

Deocclusion of Sanskrit *dh* after front vowels

Problem

(1) examples in Vedic

noun: *gṛhā*- ‘house’ < PIE *g^hrd^hó-. (*gehyà*-, *géhya*-, *gehá*-). *rohít*-, *róhita*-,
róhiṇī-, *-lohítá*-.

verb: *dhā:hitá*-, *-hiti*-. *ah*.

suffix: locatival *-dha*/*-ha*, *ihá* ‘here’, *sahá* ‘together’, *kúha* ‘where’,
viśváha/*-ā* ‘everywhere’ :: *ádha* ‘there, then’, *kadha*-, *sadha*-.

locatival *-hi*, *uttaráhi*, *dakṣiṇāhi*.

ending: 1st pl. and du. middle 2ary *-mahi*, *-vahi* etc.

2nd sg. ipv. of athematic stems *-hí*/*-dhí*:

pres.iptv: *ay/i:ihí*, *bravⁱ/brū:brūhí*; *hav/hu:juhudhí*

aor.iptv: *gam:gahí* (*gadhi* RV¹); *kar/kṛ:kṛdhí*, *var/vṛ:vṛdhi*, *śrav/
śru:śrudhí*, *spar/spr:sprdhí*

forms with consistent *h*: *śiśhí* (cf. *śiśādhí*, *śaśādhí*), *kṛṇuhí*/*-ī* (cf. *kṛdhí*,
śṛṇudhí), *sprṇuhi* (cf. *sprdhí*), *ihí*

fluctuating cases: *śṛṇudhí*~*śṛṇuhí*, *-i*; *gadhi*~*gahi*

consistently *dh*: *kṛdhí*/*-ī*, *vṛdhi*, *śrudhí*/*-ī*, *sprdhí*, *juhudhi*, *bodhí*, *yódhi*,
yuyodhí, *edhi*, *śādhí*, *śaśādhí*, *śiśādhí*

(2) An idiosyncratic property of the morpheme in question?:

PIE *-med^(h)h₂ etc.: always Skt. *-mahi* etc

PIE *-d^hi: Skt. *-hí* in most V__ contexts

PIIr. loc.suff. *-d^ha: *-dha* in some words and *-ha* in others

PIE *-d^hyōy (Rix 1976): always Skt. dat.inf. *-á-dhyai*

Skt. adv.suff. *-dhā* ‘-fold’, no ***-hā*

(3) becomes commoner in MIA (Pischel § 188, Geiger § 37, Bloch 1965: 68=65), but still not regular in Aśokan or Pāli:

(4) *h* < *d^h has traditionally been understood as

prākṛtism or dialectal (Ascoli 1868, von Bradke 1886, Meillet 1912/3)

V__V (Wackernagel 1896:252)

Minimal Word effect? *kṛdhí*, *vṛdhi*, *śrudhí*, *sprdhí* (Turner 1927)

juhudhí “to avoid the recurrence of *h*” (Whitney §652) → but *jahihi*

Proposal

(5) no *d^h retained after *i* in the 2sg. imperative forms, even in bimoraic ones: *ihá*, *ihí* :: *kṛdhí* etc., *śiśhí* :: *śiśādhí*, *jahihi* (cf. *juhudhi*)

(6) deocclusion of *d^h after front vowels; *edhí* does not nullify this, if *az > *e* is ordered after the deocclusion of *d^h

palatalization after front V: *d^h > [+distributed] / [-back] __V,

fed to the output filter /j^h/ > *h*. Or,

deocclusion after front V: *d^h > *h* / [-back] __V

(7) cross-linguistic support: Shuri Okinawan (Hattori 1959): *t* > *c* / *i* __.
Shuri *icuku* ‘cousin’ :: Yamato *itoko*, Sh. *fice*: ‘forehead’ :: Y. *fitafi*.

- (8) counterexamples: *dh* in verbal roots, suffix *-dhā*,
 (9) applicable to 1pl. ending **-med^(h)h₂* etc.?
 (10) dialectal tendency?: The NW languages have more forms of PIIr. **id^ha* with deocclusion than others (Meillet 1912/3). Pāli *idha* ‘here’, Aśokan (Gir. and Dh.) *idha*, Śaurasenī, Māgadhī and Āvantī *idha* (Pischel §266) :: Vedic *ihá*, Pāli (less frequent) *iha*, Aśokan (Sh.) *iha*, *ia*, Niya *ísa* (Burrow 1937:7)
 (11) other possibilities
 **d^h > h / [+high] __V ?*
 **d^h > h / \bar{V} __V ?* (Bloch 1929)

Experiment

- (12) influence of /i/ on the following d^h: Measure the closure duration of Hindi /d^h/ preceded by front and back vowels.
 (13) aerodynamic hypothesis: Skt. voiced aspirates vary with respect to their liability to deocclusion. Among *bh*, *dh* and *gh*, only *gh* is regularly exempt from deocclusion, and *bh* becomes *h* less frequently than *dh* does. It is because the difference in the distance between the place of articulation and the glottis results in difference in time required to build up enough oral air pressure for aspiration. **j^h* and *dh* are special.
 → Measure Hindi voiced aspirates in VCV sequences and verify the hypotheses that the closure duration becomes longer as place of articulation moves forward.
 (14) subjects: RP: Hindi speaker from Bihar. RB: Hindi speaker from western UP. measurement: based on waveforms and wide-band spectrograms.

Results

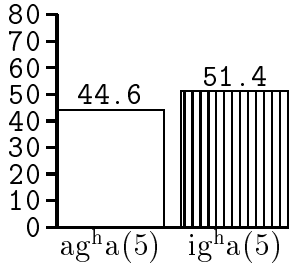
- (15) nature of Indo-Aryan voiced aspirates and ‘palatal’
 The spectrograms of /j^h/ as in /aj^ha/ etc. show frication for 20–40 ms between the closure and the breathy voice, while other voiced aspirates are bipartite. /j^h/ in /ij^ha/ by RB shows little or no closure (cf. Hoffmann–Forssmann §66ce ‘arachotisch’).
 (16) mean normalized duration of Hindi /g^h/ /j^h/ /d^h/ /d^h/ and /b^h/ in /aCa/ context:

	clos:RP	clos:RB	asp:RP	asp:RB	total:RP	total:RB
/b ^h /	71.91	79.39	66.23	63.53	138.14	142.92
/d ^h /	61.56	73.93	69.79	72.43	131.35	146.36
/d ^h /	72.62	56.08	64.05	58.81	136.67	114.89
/j ^h /	57.37	53.46	90.17	87.50	147.54	140.96
/g ^h /	58.44	59.03	69.31	77.28	127.75	136.31

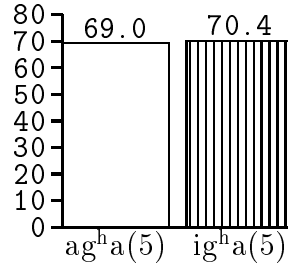
As the hypothesis predicts, the closure durations are in the order /b^h/ > /d^h/ > /g^h/.

(17) closure duration of voiced aspirates after /a/ and /i/

Hindi /g^h/ Speaker: RB



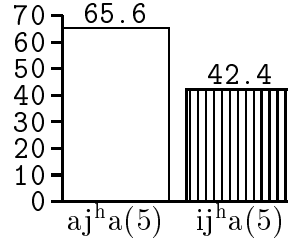
Hindi /g^h/ Speaker: RP



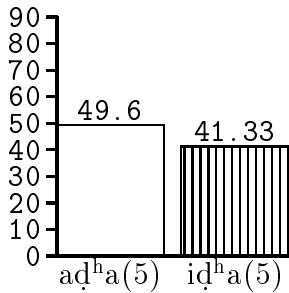
Hindi /j^h/ Speaker: RB

As is mentioned above, the closure of /j^h/ after /i/ can hardly be located either in waveforms or in spectrograms. Therefore I cannot measure or compare the durations.

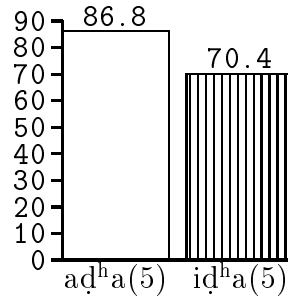
Hindi /j^h/ Speaker: RP



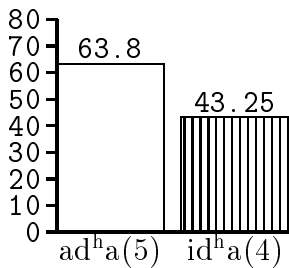
Hindi /d^h/ Speaker: RB



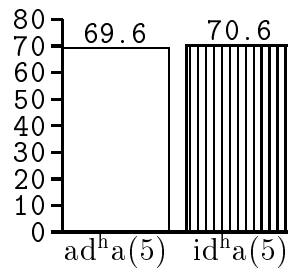
Hindi /d^h/ Speaker: RP



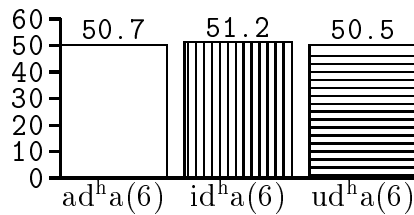
Hindi /d^h/ Speaker: RB



Hindi /d^h/ Speaker: RP



Gujarati /d^h/



(18) /i/ after voiced aspirates does not show any consistent tendency of shortening the closure duration of the preceding segments.

Phonetic Discussion

(19) ‘window of duration range’ model: The Indo-Aryan voiced aspirates had a window of the duration range, which corresponds to the phonological notion of timing slot. The tripartite segment /j^h/ exceeds this window, and the closure part is delinked, because it does not serve for a phonemic contrast.

(20) shortening of RB’s /d^h/ after /i/: The palatalization hypothesis of /d^h/ by preceding /i/ did not find any direct support in the acoustic measurements.

← Dixit (1990): /i,u/ fronts and dentalizes the following /t,d/ in the electropalatography of Western Hindi pronunciation

(21) tongue configuration hypothesis:

Sawashima & Kiritani (1987) in American English, tongue movements for the tense vowels are carried over into the following consonant to a greater extent than for the lax vowels, for a ‘tense’ vowel the tongue position is maintained longer and the movement toward the following sound takes place later. → the articulation of /d^h/ might start later in Hindi and Sanskrit, and hence shorter closure duration.

Cf. maintaining of the tongue configuration also in the spreading of retroflexion across long distance.

(22) more measurement needed

Reference

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