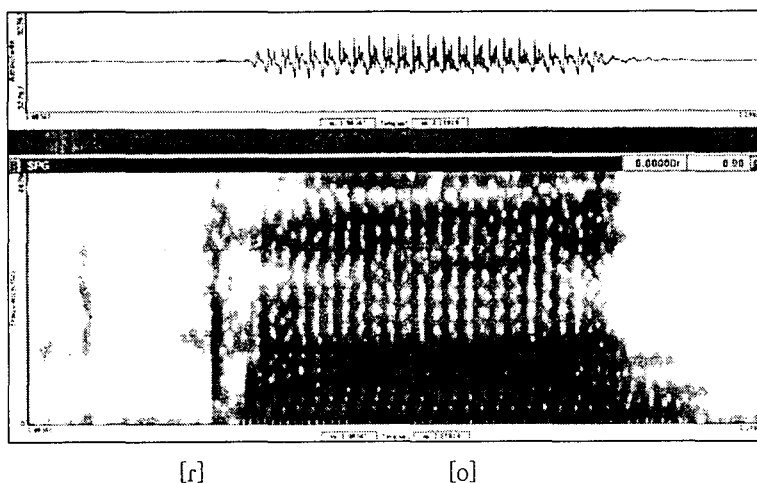


Figure 1. /loton/ → [rodon]

/l/s in intervocalic position

The underlying /l/s in intervocalic position are realized as “sonorant taps” with rather clear formant patterns, even though they are weaker than those of vowels (26 tokens out of 30), which is shown in Figure 2 below. This formant pattern is very similar to that of an intervocalic /l/ in (south) Korean (and also in many other languages). In the remaining four tokens of singleton /l/ which are all from the female speaker, obstruent taps appear. The main acoustic difference of the sonorant taps from the lateral approximants is a short duration and the weaker formant patterns.

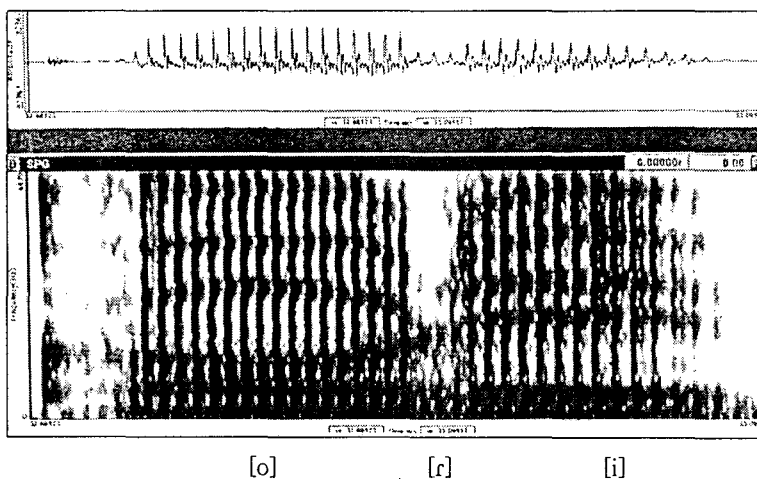


Figure 2. /kolip/ → [kɔrip]

- 2) Following Banner-Inouye (1995) and Steriade (2000), we assume that the phonetic realizations of taps as stops or fricatives involve with the feature specification of [-sonorant]. See Steriade (2000: p. 322) for more information.

/l/s in post-obstruent position

The sequence of an underlying obstruent such as /p/ or /k/ plus a lateral are realized as a corresponding nasal and a tap on the surface (29 out of 30 tokens), the latter of which appears to be a stop with a very short closure and a strong release. The remaining token is a nasalized tap, which shows a formant pattern in the place of closure, but at the same time a very strong release is followed. Several tokens of /l/s show a short period of frication noise. One representative example is given in Figure 3.

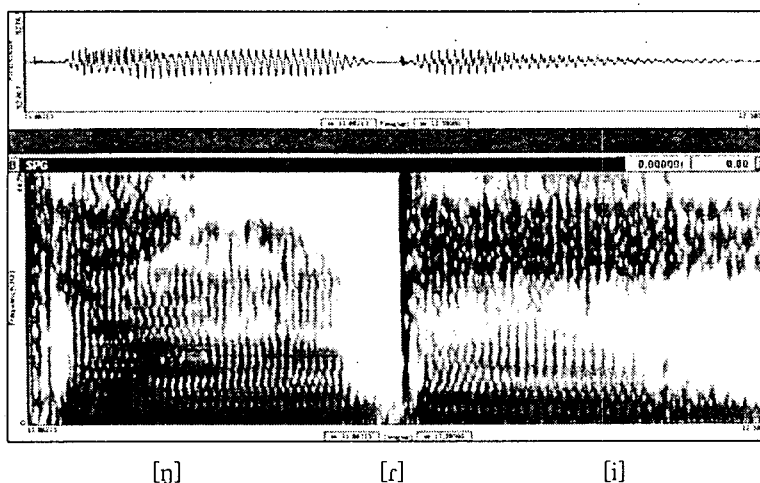


Figure 3. /kæki/ → [kæŋri]

/l/s in post-nasal position

The phonetic realization of the underlying /l/s after nasals (/m/ and /n/) is more complicated than that of post-obstruent /l/s, which is presented in Table 2.

Table 2. Phonetic Realization of the Underlying Sequence *Nasal + Lateral*
(number of tokens):

context	subject						sum
	male			female			
	N+T	N+L	LL	N+T	N+L	LL	
Labial N_	15	0	0	15	0	0	30
Alveolar N_	1	5	9	4	1	10	30

(N=nasal, T=tap, L=lateral, LL=lateral geminate)

Table 2 shows that place of articulation of the preceding consonants is crucial in the phonetic realization of the underlying laterals. When the preceding nasal is labial, namely, /m/, all tokens are realized as an obstruent tap, a short stop with a strong release, even

though the preceding nasal is without any change. Thus summarizing this result with that of the post-obstruent laterals, we can say that whether the preceding consonants are underlyingly obstruents, or nasals, they are all nasalized on the surface, and the following laterals are represented as taps. However, when the nasal is alveolar ($/n/$), almost half of the sequence of a nasal plus a lateral is realized as a lateral geminate (19 tokens out of 30), similar to Korean. For example, the underlying form $/inlyu/$ 'humankind' is realized as $[illyu]$ on the surface. Even in the case where the preceding nasal is preserved, the underlying $/l/$ is more likely realized as a lateral, not a tap. Only five tokens of taps appear in the post-nasal position (out of 30). The surface realization of $/l/$ s following underlying nasals are presented in Figure 4, for a bilabial nasal and in Figure 5, for an alveolar nasal.

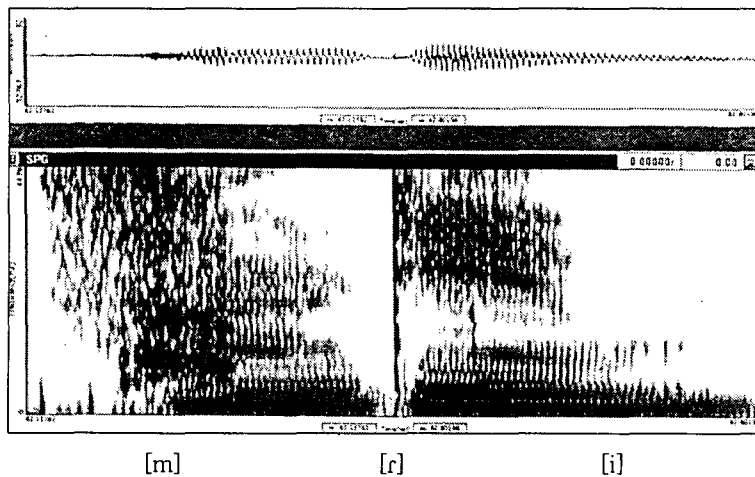


Figure 4. $/samlim/ \rightarrow [samrim]$

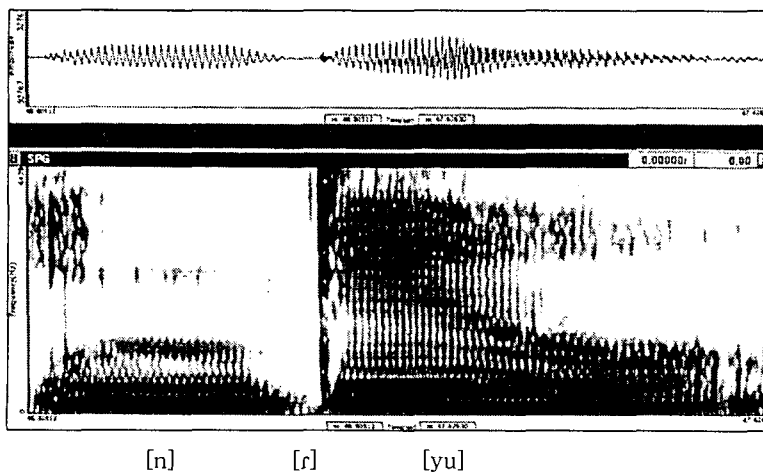


Figure 5. $/inlyu/ \rightarrow [inryu]$

The asymmetry between the labial and the alveolar nasals in tapping of the following laterals is closely related with the articulatory movement of the tap gesture. A tap is defined as having a certain part of the tongue strike against the roof of the mouth and then return to its rest position. The movement of the tongue tip toward the alveolar ridge is a crucial aspect of the successful tap gesture. However, if coronal alveolar contact which is for the alveolar nasal, /n/, is immediately before the tap, the tongue will tend to economically maintain the alveolar contact it began during the /n/, rather than a nasal and a tap. This blocks the occurrence of tap in this environment; instead lateral geminates occur. Similar avoidance of the consecutive coronal gestures is found in the glottalization of /t/ in English. In the word 'beaten', for example, where the tap gesture for /t/ is immediately followed by another coronal gesture for /n/, the return of the tongue tip after the contact against the alveolar ridge is not successful because the immediately following segment requires another coronal gesture. As a result, the tap is replaced by a glottal gesture in this case (Kahn 1980; Banner-Inouye 1995).

3.2 Mean closure duration of taps in intervocalic vs. post-consonantal positions

The mean closure duration and the duration of the burst and the following transition of the underlying laterals in each phonological position are presented in Table 3 and Table 4, respectively.

Table 3. Mean closure duration of intervocalic vs. post-consonantal taps (ms):

	intervocalic		post-obstruent		post-nasal	
	mean	range	mean	range	mean	range
male	30.97	19.2-46.6	15.25	1.1-34.14	10.58	3.0-25.1
female	41.84	27-57.9	25.15	5.0-54.2	27.79	16.8-44.6
sum	36.4		20.20		20.19	

Table 4. Mean duration of Burst+Transition of word-initial vs. post-consonantal taps (ms):

	word-initial		post-obstruent		post-nasal	
	mean	range	mean	range	mean	range
male	33.4	17.7-57.1	15.5	5.0-21.9	14.66	4.5-33.1
female	14.7	8.4-24.9	14.2	7.3-33	13.46	7.6-21.9
sum	24.05		14.85		14.06	

Table 3 shows that the tap has a very short closure duration whether it is sonorant (intervocalic) or obstruent (post-consonantal). Moreover, it shows a wide range of values. The difference of the mean closure duration values between the male speaker and the female speaker is also very large. Also there is noticeable duration difference between

intervocalic and post-consonantal positions which can be explained with the general effect of prosody on duration. If we see the results of the acoustic measurements by Silva (1992), the mean closure duration of bilabial and alveolar stops is 23 ms. in post-nasal position. Considering the fact that in Silva's study, each stop is included in a carrier sentence, we are safe to say that taps in Yonbyon Korean show much shorter values of closure than the corresponding stops.

Word-initial taps are not included in the data because it is hard to measure the closure duration of segments in initial position. Thus for the tap in word-initial position, the duration of the burst and the transition was considered as in table 4. The duration of burst and the following transition of the word-initial taps is much longer than that of post-consonantal taps, but again much shorter than that of the corresponding stops: 35 ms in Han and Weitzman (1970) and 61 ms in Silva (1992).

Summarizing our findings, the phonetic realization of the Yonbyon Korean laterals varies according to the adjacent segments and the phonological positions in which each segment occurs. Intervocalic laterals are realized as sonorant taps, while after consonants, or in word-initial position, obstruent taps appear with a short closure and a strong release.

4. Summary and Phonological Implication

The spectrographic data and the results of the acoustic measurements of the underlying laterals in Yonbyon Korean show that it has two different types of taps on the surface. Intervocalically, the underlying lateral is realized as a sonorant tap with a weak formant pattern. However, in syllable onset position, whether word-initially or post-consonantly, it is realized as an obstruent tap with a short closure and a strong release. This is schematically represented as in (2).

$$(2) \quad /l/ \quad \rightarrow \quad [r1] \quad / \quad \sigma \quad [_ \\ \rightarrow \quad [r2] \quad / \quad V_V$$

The occurrence of the post-consonantal tap in Yonbyon Korean reveals an interesting issue with respect to the general status of tapping. As discussed earlier in this study, it is widely assumed that tapping is lenition, triggering the reduction of the stricture, and thus shortening of the closure. All the cases discussed in the Banner-Inouye (1995)'s survey based on 65 languages are involved with the lenition process: taps are derived from the corresponding trills or stops in order to minimize the articulatory effort. Generally trills or stops are realized with increased closure duration at the onset of the

syllable, while they are tapped with extra-short duration of closure in the prosodically weak positions such as final or intervocalic position. American English is a typical example of this. Also the sonorant tap in Yonbyon Korean, which appears in intervocalic position, could be treated as the result of lenition.

However, in Yonbyon Korean, another type of tap consistently appears in syllable-initial position, which is clearly a prosodically strong position. Further this type of tap is basically an obstruent, namely, a short stop or in a limited case, a short fricative. The post-consonantal or word-initial tap in this dialect does not look fit into the description of the tap, even though it shows extra short duration and also an alveolar contact. In this respect, the obstruent tap in syllable-initial position cannot be easily grouped together with the sonorant tap; it cannot be explained in terms of lenition.³⁾ Instead, the post-consonantal tap is likely to maintain the consonantal strength in a strong position, as a less sonorous segment. Note that (south) Korean data shows a corresponding nasal in the same environment (/kyækli/ → [kyæŋni] 'isolation'). The nasalization of the underlying lateral is clearly a process lowering the sonority scale. In Yonbyon Korean, however, the selected output for a non-lenited one should also maintain the "liquidity" of the underlying lateral because it can help the listener to retrieve the underlying segment. Thus the optimal output satisfying the two conditions, maintenance of consonantal strength in syllable-initial position and maintenance of liquidity, might be an obstruent tap.

In conclusion, various types of taps occur, depending on the phonological or segmental position in which each type of tap occurs, and thus they cannot be treated in a uniform manner, namely, in terms of the lenition process. The Yonbyon data clearly provide a counter evidence to the analysis of taps as the result of lenition.

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3) Alternatively, this unattested type of tapping can be explained with the assumption that the tap, not the lateral, is an underlying segment of the Yonbyon Korean liquids. That is, the occurrence of [r] in syllable onset position may not be the result of lenition; it may be the phonetic realization of the underlying liquid without any change in property. Kang, Han and Baik (in preparation) for a detailed analysis.

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