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Preaspiration in Modern and Old Mongolian

Background

The problem of how to analyse the two contrasting manners of articulation for Mongolian stops and affricates has been debated since Mongolian phonetics first came to be studied. To date, there remains no consensus about the phonetic correlates of the two manners of articulation found in the literature. In phonemic transcriptions, the two series have often been rendered with symbols for voiceless and voiced consonants. The Cyrillic Mongolian script also treats them in this way. Most Mongolists have used terms such as fortis ~ lenis, strong ~ weak, or tense ~ lax; see the review in our book, *The Phonology of Mongolian* (Svantesson et al. 2005: 220–221).

In that book, we presented data showing that the difference is one of the presence vs. the absence of aspiration. Aspirated consonants are preaspirated in all positions except utterance-initially, while they are postaspirated word-initially. Here we will present more data to support this analysis. (An analysis of this kind was already proposed by the Finland-Swedish scholar John Ramstedt in his pioneering 1902 description of Halh Mongolian phonetics.)

The stop and affricate phonemes are shown in (1). Minimal pairs showing that they contrast are given in Svantesson et al. (2005: 26–27). In phonemic transcription, we write aspirated stops and affricates as /pʰ/, /tʰ/, etc.; although the aspiration sign is written after the consonant, it is intended as a symbol for (pre- or post-) aspiration in general. In close phonetic transcription, we differentiate between pre- and postaspiration [ʰt, tʰ].

(1) Mongolian stops and affricates

	Labial		Dental		Post-alveolar	Velar		Uvular
	Plain	Palatalized	Plain	Palatalized		Plain	Palatalized	
Aspirated stop	pʰ	pʲʰ	tʰ	tʲʰ				
Unaspirated stop	p	pʲ	t	tʲ				
Voiced stop						g	gʲ	ɢ
Aspirated affricate			tsʰ		tʃʰ			
Unaspirated affricate			ts		tʃ			

Per Urales ad Orientem. Iter polyphonicum multilingue.
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Phonetic investigation

Method

We recorded and analysed the words listed in (2), which illustrate the two series of stops and affricates in different positions in a word. Using a portable analogue cassette recorder of relatively high quality (Sony WM D6C), the recordings were made of three male speakers (BB, DD and XB), all of whom were born in and had grown up in Ulaanbaatar, and were living there at the time of the recording. Their age was 21, 26 and 36 years, respectively. Only the dental stops and affricates and the postalveolar affricates are analysed here, because they occur in all positions in a word.

(2) Material for the acoustic investigation

initial:	tʰ–	tʰaɮa	талаа	‘steppe–RFL’
	t–	taɮa	далаа	‘shoulder-blade–RFL’
	tsʰ–	tsʰama	цамаа	‘mask dance–RFL’
	ts–	tsama	замаа	‘road–RFL’
	tʃʰ–	tʃʰʊɮʊ	чулуу	‘stone’
	tʃ–	tʃama	жамаа	‘law–RFL’
medial:	–tʰ–	atʰa	атаа	‘camel gelding–RFL’
	–t–	ata	адаа	‘demon–RFL’
	–tsʰ–	atsʰa	ацаа	‘fork–RFL’
	–ts–	atsa	азаа	‘good luck–RFL’
	–tʃʰ–	atʃʰa	ачаа	‘grandson–RFL’
	–tʃ–	atʃa	ажаа	‘father’
final:	–tʰ	atʰ	ат	‘camel gelding’
	–t	at	ад	‘demon’
	–tsʰ	atsʰ	ац	‘fork’
	–ts	ats	аз	‘good luck’
	–tʃʰ	atʃʰ	ач	‘grandson’
	–tʃ	atʃ	аж	‘to observe’

The words were put into the carrier sentence *pii* ___ *gisəŋ* би ___ гэсэн ‘I said ___’, and were read three times by each speaker. The recordings were analysed in the Phonetics Lab at Lund University, using the *Praat* speech analysis program. The duration of the occlusion phase, voice onset time and voice offset time (preaspiration) were measured from waveform plots and spectrograms.

The duration of the occlusion phase was measured in all positions: initial, medial and final.

Voice onset time (VOT) was measured from the stop release to the onset of voicing in the following vowel. It includes the release and the aspiration phase of the stops. For the affricates, the boundary between the fricative and aspiration phases was often unclear, so VOT here includes the fricative phase as well. The

final word of the carrier sentence (i.e., *gisəŋ* 'said') was often reduced; when it was preceded by a consonant, an epenthetic vowel was sometimes introduced (so that *pii at gisəŋ* could be pronounced as [piːatəksə̃], for example). This made it difficult to measure VOT in word-final position, and we made no such measurements. Audibly there is no postaspiration word-finally, and additional observations made on words spoken in isolation by other speakers show no word-final postaspiration.

The final part of a vowel (or a sonorant) preceding an aspirated stop is devoiced and usually pronounced with clearly audible aspiration noise. This is most salient when the preceding vowel is in the same word (i.e., when the consonant is in medial or final position), but it also occurs when an aspirated consonant follows a vowel in the preceding word in the same utterance (e.g., the vowel [iː] of the first word *pii* in the carrier sentence). The duration of preaspiration was measured from the beginning of the devoicing of the vowel to the beginning of the occlusion phase of the consonant. Preaspiration was thus measured in all positions. It does not occur with unaspirated stops, except that a slight devoicing of the vowel before the affricate /tʃ/ in *tʃama* was found for speakers DD (13 ms on average) and XB (16 ms).

Results

The results of the measurements are shown in (3). The values are the means for the three readings by each speaker (except for the word *ts^{h}ama* for speaker XB, for which only two measurements could be made). Differences between the values for aspirated and unaspirated consonants were tested with *t*-tests ($df = 4$, except for XB's *tsama* ~ *ts^{h}ama*, where $df = 3$).

The results show that there is basically no significant difference in the duration of the occlusion phase of aspirated and unaspirated consonants.

In word-initial position, VOT is always larger for aspirated than for unaspirated stops and affricates. The difference is considerable for both stops and affricates, and shows a clear statistical significance for the stops. For the affricates, the variation is larger and the test results are less clear, probably due to the fact that VOT includes both the aspiration and the fricative phases. In medial position, the difference in VOT is small and not significant for the stops. Some of the affricates show a significant difference in VOT, apparently due to a longer fricative phase in the aspirated affricates. Postaspiration is thus consistent and salient in initial, but not in medial, position. As mentioned above, word-final VOT could not be measured in our data, but other observations indicate that there is no word-final postaspiration.

As is well known, Chinese, Thai and many other East and Southeast Asian languages use postaspiration of stops and affricates as a distinctive feature. In these languages, VOT of aspirated consonants is larger than in Mongolian (e.g., around 100 ms in Standard Chinese stops (Svantesson 1987)).

(3) Duration measurements (means in ms)

Levels of significance: n.s. ($p \geq 0.05$); * ($p < 0.05$); ** ($p < 0.01$); *** ($p < 0.001$).

INITIAL

speaker	preaspiration	occlusion			VOT		
	/tʰ-/	/tʰ-/	/t-/	*test*	/tʰ-/	/t-/	*test*
BB	18	64	75	n.s.	57	22	*
DD	11	99	98	n.s.	58	11	***
XB	10	68	65	n.s.	40	23	**
	/tsʰ-/	/tsʰ-/	/ts-/		/tsʰ-/	/ts-/	
BB	21	57	52	n.s.	102	47	**
DD	16	72	73	n.s.	88	57	**
XB	24	82	62	n.s.	76	49	n.s.
	/tʃʰ-/	/tʃʰ-/	/tʃ-/		/tʃʰ-/	/tʃ-/	
BB	17	34	78	*	85	58	*
DD	14	53	63	n.s.	108	60	n.s.
XB	13	50	40	n.s.	70	49	n.s.

MEDIAL

speaker	preaspiration	occlusion			VOT		
	/-tʰ-/	/-tʰ-/	/-t-/	*test*	/-tʰ-/	/-t-/	*test*
BB	39	117	134	n.s.	20	16	n.s.
DD	41	110	129	n.s.	15	13	n.s.
XB	39	123	117	n.s.	19	14	n.s.
	/-tsʰ-/	/-tsʰ-/	/-ts-/		/-tsʰ-/	/-ts-/	
BB	54	77	90	*	102	70	*
DD	55	75	64	n.s.	93	73	n.s.
XB	45	83	78	n.s.	64	54	n.s.
	/-tʃʰ-/	/-tʃʰ-/	/-tʃ-/		/-tʃʰ-/	/-tʃ-/	
BB	55	83	106	n.s.	78	53	*
DD	33	90	121	n.s.	74	53	*
XB	13	91	85	n.s.	66	45	**

FINAL

speaker	preaspiration	occlusion			VOT	
	/-tʰ/	/-tʰ/	/-t/	*test*		
BB	30	123	130	n.s.	–	–
DD	26	100	104	n.s.	–	–
XB	15	98	107	n.s.	–	–
	/-tsʰ/	/-tsʰ/	/-ts/			
BB	20	88	85	n.s.	–	–
DD	23	92	80	n.s.	–	–
XB	20	74	77	n.s.	–	–
	/-tʃʰ/	/-tʃʰ/	/-tʃ/			
BB	35	72	98	n.s.	–	–
DD	29	63	64	n.s.	–	–
XB	47	67	70	n.s.	–	–

All aspirated stops and affricates have preaspiration in all positions, and the unaspirated consonants have no preaspiration, showing that this is a consistent phonetic correlate differentiating aspirated and unaspirated consonants. Although it cannot be realized in utterance-initial position, preaspiration of a word-initial consonant is realized as devoicing of the preceding segment within an utterance.

It is obvious, both from listening and from this instrumental investigation, that the unaspirated Halh stops are ordinary voiceless unaspirated stops, similar to those found in Russian or French and to the prototypical sounds denoted by the IPA symbols for voiceless stops. When preceded by a voiced sound, they may become partially voiced; in particular, the labial stop can also become fricativized.

Preaspiration is not very common in the world's languages. It is found in some languages in Northern Europe (including Icelandic, Faroese, Swedish and Norwegian dialects, Scottish Gaelic and some Sámi languages); see Ladefoged and Maddieson (1996: 70) and Helgason (2002) for surveys. Medial and final preaspiration and initial postaspiration seem to be a common pattern. Preaspiration in the Chahar dialect of Mongolian has recently been treated by Qascimeg (2009).

Illustrations

Aspiration is illustrated here with waveform plots and spectrograms of words read in isolation by a female Ulaanbaatar speaker (EM, age 45). She was recorded in Moscow in 2001, using a DAT cassette recorder. The figures were made with the WaveSurfer analysis program.

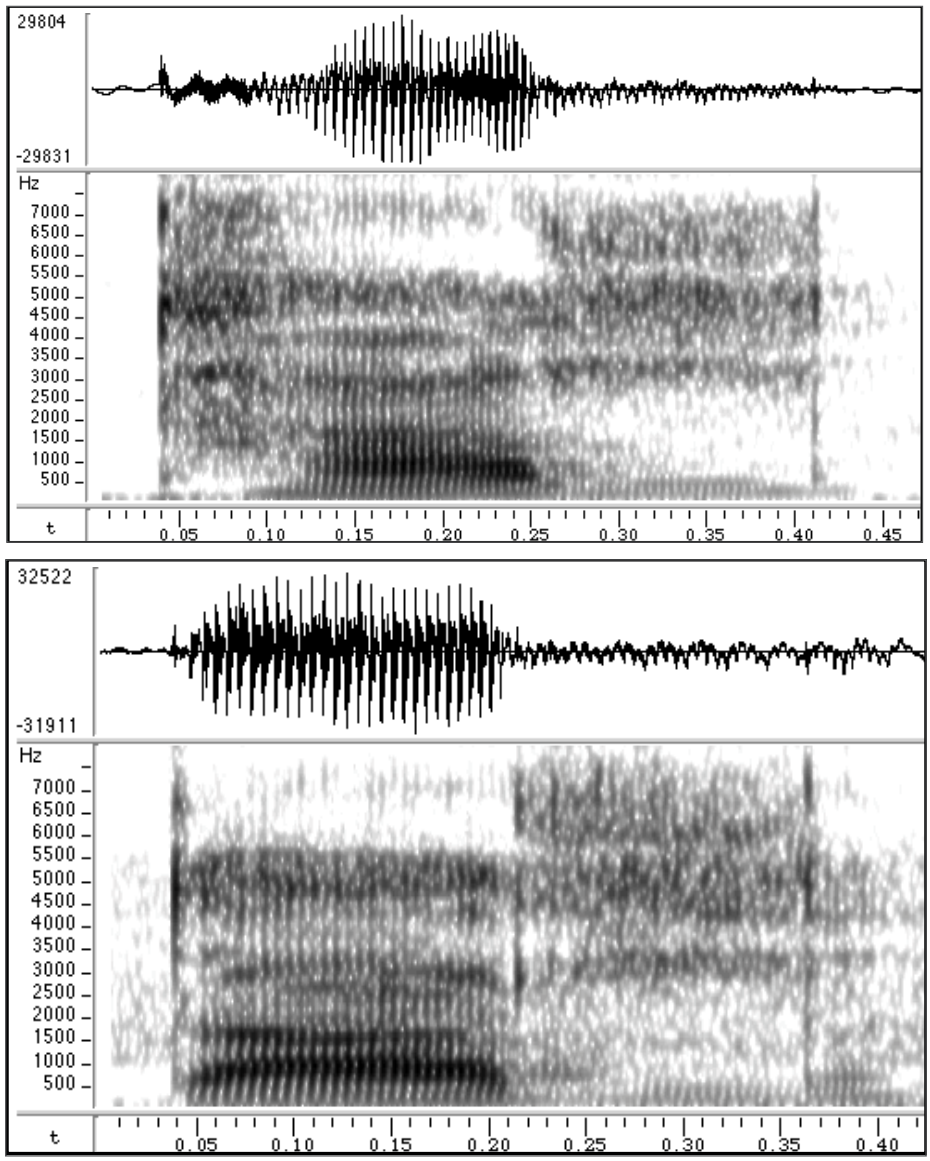
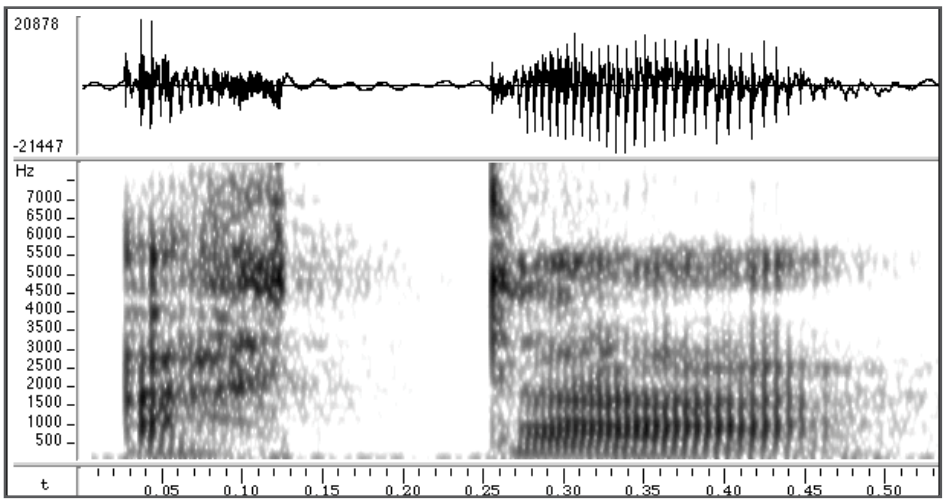


Figure 1. Postaspiration in utterance-initial position: /tʰaɮ/ [tʰaɮ] тал ‘steppe’ (top) and /taɮ/ [taɮ] дал ‘shoulder-blade’ (bottom). Aspiration is seen as high frequency noise in the spectrograms. There is a clear difference in VOT between [tʰ] and [t].



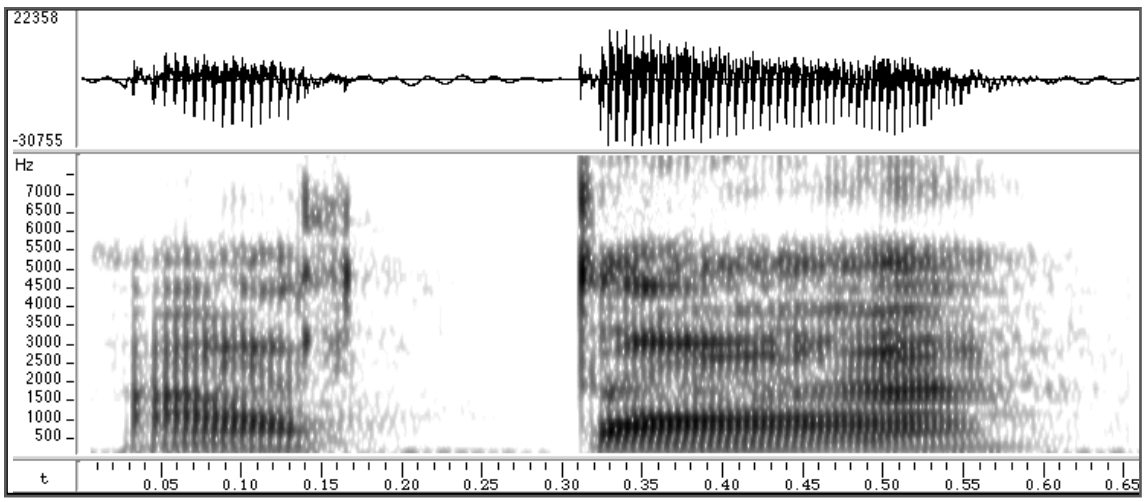


Figure 2. Preaspiration in medial position: /at^{h}a/ [a^{h}ta] атаа 'camel gelding–RFL' (top) and /ata/ [ata] адаа 'demon–RFL' (bottom). Preaspiration is seen as high-frequency noise in the second half of the vowel preceding the aspirated stop, and also as blurring of the vowel formants. The releases are similar for the two stop series, and there is no contrastive postaspiration.

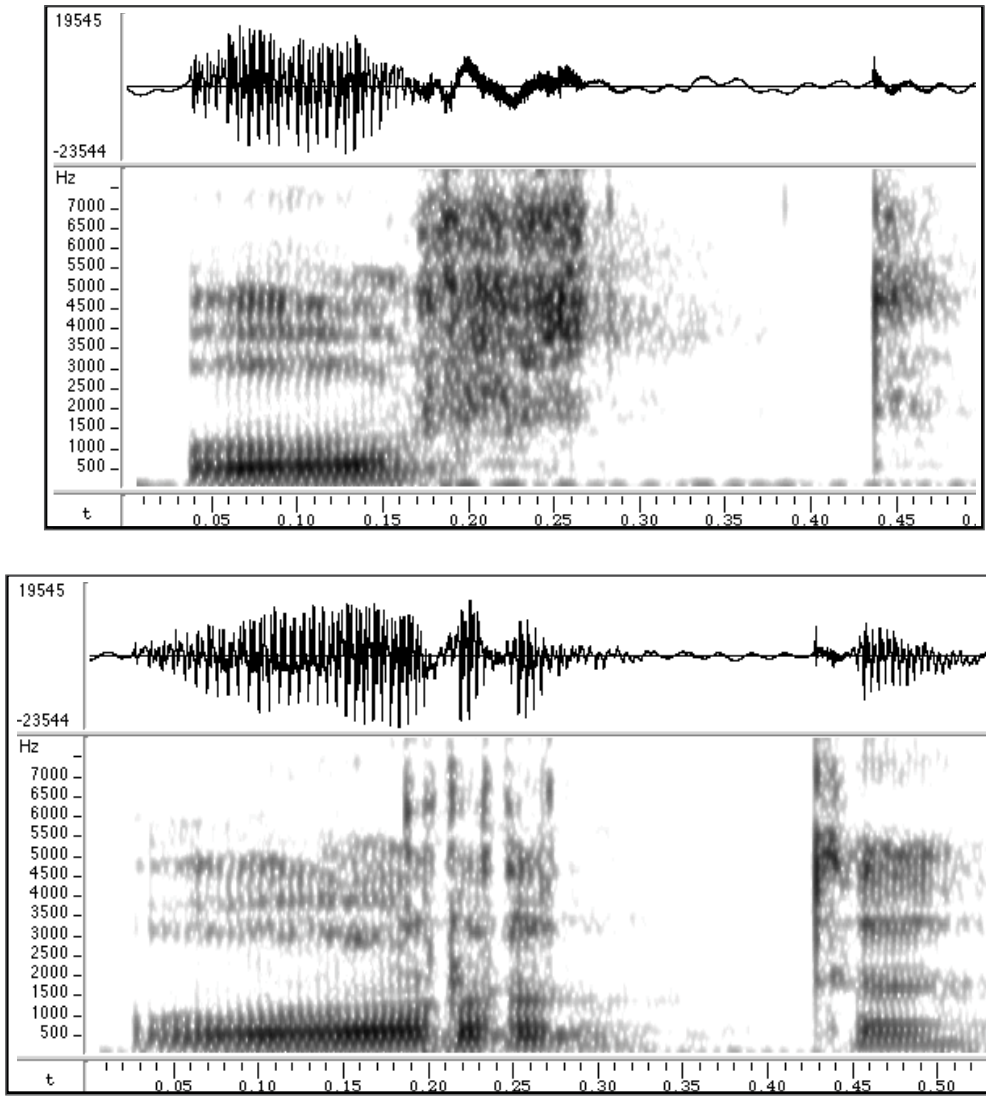


Figure 3. Devoicing and fricativization of a sonorant preceding a preaspirated stop: /ʊrtʰ/ [ʊr̥t] ypт 'short' (top) and /ʊrt/ [ʊrt] ypд 'front' (bottom). Preaspiration is realized as devoicing of the trill /r/.

Old Mongolian

The Mongolic language group, usually regarded as a subgroup of the Altaic language family, consists of some ten languages spoken in Mongolia, China and Russia. The time depth is not so great: the proto-language is more or less identical to Old Mongolian, the language that can be reconstructed from the oldest Mongolian written documents from Chinggis Khan's time in the 13th century.

Some Mongolic languages, including Buriad and Oirad dialects, lack preaspiration. For many Mongolic languages, the exact phonetic realization of the stops is unknown, since instrumental phonetic data is lacking. There is evidence in the historical development of Old Mongolian into the modern Mongolic languages, however, that Old Mongolian did have preaspiration. This evidence consists of a number of historical phonological processes where two consonants on either side of a vowel interact with each other in a way that is best explained by assuming that the consonant before the vowel is postaspirated and the one after it is preaspirated.

Deaspiration

One such process is deaspiration, by means of which the occurrence of two aspirated consonants in a word is eliminated in a manner that reminds of Grassmann's law in Indo-European.

In Chahar and some other dialects of Mongolian proper (but not in Halh), the first of two originally aspirated consonants is deaspirated (4a); this is also triggered by the fricative /s/, which is slightly aspirated in Mongolian. Deaspiration takes place if the two aspirated consonants are close to each other, separated only by a short vowel; otherwise there is no deaspiration (4b). The regular reflex of aspirated **kʰ* is *x* in Chahar and Halh.

(4) Deaspiration in Chahar

Old Mongolian from Svantesson et al. (2005); Chahar from Dobo (1983).

		Old Mongolian	*Chahar*	*Halh*	
a.	'to pull'	*tʰatʰa	tatʰ	tʰatʰ	тат
	'ear'	*tʃʰikʰin	tʃix	tʃʰix	чих
	'fat'	*tʰosun	tɔs	tʰɔs	тос
	'to strive'	*kʰitʃʰihe	kitʃʰɤ	xitʃʰe	хичээ
b.	'cold'	*kʰøitʰen	xiitʰəŋ	xuitʰəŋ	хүйтэн
	'together'	*kʰamtʰu	xamtʰ	xamtʰ	хамт
	'paper'	*tʃʰahalsun	tʃʰaas	tsʰaas	цаас

Some Mongolic languages spoken in Gansu and Qinghai provinces in China (including Monguor (Qasbagatur 1986) and Santa (Böke 1983), as well as Bonan, Kangjia and Shira Yugur) operate in an opposite manner than Chahar and deaspirate the second of two aspirated consonants more or less regularly:

(5) Gansu–Qinghai type deaspiration

	Old Mongolian	*Monguor*	*Santa*
'to pull'	*tʰatʰa	tʰita	sta
'ear'	*tʃʰikʰin	tʃʰiki	tʃʰiqeŋ
'China'	*kʰitʰat	tʃʰitar	qʰɯtei
'blue'	*kʰøkʰe	kʰuko	kʰukie

The assumption that Old Mongolian had pre- and postaspiration, distributed as in Halh, provides a plausible explanation for these changes. The simultaneous devoicing of both the initial and the final parts of a short vowel like the first /a/ in */tʰatʰa/ [tʰaʰta], may be difficult to uphold (although it does occur in Halh), and this leads to the deaspiration of one or the other of the aspirated consonants

Although Halh does not have phonological deaspiration, the VOT (duration of the aspiration) is relatively shorter in those positions where Chahar has deaspiration. Measurements of words said by the Ulaanbaatar Halh speaker EM show that the VOT of the initial [tʰ] is longer (72 ms on average) in the word [tʰaɮ] тал 'steppe' than in [tʰaʰtəx] татах 'to pull' (50 ms) and [tʰɔs] тос 'fat' (49 ms). These differences are statistically significant (0.05 level, using a *t*-test based on 4 repetitions of each word).

Aspiration flip-flop

A similar process is aspiration flip-flop, which occurs more or less regularly in the Gansu–Qinghai languages. This process converts an unaspirated-aspirated consonant sequence into an aspirated-unaspirated sequence (6). In this case as well, the existence of preaspiration is a possible explanation. For example, the preaspiration of the second consonant in */totʰara/ *[toʰtara], realized as devoicing of the final part of the vowel, may have spread through the vowel to then be reinterpreted as postaspiration of the initial consonant, *[tʰotara]. In some words, aspiration flip-flop has created an aspirated labial stop phoneme /pʰ/. This consonant did not exist in Old Mongolian and is only a marginal phoneme in most Mongolic languages.

(6) Aspiration flip-flop

	Old Mongolian	*Monguor*	*Santa*
'inside'	*totʰara	tʰutor	sutoro
'pig'	*kakʰai	xqai	qʰɯqei
'to fit'	*tʃokʰi	tʃʰuqu	
'firm'	*patʰu	pʰati	pʰutu

Spurious /x/

A third historical process that can be explained by preaspiration is the development of an initial /x/ in the Qinghai-Gansu languages. In some cases this is the reflex of an Old Mongolian initial **h* that can be reconstructed (cf. the language of *The Secret History of the Mongols* (13th Century), where Mongolian is written with Chinese characters). The initial **h* was lost in Mongolian proper (including Halh), but is retained as *x* (sometimes realized as [ʃ] or [ɸ]) in Monguor and Santa (7a)).

Some words in Monguor and Santa have an initial /x/ with no correspondence in *The Secret History* or in other sources for Old Mongolian (7b). Most of these words have an aspirated consonant in the second syllable. The preaspiration apparently moved to the beginning of the word, where it was interpreted as an initial fricative in Monguor, and sometimes in Santa (cf. Helimski 1984).

(7) Spurious *x* in Gansu–Qinghai languages

		OM	Secret History		Monguor	Santa	Halh	
a.	‘year’	*hon	桓	xon	xon	xoŋ	ɔŋ	он
	‘red’	*hulahan	忽剌安	xulaan	xulaan	xulaŋ	ʊɮaŋ	улаан
	‘ten’	*harpan	哈兒班	xarpan	xaran	xaroŋ	arəw	арав
b.	‘to die’	*yk^{h}y	兀窟	uk^{h}u	xuku	xuku	ux	ɣx
	‘gold’	*alt^{h}an	阿勒壇	alt^{h}an	xaltan	ant^{h}aŋ	aɮt^{h}	алт
	‘big’	*jek^{h}e	也客	jek^{h}e	ʃke	xukie	ix	их

Conclusion

Our acoustic investigation shows that the presence vs. the absence of aspiration is the main phonetic property distinguishing the two series of stops and affricates in Halh Mongolian. Both series are basically voiceless. In word-initial position, aspiration is realized as postaspiration; if an aspirated consonant is preceded by a voiced segment in the same utterance, however, there is preaspiration as well. In word-medial and final position, aspiration is realized as preaspiration. Aspirated and unaspirated stops have very similar release in these positions, and there is no postaspiration.

Preaspiration is thus the main distinctive property, realized in those positions where it is possible.

The hypothesis that old Mongolian had pre- and postaspiration with the same distribution as that in modern Halh provides a plausible explanation for several historical phonological processes in different Mongolic languages which are otherwise difficult to explain.

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