

## VOICE ASSIMILATION IN MARATHI

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## ABSTRACT

This article discusses voice assimilation phenomenon in Marathi, an Indo-Aryan language. The goals of this study are three-fold: i) to provide empirical evidence for regressive assimilation in Marathi as claimed in previous studies by Junghare (1969), ii) to check whether obstruents and breathy voice can undergo and/or trigger voice assimilation, iii) to investigate what type of language Marathi belongs to based on Wetzels and Mascaró's (2001) language typology. The results show that Marathi exhibits voice assimilation as stipulated by Junghare, and it belongs to type II languages that have voice assimilation and no word-medial and word-final devoicing.

**Keywords:** Marathi, voice assimilation, voicing, devoicing, Voice Onset Time (VOT)

## I. Introduction

In their article "The Typology of Voicing and Devoicing", Wetzels and Mascaró (2001) grouped languages into different types according to the presence of word-medial and word-final devoicing in addition to voice assimilation. The languages were divided into 4 types. Type I includes German, a language that has word-final and word-medial devoicing, but there is no voice assimilation. An example of type II is Yiddish, which does not have word-medial or word-final devoicing, but voice assimilation occur in its consonant cluster. Dutch is an example of type III. Type III language has devoicing word-medially and word-finally, as well as voice assimilation. Type IV languages, i.e. Berber, does not have devoicing or voice assimilation.

The focus of this study is Marathi, an Indo-Aryan language that has a four-way stop contrast based on voicing and aspiration. The distinction between Marathi and the other languages is that sonorants as well as affricates in this language can also have aspiration. This paper, however, will focus only on the four-way contrast of stop series. The table below shows the oral stops existing in Marathi (Berkson 2012: 28)

Table 1. Marathi Oral Stops

<b>BILABIAL</b>	p	p <sup>h</sup>	b	b <sup>h</sup>
<b>DENTAL</b>	t	t <sup>h</sup>	d	d <sup>h</sup>
<b>RETROFLEX</b>	ʈ	ʈ <sup>h</sup>	ɖ	ɖ <sup>h</sup>
<b>VELAR</b>	k	k <sup>h</sup>	g	g <sup>h</sup>

Previous study on Marathi's phonology was carried out by Junghare (1969: 41-42) who claimed that there is a regressive voice assimilation in Marathi. The voiced obstruent will undertake devoicing when it precedes a voiceless obstruent, whereas the voiceless obstruent will become voiced when it is followed by a voiced obstruent. The followings are examples of voice assimilation provided by Junghare. We can see that voice assimilation occurs in affricate-stop cluster (1 and 2), fricative-stop sequence (3), as well as stop-stop cluster (4).

1. Aj + ca → adca → atca 'of today'
2. Wajəta → wajta → wazta → wasta 'striking'
3. Kac + ghər → kasghər → kazghər 'glasshouse'
4. Ladəto → ladto → latto '(he) loads'

Junghare (1969) also described that the retroflex stop [ɖ] does not assimilate in voicing. When the retroflex stop is found in a consonant cluster that does not agree in [voice] feature, it will change into a flap. Junghare's hypothesis regarding voice assimilation in Marathi raises some questions. From data 3, we can see that a voiced aspirate triggers the voicing of a preceding fricative. Vaux's (1998) claim, based on empirical evidence from different languages, is that voiced fricatives are specified as [-spread]. Since the specifications of a breathy voiced (voiced aspirate) are [voice] and [spread glottis], the assimilation of a voiceless fricative into a voiced fricative is nearly impossible because of the conflict in the feature [spread]. Consequently, the aims of this study can be formulated as follows:

- a. To investigate whether there is regressive voice assimilation in Marathi.
- b. To investigate which obstruents undergo voice assimilation. Can voiced aspirates (breathy voiced) trigger assimilation for the preceding fricative?
- c. To determine which type does this language belong to according to Wetzels and Mascaró's typology.

In section 2 of this paper, the methods of the experiment and the description of points that will be analyzed are explained. Section 3 includes the measurement of VOT average of initial stop and that it is similar to Yiddish in the typology of voicing and devoicing, as well as exemplifying the findings on voice assimilation in consonant cluster. Conclusion can be found in section 4.

## II. Methods

Five native speakers of Marathi, three males and two females (ranging in age from 20 to 30), were recorded in a sound-treated room at the University of Iowa. The speakers read a list of words consisted of Marathi's four stops series (i.e. voiced, voiced aspirate, voiceless, and voiceless aspirate) available in initial, intervocalic, and final position. Consonant clusters of stops and fricative-stop were also included in the list (see Appendix). The duration of voice onset to stop

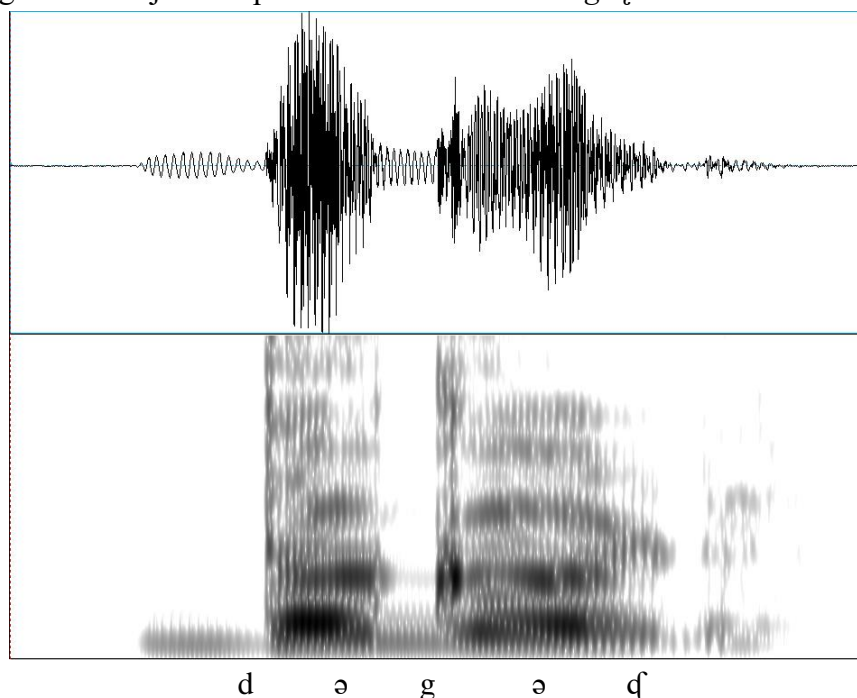
release is measured for initial stops, whereas the presence of voicing for word-final stops is noted in order to check for syllable final devoicing. The analysis of the data includes:

- a. VOT measurement of each obstruent in initial position
- b. The presence of voicing in final position.
- c. The presence of voicing in consonant cluster: Is there regressive voice assimilation?
  - Voiced stop – voiceless stop
  - Voiceless stop – voiced stop
  - Affricate – stop cluster
  - Affricate – affricate cluster

### III. Findings and Discussion

If we look at the spectrogram of a word in Marathi below (e.g. [dægəɖ]), we can see that Marathi is a true voiced language because devoicing does not occur in word-medial or word-final position. The spectrogram below clearly shows the prevoicing of the initial stop [d], the prevoicing of the middle stop [g] and the voicing of the final stop [ɖ] up until closure. Moreover, if we take Junghare's analysis regarding voice assimilation in Marathi into account, it means that Marathi can be categorized as a type II language, like Yiddish.

- (1) Spectrogram of subject 1's production of the word *dægəɖ* 'stone'



Voice Onset Time was used by Lisker and Abramson (1964, in Beckman et.al. 2011) to differentiate stops in aspirating language like German. The negative VOT indicates voiced stops, short-lag VOT signifies voiceless stops, and long-lag VOT specifies voiceless aspirated stops. The

average VOT of initial stops in Marathi and Hindi was measured by Lisker and Abramson (1964, in Berkson 2012: 29) and the result can be seen below

Table 2. Average VOT of velar stops in Hindi and Marathi (in ms)

	/k/	/kʰ/	/g/	/gʰ/
<b>Hindi</b>	18	92	-63	-75
<b>Marathi</b>	24	87	-116	-89

(data from Lisker & Abramson 1964: 398<sup>2</sup>)

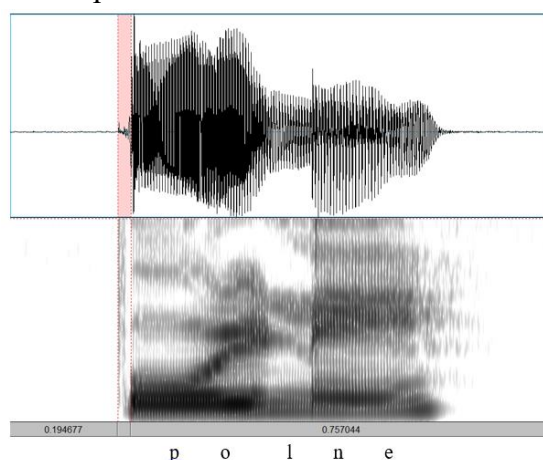
If we compare the results of Marathi's VOT that Lisker and Abramson calculated with the result of average VOT that I computed in table 3 below, we can see that the difference is not significant. The hierarchy of VOT from the highest to lowest is T<sup>h</sup> > T > D<sup>h</sup> > D.

Table 3. Average VOT of initial stops in Marathi

Place of Articulation	Voiced	Voiced aspirate	Voiceless	Voiceless aspirate
Bilabial	-85	-69	16	- <sup>1</sup>
Dental	-81	-81	15	51
Retroflex	-115	-93	9	72
Velar	-90	-82	30	94

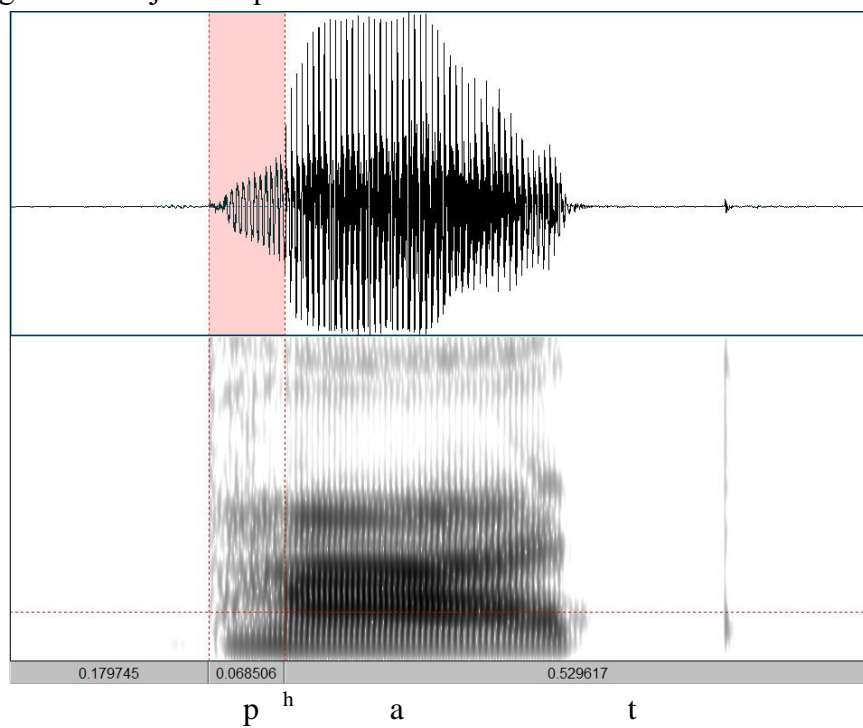
77 out of 80 tokens of word initial voiced and breathy voiced shows prevoicing. The three tokens which do not exhibit voicing were three different words spoken by two different subjects (see spectrogram 2, 3, and 4 below). Therefore, this devoicing of word initial stop does not have any significance to the analysis that Marathi is a true voice language.

(2) Spectrogram of subject 5's production of the word *bolne* 'talk-3sn'

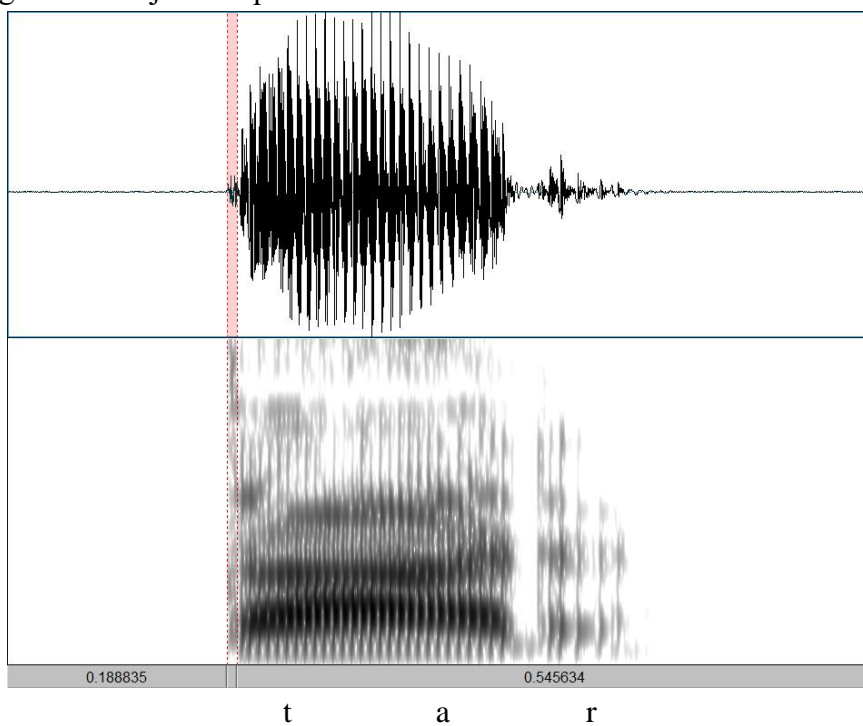


<sup>1</sup> Bilabial voiceless aspirate /pʰ/ is not calculated because the subjects pronounce it as a fricative /f/.

- (3) Spectrogram of subject 5's production of the word *bhat* 'rice'



- (4) Spectrogram of subject 3's production of the word *dar* 'door'



This section looks at whether Junghare's claim (1969) on regressive voice assimilation in Marathi can be justified or not. Based on the examples that she provided, it seems that all obstruents (including stops, fricatives, and affricates) assimilate in voicing depending on the [voice] feature of the following obstruent, except for voiced retroflex which assimilate into a flap in a consonant cluster. I divide this section into 5, looking at different combination of consonant clusters to see whether regressive voice assimilation really occurs in Marathi.

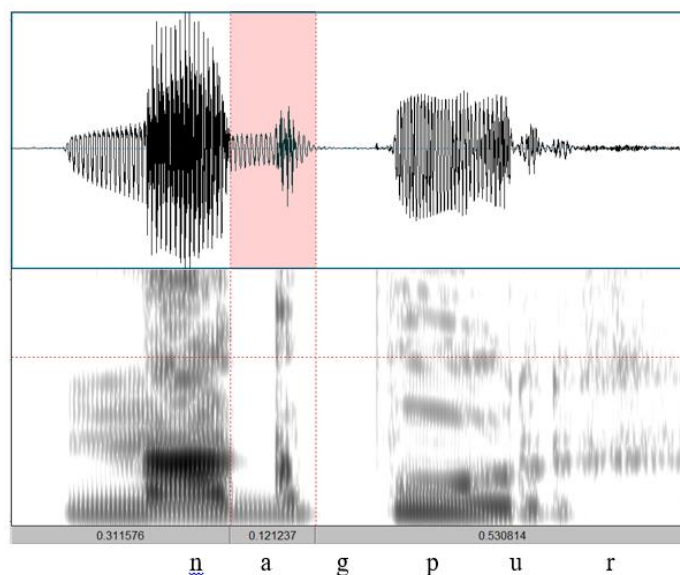
### Voiced stop-voiceless stop cluster

The following is the list of words with voiced-voiceless stop cluster.

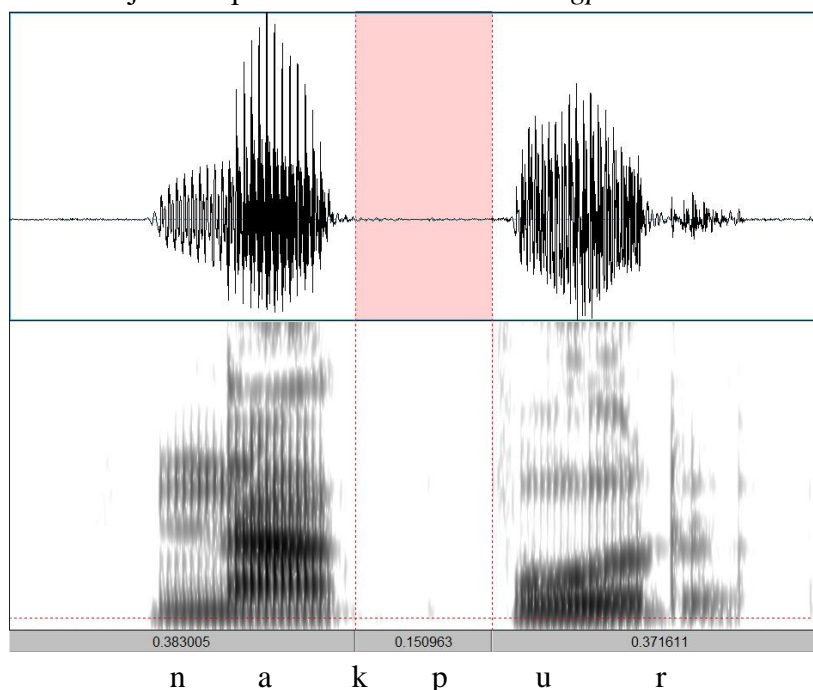
- a. Nagpur = Nagpur
- b. puḍḱe = a small packet
- c. toḍṭe = picks.pres.3sf
- d. khoḍḱar = naughty
- e. chiḍḱaa = snappish
- f. aḍḱan = hitch
- g. waḍḱpyaa = waiter

From the list, we can see that only the first word has a cluster consisted of voiced velar stop and voiceless bilabial stop. Three out of five spectrograms of the word *Nagpur* show that the voiced velar stop devoiced when it precedes voiceless bilabial stop. The other two showed that voicing can still be maintained in a voiced-voiceless cluster in a careful speech where the voiced stop is being released, as shown by spectrogram (5). When the first stop in the consonant cluster is not released, it is more likely that voice assimilation occurs. Notice the absence of voicing in spectrogram (6) compared to spectrogram (5).

(5) Spectrogram of subject 2's production of the word *Nagpur*

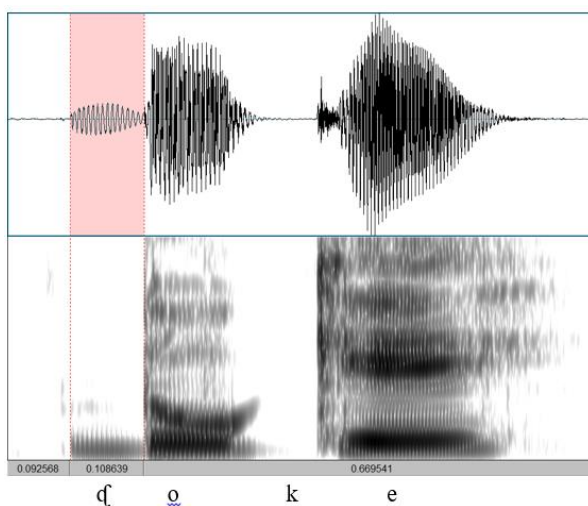


(6) Spectrogram of subject 3's production of the word *Nagpur*

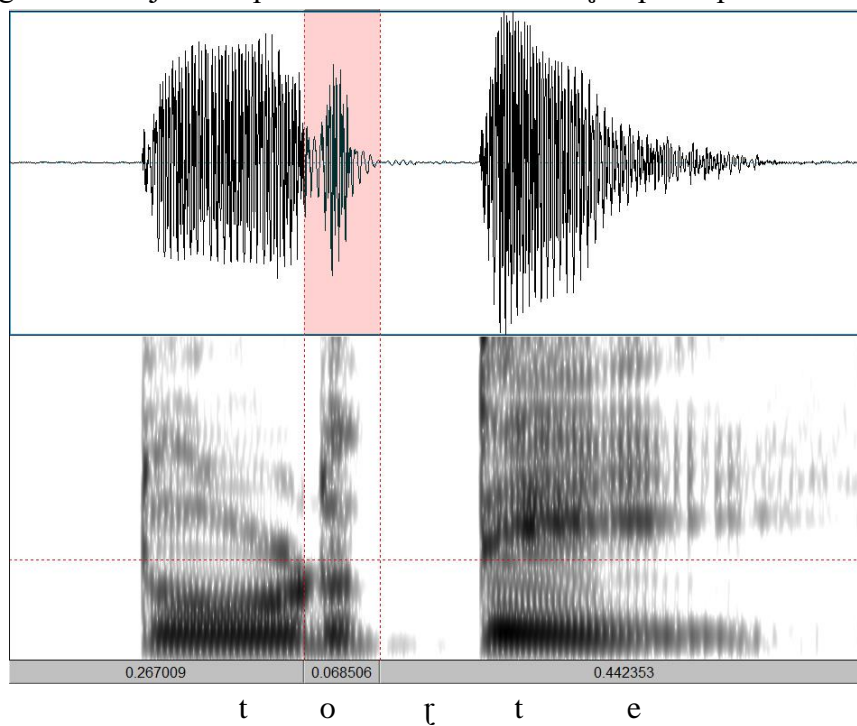


The rest of the words in the list were analyzed to prove Junghare's claim that voiced retroflex does devoiced in a consonant cluster as it will change into a flap. The result of analysis shows that this claim is true, as illustrated by spectrogram (7) and (8). Spectrogram (7) portray [ɖ] in word-initial position. If we compare it with spectrogram (8), we can see the difference that shows voiced retroflex [ɖ] assimilated into a flap, thus devoicing is not possible.

(7) Spectrogram of subject 2's production of the word *qoke* 'head'



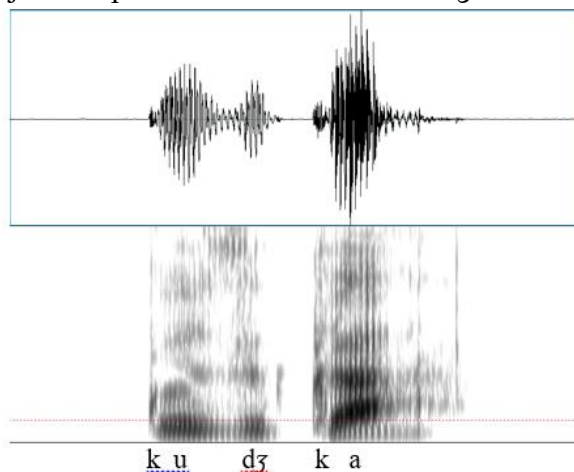
- (8) Spectrogram of subject 3's production of the word *toqte* 'pluck.pres.3sf'



### Voiced affricate-voiceless stop/affricate cluster

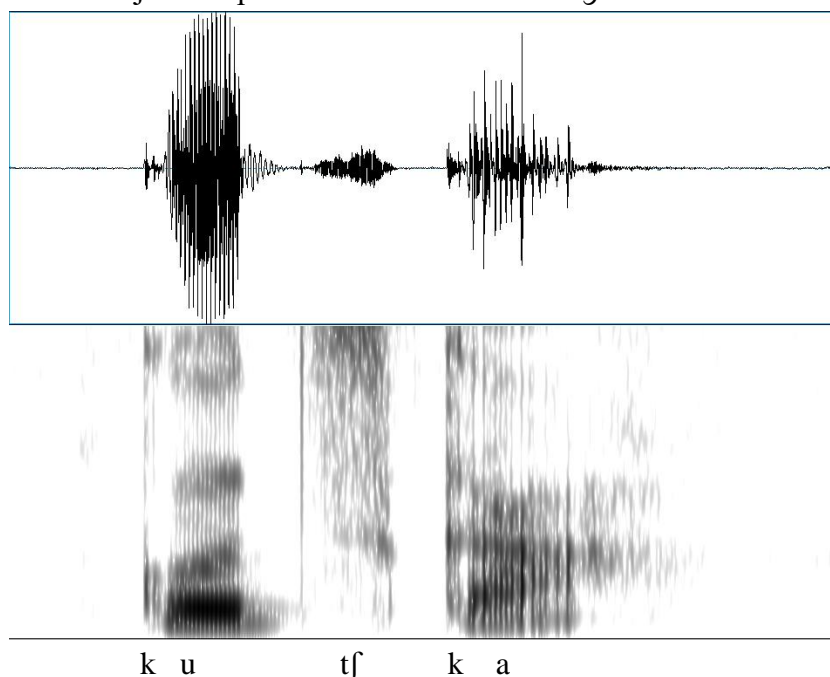
There is only one example of voiced affricate-voiceless stop cluster in the data, i.e. *kudʒka* 'rotten'. Apparently, regressive voice assimilation happens in this sequence (spectrogram 10), although 3 out of five speakers maintained the voicing of the first consonant in the cluster, as illustrated by spectrogram (9). In spectrogram (9), we can see the voicing along with the frication of the affricate /dʒ/, while in spectrogram (10) voicing only occurs during closure, but it does not last along with the frication.

- (9) Spectrogram of subject 1's production of the word *kudʒka* 'rotten'





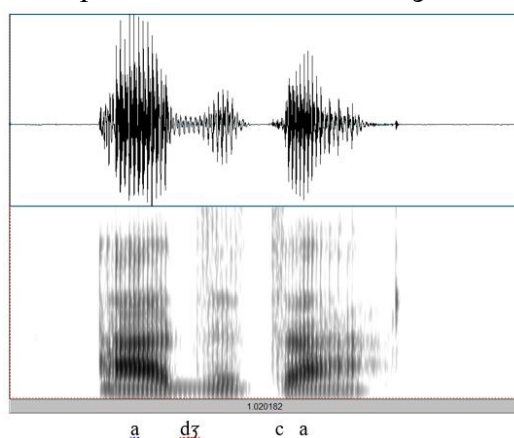
- (10) Spectrogram of subject 5's production of the word *kudʒka* 'rotten'



### Voiced affricate-voiceless affricate cluster

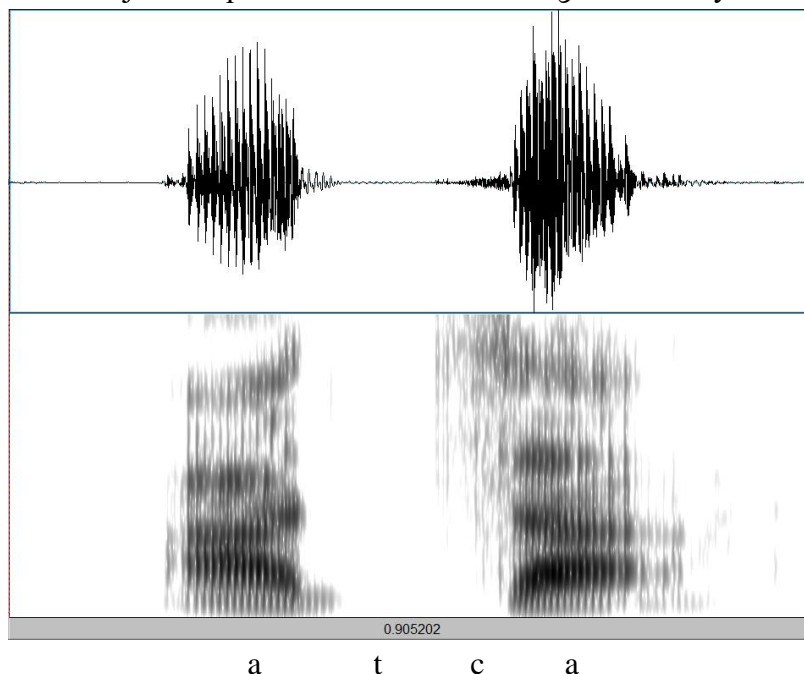
A sequence of voiced affricate and voiceless affricate is included in this study in order to ascertain the possibility of voice assimilation in clusters other than stops cluster. There is only one word that has this voiced-voiceless affricates sequence, which is *adʒca* 'of today'. Out of the five subjects, three of the outcomes show voice assimilation. It seems that Junghare's hypothesis (1969) regarding voice assimilation of voiced-voiceless affricates is correct. If you compare the spectrograms below, you can clearly see the devoicing of the first affricate in the sequence. From spectrogram (11), we can notice that the voicing of the first affricate in the cluster is maintained by releasing the affricate, as indicated by the gray bar in the middle of the spectrogram.

- (11) Spectrogram of subject 1's production of the word *adʒca* 'of today'



The idea that voicing can be maintained by the release of the affricate or stop is also supported by the following spectrogram. When the following spectrogram is compared to the previous one, it is obvious that there is no release of affricate in between the consonant cluster, thus delinking of [voice] feature occurred as the preceding affricate agrees with the voice feature of the following consonant.

(12) Spectrogram of subject 3's production of the word *adʒca* 'of today'



### Voiceless stop-voiced stop cluster

Below is the list of tokens with voiceless-voiced stops cluster.

- a. *topq̃i* = small cap of a baby
- b. *taapdayk* = annoying
- c. *potdar* = surname
- d. *ekda* = once
- e. *əphgət* = accident
- f. *kaapq̃a* = cloth
- g. *saapdle* = find (intr)-past-3sm
- h. *təbəkq̃ii* = flying saucer

Out of 40 tokens, only 27.5% are produced with voice assimilation in the consonant cluster. Subject 3, 4, and 5 are the ones that usually assimilate the [voice] feature of the initial consonant depending on the [voice] feature of the following consonant in the consonant cluster. Voice assimilation never occurs in the speech of subject 1 and 2. From the graph below, we can see that the consonant cluster in two words, *topq̃i* and *təbəkq̃ii*, does not undergo voice assimilation,

whereas for the other words, there are two speakers that assimilate the consonant cluster for each word in average.

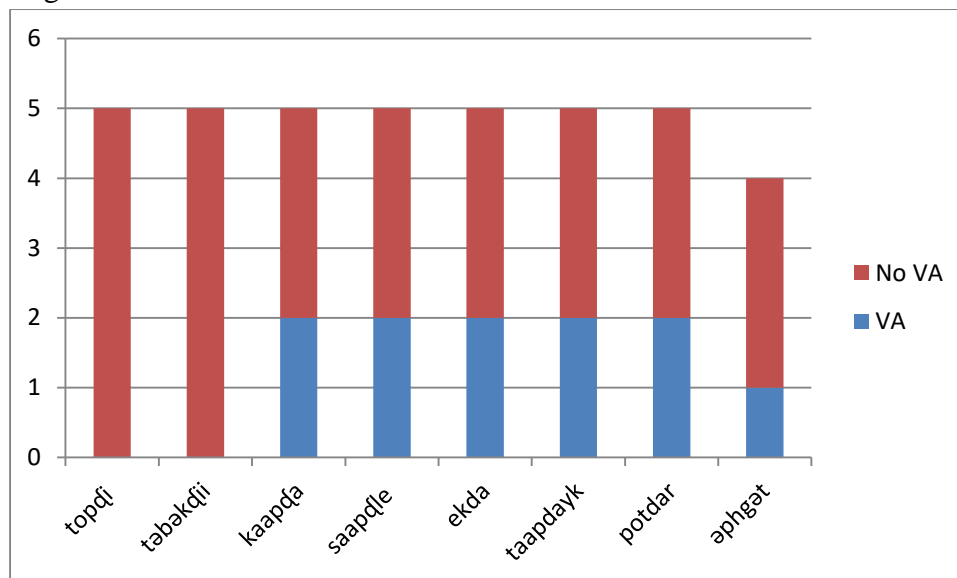
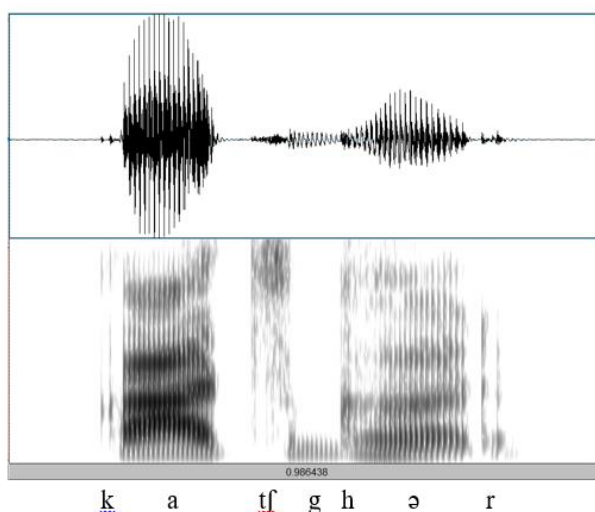


Figure 1. The occurrence of voice assimilation (VA) in the tokens

### Voiceless affricate-voiced stop cluster

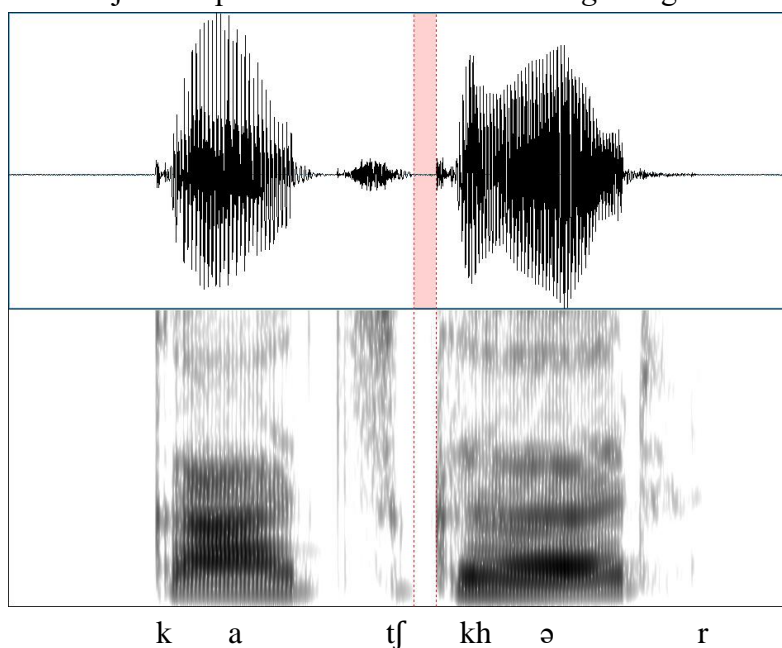
If we refer to Vaux's claim (1998) regarding the specification of voiced fricatives which is [-spread], the fact that a breathy voiced can trigger the voicing of a voiceless fricative seems to be unfeasible as voiced fricatives and breathy voiced have opposing specification for [spread glottis]. Therefore, it is very interesting to see if voice assimilation does happen in the consonant cluster in *kac+ghər* 'glass house'. From the analysis of the spectrogram, we can see that there is no voicing of a voiceless fricative that is triggered by a voiced aspirate, as portrayed by (13) below.

(13) Spectrogram of subject 3's production of the word *kac+ghər* 'glass house'



On the other hand, the spectrogram of the fifth speaker shows an irregularity where there is no prevoicing for the breathy velar stop. Does this mean that the breathy voiced stop delinked its [voice] feature as the influence of the preceding voiceless fricative? Further data is needed to check this assumption.

(14) Spectrogram of subject 5's production of the word *kac+ghar* 'glass house'



#### IV. Conclusion

The empirical data support Junghare's claim that regressive voice assimilation occurs in Marathi. In addition, obstruents can trigger voice assimilation, whereas the breathy voice shows conflicting results. Moreover, from the result of the data analysis, we can conclude that Marathi is similar to Yiddish because it does not have word-final devoicing but some consonant clusters undergo regressive voice assimilation, although the data is not consistent as some speakers did not seem to have voice assimilation in pronouncing consonant cluster. Therefore, it can be assumed that Marathi conforms to the same constraints ranking as Yiddish, that is  $I_{DONS}V_O, A_{GREE} \gg I_{DV_O} \gg *V_O$ . However, the fact that retroflex stop is not prone to voice assimilation may or may not influence this constraints ranking.

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## APPENDIX

		INITIAL	INTERVOCALIC	FINAL	CONSONANT CLUSTER
bilabial	/p/	1 pustək 51 paats	74 kaapus 82 sopa	13 khup 91 saap	30 Nagpur = Nagpur 42 puḍke = a small packet 41 toḍte = picks.pres.3sf 83 khoḍkər = naughty 63 chidkaa = snappish 110 kujka = rotten 106 aḍkən = hitch 60 Aj+ca = of today 107 waḍhpyaa = waiter
	/p <sup>h</sup> /	4 phuphphus 46 phataa	19 sophā 92 nəpha	34 Saph 102 Toph	
	/b/	49 bolne 50 baaraa	93 kəbər 12 dhobi	11 Gulab 95 Saahib	
	/b <sup>h</sup> /	56 bheṭne 45 bhaat	78 ubhe 86 abhaaw	3 jibh 73 lobh	
Dental alveolar	/t/	52 Tī 18 Tas	1 pustək 2 səntə	72 gəwət 33 Sat	94 təbəkḍi = flying saucer 31 topdi = small cap of a baby 9 Kachghər = glass house 62 taapdayk = annoying 40 potdar = surname 48 ekda = once 75 kaapḍa = cloth 59 saapḍle = find (intr)-past-3sm 65 əphgət = accident
	/t <sup>h</sup> /	57 thuṅkii 16 thaarj	14 ithe 47 shithil	79 anaath 77 saath	
	/d/	89 dəgəḍḥ 35 dar	85 kudēl 76 aadhya	39 Naṇand 64 unmaad	
	/d <sup>h</sup> /	70 dhəg 17 dhaar	103 Adhaar 15 aadhi	101 əpəradh 58 Mədh	
Retroflex	/ṭ/	100 ṭol 84 ṭaats	104 khiṭi 24 khiṭi	7 boṭ 67 paathpot	96 wədhək = attractive 61 aṅgtha = thumb 69 paadəp = plant
	/ṭ <sup>h</sup> /	55 ṭhəraw 38 ṭhaam	21 kuṭhe 44 kaathhi	71 oṭh 20 kaath	
	/ḍ/	5 ḍōke 53 ḍag	105 saadḍi 87 chəḍḍi	97 haadḥ 89 dəgəḍḥ	
	/ḍ <sup>h</sup> /	108 ḍhol 23 ḍhaal	6 daḍhii 88 kaadḥne	25 waadḥ 66 gaadḥ	

Velar	/k/	85 kudel 26 kakh	29 eka 90 kaka	1 pustək 99 taak	
	/k <sup>h</sup> /	13 khup 28 khas	8 Mukh 43 aakhaaḍḍaa	26 kakh 32 nəkh	
	/g/	72 gəwət 54 gaal	98 Saudagər 89 dəgəḍḍ	70 dhəg 80 wig	
	/g <sup>h</sup> /	22 ghər 37 ghaar	109 Nighuun 68 bəghaa	81 ogh 36 aagh	

- |                                   |   |   |
|-----------------------------------|---|---|
| 1. [pustək] पुस्तक = book         | 23. [d̪haal] ढाल = shield                     | 44. [kaaθhi] काठी = stick / cane        |
| 2. [səntə] संत = saint            | 24. [khiθi] काटेरी = thorny                   | 45. [bhaat] भात = rice                  |
| 3. [jibh] जीभ = tongue            | 25. [waad̪h] वाढ = serve him/her!             | 46. [phataa] फाटा = fork (in road)      |
| 4. [phuphphus] फुप्फुस = lung     | 26. [kakh] काख = armpit                       | 47. [shithil] शिथिल = relax             |
| 5. [d̪oke] डोके = head            | 27. [pote] पोते = sack                        | 48. [ekda] एकदा = once                  |
| 6. [daθhi] दाढी = beard           | 28. [khas] खास = special                      | 49. [bolne] बोलणे = talks               |
| 7. [boθ] बोट = finger             | 29. [eka] एका = one                           | 50. [baaraa] बारा = twelve              |
| 8. [mukh] मुख = face              | 30. [nagpur] नागपुर = Nagpur                  | 51. [paats] पाच = five                  |
| 9. [Kacghər] काच घर = glass house | 31. [topdi] टप्डी = a small cap/hat of a baby | 52. [ti] ती = she                       |
| 10. [rutuu] ऋतू = season          | 32. [nəkh] नख = nail                          | 53. [d̪ag] डाग = stain                  |
| 11. [gulab] गुलाब = rose          | 33. [saat] सात = seven                        | 54. [gaal] गाल = cheek                  |
| 12. [dhobi] धोबी = washerman      | 34. [saph] साफ = clean                        | 55. [θəraw] ठराव = decision             |
| 13. [khup] खुप = a lot            | 35. [dar] दार = door                          | 56. [bheθne] भेटणे = meet               |
| 14. [ithe] इथे = here             | 36. [waagh] वाघ = tiger                       | 57. [thuŋkii] थुंकी = spit              |
| 15. [aadhi] आधी = previously      | 37. [ghaar] घर = kite                         | 58. [mədh] मध = honey                   |
| 16. [thaar̪i] थाळी = plate / dish | 38. [θaam] ठाम = firm (mentally)              | 59. [saapd̪le] सापडले = found           |
| 17. [dhaar] धार = sharpness       | 39. [nənənd] नणंद = husband's sister          | 60. [aj ca] आज चा = of today            |
| 18. [tas] तास = hour              | 40. [potdar] पोतदार = Potdar                  | 61. [angtha] अंगठा = thumb              |
| 19. [sofa] सोफा = sofa            | 41. [toθte] तोडते = she plucks                | 62. [taapdayk] तापदायक = annoying       |
| 20. [kaaθh] काठ = edge            | 42. [puθke] पुडके = a small packet            | 63. [chidkaa] चिडका = snappish / grumpy |
| 21. [kuthe] कुठे = where          | 43. [aakhaad̪aa] आखाडा = arena                | 64. [unmaad] उन्माद = arrogance         |
| 22. [ghər] घर = house             |   |   |



- |                                     |   |                               |
|-------------------------------------|---|-------------------------------|
| 65. [apghaat] अपघात = accident      | 88. [kaadhne] काढणे = draw/extract        | 108. [dhol] ढोल = drum        |
| 66. [gaadh] गाढ = sleep tight       | 89. [dagad] दगड = stone                   | 109. [nighuun] निघून = depart |
| 67. [paathpot] पाठपोट = both sides  | 90. [kaka] काका = uncle                   | 110. [kujkaa] कुजका = rotten  |
| 68. [baghaa] बघा = look             | 91. [saap] साप = snake                    |                               |
| 69. [paadap] पादप = plant           | 92. [napa] नफा = profit                   |                               |
| 70. [dhag] ढग = cloud               | 93. [kabar] कबर = tomb                    |                               |
| 71. [oth] ओठ = lips                 | 94. [tabakdi] तबकडी = flying saucer       |                               |
| 72. [gawet] गवत = grass             | 95. [saahib] साहेब = sir                  |                               |
| 73. [loobh] लोभ = greed             | 96. [wadhak] वेधक = attractive / striking |                               |
| 74. [kaapus] कापूस = cotton         | 97. [haad] हाड = bone                     |                               |
| 75. [kaapda] कपडा = cloth           | 98. [saudagar] सौदागर = trader, merchant  |                               |
| 76. [aadhye] आद्य = primary/first   | 99. [tak] ताक = buttermilk                |                               |
| 77. [saath] साथ = company           | 100. [tol] टोल = grasshopper              |                               |
| 78. [ubhe] उभे = stand              | 101. [aparadh] अपराध = fault / crime      |                               |
| 79. [anaath] अनाथ = orphan          | 102. [toph] तोफ = cannon                  |                               |
| 80. [weg] वेग = speed               | 103. [adhaar] आधार = support              |                               |
| 81. [ogh] ओघ = flow                 | 104. [khi] खिटी = bolt                    |                               |
| 82. [sopaa] सोपा = easy             | 105. [saadi] साडी = saree                 |                               |
| 83. [khodkar] खोडकर = naughty       | 106. [adkan] अडकण = hitch                 |                               |
| 84. [taats] टाच = heel              | 107. [wadhpaya] वाढप्या = waiter          |                               |
| 85. [kudel] कुदळ = hoe              |   |                               |
| 86. [abhaaw] अभाव = absence         |   |                               |
| 87. [chadi] छडी = rod / small stick |   |                               |