STUDY OF ASPIRATED CONTINUANTS IN URDU

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ABSTRACT

Recordings of aspirated continuants present in Urdu were made of four speakers. The experimental utterances consisted of meaningful words disguised in carrier sentences to ensure that the speaker does not guess the experiment and adjust his voice. The recordings were made with every aspirated continuant in every possible position. The results showed that the aspiration of continuants in Urdu has almost vanished and in some cases broken into a separate |h|.

1. INTRODUCTION

A consonant is said to be aspirated or plosive when it comes out with a small burst of air. In Urdu 𝒟 following the letter represents aspiration generally, but it may represent a separate phoneme as well. There are believed to be as many as 15 aspirated consonants (Khan, M.A., 1997), most of which however are stops, they unquestionably are proper aspirations represented by the 𝒟, affricates also are above suspicion. Aspirations can be divided into two categories: stops and continuants. The stops in Urdu are quite straightforward as far as their aspiration is concerned except for the nasals. Continuants are approximants and consonants that are not stops. In Urdu there are 10 sounds that fit into this category: [w], [r], [j], [l], [ɽ], [ʃ], [s], [f], [x], [ɤ], [v]. The aspirations in continuants however appear to be in doubt, this paper identifies the aspirations in these phonemes and tackles some issues related to separation of phones and the phonological constraints altering these aspirations.

2. LITERATURE REVIEW AND PROBLEM STATEMENT

One of the theories about aspirations of continuants in Urdu is that aspirated continuants require more articulatory effort, so they have been replaced by the continuant followed by |h|. Dr. Mehboob supports this theory in *Urdu ka Sauti Nizam*(Khan, M.A, 1997). According to him aspiration in continuants (non-stops) is vanishing, he says that [vʰ], [sʰ] are mentioned by Insha in his books but are missing from Urdu, this fact provides support for this hypothesis. Also he claims that the aspirated [vʰ], [sʰ] and [jʰ] are no longer used in Urdu. The example he mentions for [rʰ] however is quite debatable, he uses [sərʰɑne], which is also referred to sometimes in Urdu as [sərhɑne], perhaps this is because of the syllabification in this word. In the first case syllabification is [sərʰ.ɑ.ne], and in second case [sər.hɑ.ne], the second one is easier to pronounce goes with the fact that languages prefer CVC syllables over V syllables. His count for aspirations totals 15, most of which are stops and affricates. According to him both [ɽ] and [ɽʰ] are not available in the beginning of any words, if the [ɽʰ] occurs at the end of a word, the aspiration isn't noticeable. He further says that [vəhɑ̃] was actually [vʰɑ̃], supporting his claim with the help of some examples. He also says that aspirations at the end of words vanish e.g. in [kɑɽʰ].

According to *Farhang-e-Talaffuz* (Haqi, Su.H, 1996) the aspirated continuants present in Urdu were [vʰ] (or [wʰ]) , [rʰ], [lʰ], [ɽʰ]. The words found corresponding were like [vʰel], [pəɽʰɑi], [pəndrʰəvī], [solʰvī]. As can be seen that there are many continuants that are missing here, also of these only [vʰ] occurs at the beginning of words. In *Feroz-ul-Lughat* [vʰel] is listed in the non-aspirated words and there is no other word in Urdu that starts with a [vʰ]. It is clear however that if there is an aspiration or [h], then [v] is aspirated because this is clearly a monosyllable word and if there were a separate [h], it would

violate the Sonority Sequencing Principle to form a monosyllable word, and [v] alone cannot form a syllable. Another point worth noticing is that the word [vʰel] is somewhat a recent import from English (whale).

The author of *Lasani Masail-o-Lataif(*Haqi, S.u.H, 1996) agrees with S*auti Nizam* that there are up to 15 aspirations in Urdu, he also agrees with the aspirated continuants identified earlier. In his book *Lasani Muqalat(*3rd *Part)*, Dr. Sohail Bokhari (Bokhari, S., 1991) says that actually most of the sounds with a [h] were aspirations which by the passing of time turned into a separate phonemes. He mentions [rʰ], [lʰ], [ɽʰ] as the aspirations present in Urdu.

However most of the authors seem to agree that the aspiration has vanished and perhaps there are some continuants in which it is still vanishing, and the reason seems to be the articulatory effort. In continuants, there is no stop, so producing a burst becomes difficult. The [vʰ] problems is double, because in English [wʰ] was used instead of [vʰ], which was a glide, whereas the latter is a fricative. The [lʰ] is present in some words, and in most cases the native speakers say that it doesn't make a difference that if it is spelled with an aspiration or a simple [h] representing character. The trill [r] follows the same pattern, so both of these are very sketchy. Aspirated versions of the rest of the continuants seem to have disappeared from Urdu. As far as aspirated stops are concerned, all of these authors unite that Urdu has a full set of aspirated stops.

Urdu retains the original Indo-European list between aspirated and non-aspirated voiced plosives as compared to the other sister languages. In Sindhi aspiration is also represented separately, with dots. Some languages that have seven articulations don't have some aspirated versions e.g. Shumashti doesn't have aspirated versions of |tʃ, tʂ, j| (Masica, Colin P. pg. 102). Whereas some languages Gwarbati, Kalasha, Phalura, Shina have a full complement of seven voiceless aspirates. Kashmiri has all voiceless aspirated but is missing several voiced ones, including approximants e.g. |dʒʰ|. In Marathi-Konkani [*tsʰ] has become a pure [s], it has lost its aspiration and become an allophone of [s]. Also on Marathi |dʒʰ| is frequently mapped onto [ʒʰ] In another native language of Pakistan, Punjabi, voiced aspiration is missing and a voiceless phoneme is used instead. In other languages near Urdu: Hindi, Nepali, Gujarati and more, aspirated [l] is available. In Pakistan's native languages Sindhi and Siraiki possess these characteristics, however, Kashmiri does not. Aspirated trill [r] in regional languages occurs in Bhojpuri, Gujarati, Hindi, Marathi, Nepali, and Pakistan's own Siraiki. Aspirated retroflex |ɽ| occurs in Indo-Aryan languages which have its unaspirated version, Rajhastani, Marwari, and Mewari are some exceptions (Masica, Colin P. pg. 102). Urdu fits the description, but whether it is specifically available is not very definite, as mentioned before most authors are in favor of its presence, either in form of aspiration or a separate |h|. The aspirated [v] is a characteristic sound in Marathi. In Bengali, the aspirated versions of |ɽ, r, l| occur under some restrictions. Also in Marathi there is a tendency to weaken post-vocalic aspiration. A |jʰ| was recorded in Kudali dialect of Marathi. Sometime in Indo-Aryan languages, the aspiration becomes fricative like |bʰ| becomes |β|. Then again, which seems to be the case sometimes in Urdu also, that aspiration can be lost sometimes as well.

The controversy, that seems to emerge out of all this is that whether the continuants are aspirated, non-aspirated, or has the aspiration been converted into a separate |h|, to resolve this controversy the following experiment was performed.

3. METHODOLOGY

The first problem was to collect words that represented classes of words, since most of the continuants did not come at the beginning of words, so there were two main places where they could occur, at the end of a word, or in the middle of a word. Some of the continuants occurred only in the middle

of the word. To find these words, Urdu Dictionary (*Feroz-ul-Lughat*) was used. When the words had been found they were used in sentences in such a way that they always came in the middle of sentences, attempting to hide the actual problem. These sentences were written on separate cards. The words and their carrier phrases are listed below. Then 4 speakers were recorded, each of the speakers was completely unaware of the subject of the paper or had ever taken a course in Phonetics or Linguistics or any similar subject. The speaker was instructed to speak casually and slowly.

For each speaker the cards were spread on the table and every speaker was asked to pick a card at random, then he was asked to speak the sentence written on the card three times to ensure normalization. The software used to record and analyze the sounds was Ensig by Entropic. The spectrograms of these sounds were generated and then they were analyzed. Aspiration and glottal sound is differentiated on the basis of VOT. In approximants neither of these is available, so F1/F2 intensity ratio is the acoustic cue used to measure aspiration. In glottal |h| there were weak formants following the approximant. F1/F2 ratio was measured and recorded, and a threshold value was used to determine its aspiration. In the case of |ɽ| there are no formants but somewhat a closure, and a schwa follows. This is present in both aspirated and non-aspirated cases. So only cue is the duration of that schwa, if the duration is too short then there can be a separate |h|. Besides this the spectrograms were searched for a separate |h| if an aspiration was not present

TABLE1: CARRIER SENTENCES FOR THE EXPERIMENT

Sound	Sentences	Meaning
vʰ	voh d̪ekʰo **vʰ**el mətʃli	*Look! A Whale (fish)*
rʰ	ɑdʒ pəndrʰəvī tɑrix he	*Today is fifteenth*
lʰ	kəl solʰvī tɑrix he	*Tomorrow is sixteenth*
ɽʰ	t̪um buɽʰe ho gəe ho	*You have become old*
rʰ	jeh t̪umhare sarʰɑne kɪjɑ peɽɑ he	*What is that on your pillow*
lʰ	ʊs kɑ kulʰɑ hɪl gəjɑ	*His hip-bone is damaged*
ɽʰ	upər tʃəɽʰ dʒɑ	*Climb Up*
Sentences to Clarify aspirated |tʃ|		
ɽ	woh tʃɪɽ gəjɑ	*He got irritated*
ɽʰ	billi tʃəɽʰ gəi	*Cat climbed up*

4. RESULTS

The results have been displayed in form of scatter diagrams, for raw data see Appendix A.

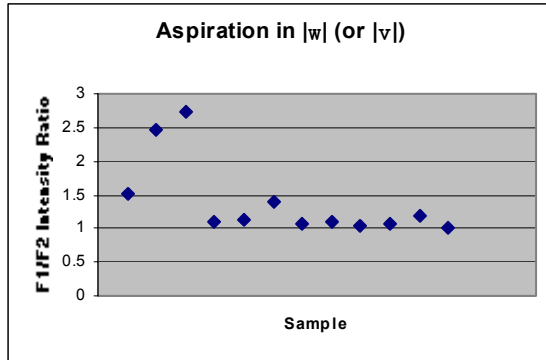**Aspiration in |w| (or |v|)**

FIGURE 1: ASPIRATION IN |W| (OR |V|)

The two dots above 2 seem to be aspirated but the rest of the data stays very close to 1, which means 2 is the threshold
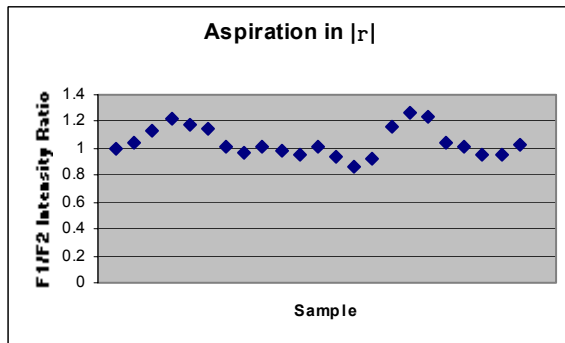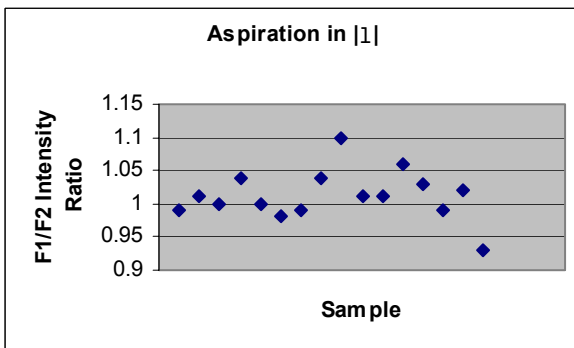
Aspiration in |r|

FIGURE 2: ASPIRATION IN |R|

In case of |r| there seems to be absolutely

Aspiration in |l|

FIGURE 3: ASPIRATION IN |L|

no aspiration since all value are between a steady range of 0.75 and 1.5.

The aspiration in |l| has vanished as well, the ratio goes only up to 1.1 at most, the values again are very closely packed. The one at 1.1 hints aspiration due to its separation from the group.
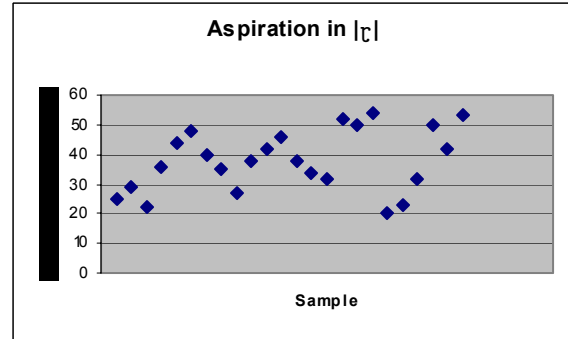
Aspiration in |ɽ|

FIGURE 4: ASPIRATION IN |ɽ|

In |ɽ| most cases the aspirated values were more than 30ms, values less than that were usually unaspirated. Lengthening of this seems to be the acoustic realization of aspirated retroflex. The unaspirated one has small duration schwa, about 30 – 40 ms, the one followed by a glottal |h| has even smaller one, about 20 – 25 ms. The duration of the aspirated one is 40 - 60 ms.

In many of these cases aspiration was missing and seemed to have broken off into a separate |h|. The words that contained them were [buɽʰe], [sarʰɑne] and [kulʰɑ].

5. DISCUSSION

The results were very clear in indicating that the aspiration in continuants is finished, and in some cases broken off.

Aspirated |ɽ| coming at the end was quite uniform in result. The study of |ɽ| indicates that there is some sound similar to a schwa after it, and the difference between the aspirated and the non-aspirated one is not that of a aspirated noise, but the length of this sound.

In the center of words it is quite uniform as well, that there is a separate consonant, not aspiration. This means that the aspiration has now broken down to a separate consonant, but in some cases, especially

when the speaker says hurriedly, neither of the two is the aspirated version of |l| was found in very few results, when there was a slow speaker. A general rule that seems to apply is that whenever the syllable following the one containing the aspirated continuant has a non-empty onset, the aspiration may break into a separate consonant to fill the onset of the following syllable. Another requirement is that the continuant is at the end of the syllable. Or simply the above can be expressed as:

$$\phi \rightarrow h \; / \; \underset{[+aspirated]}{C} \; \_ \; . \; V$$

The case of |v| or |w| is very interesting, since it is an import from English, the speakers with a good English background pronounce a |w| and in some cases an aspirated one. Naturally the |v| had no question of aspiration or non-aspiration.
The reason for this vanishing is quite simple, aspiration is best pronounced in stops because there is a closure. Aspirated continuants are very unnatural because there is no closure, specially aspirated fricatives are impossible to pronounce.

6. REFERENCES

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7. APPENDIX A: Raw Results

TABLE A.1: F1/F2 INTENSITY RATIOS OF SPEAKER 1

Words	F1/F2 Ratio		
	First	**Second**	**Third**
[vʰel] or [wʰel]	1.52	2.46	2.73
[pəndrʰəvi]	1	1.05	1.13
[solʰvi]	0.99	1.01	1
[sarʰɑne]	0.94	0.87	0.92
[kulʰɑ]	1.03	0.99	1.02

TABLE A.2: SCHWA LENGTH FOR RETROFLEX OF SPEAKER 1

Words	Schwa Length (seconds)		
	First	**Second**	**Third**
[buʈʰe]	0.025	0.029	0.022
[tʃɪʈ]	0.034	0.036	0.034
[tʃəʈʰ]	0.036	0.044	0.048

TABLE A.3: F1/F2 INTENSITY RATIOS OF SPEAKER 2

Words	F1/F2 Ratio		
	First	**Second**	**Third**
[vʰel] or [wʰel]	1.1	1.12	1.4
[pəndrʰəvi]	1.22	1.18	1.15
[solʰvi]	1.04	1	0.98
[sarʰɑne]	1.16	1.26	1.23
[kulʰɑ]	0.93	1	0.93

TABLE A.4 Schwa Length for retroflex of Speaker 2

Words	Schwa Length (seconds)		
	First	**Second**	**Third**
[buʈʰe]	0.040	0.035	0.027
[tʃɪʈ]	0.034	0.036	0.034
[tʃəʈʰ]	0.038	0.042	0.046

Speaker 3

TABLE A.5 F1/F2 Intensity Ratios of Speaker 3

Words	F1/F2 Ratio		
	First	**Second**	**Third**
[vʰel] or [wʰel]	1.07	1.1	1.04
[pəndrʰəvi]	1.01	0.97	1.01
[solʰvi]	0.99	1.04	1.1
[sarʰɑne]	1.04	1.01	0.96
[kulʰɑ]	0.99	1.05	0.96

TABLE A.6 Schwa Length for retroflex of Speaker 3

Words	Schwa Length (seconds)		
	First	**Second**	**Third**

[buɽʰe]	0.038	0.034	0.032
[tʃɪɽ]	0.037	0.035	0.030
[tʃəɽʰ]	0.052	0.050	0.054

Speaker 4

TABLE A.7 F1/F2 Intensity Ratios of Speaker 4

Words	F1/F2 Ratio		
	First	**Second**	**Third**
[vʰel] or [wʰel]	1.06	1.2	1.02
[pəndrʰəvi]	0.99	0.96	1.01
[solʰvi]	1.01	1.01	1.06
[sarʰɑne]	0.95	1.03	0.98
[kulʰɑ]	1	1	0.95

TABLE A.8 Schwa Length for retroflex of Speaker 3

Words	Schwa Length (seconds)		
	First	**Second**	**Third**
[buɽʰe]	0.020	0.023	0.032
[tʃɪɽ]	0.033	0.034	0.032
[tʃəɽʰ]	0.050	0.042	0.053