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Acoustic Analysis of Punjabi Phonemes / / and / /

Abstract: In this paper, acoustic properties of two Punjabi phonemes / / and / / are discussed. A comparison is also made between them and three other Punjabi phonemes / /, /n/, and / / that closely resemble them.

Keywords: Punjabi, nasalized retroflex, retroflexed approximant, retroflexed lateral, / /, / /, phonetics, phonemes

1. INTRODUCTION

Punjabi is a widely spoken language; its speakers are spread all over the world. In Pakistan there are 30,000,000 to 45,000,000 speakers mainly in Punjab area (Baart, 2001).

Punjabi is a member of NIA (New Indo Aryan) group of Languages. It is also claimed that Punjabi belongs to Dardic family. Though there are many words in Punjabi inventory that seems to have come from Dardic language but its grammar and phonology is much more closer to that of Indo Aryan Languages which proves that its family is NIA and at some time in history it got mixed up with Dardic (Dr. Sidhi, 1992).

There are numerous dialects of Punjabi in Pakistan. Some of them have great resemblance with each other while some differ greatly and seem to be closer to Sindhi and Saraiki languages. Main dialects are Pothohari, Dhanni, Chachi, Jangli and Majhi (Masica, 1991). Majhi is considered the standard dialect and is found in Lahore and its surroundings (Dr. Sidhi, 1992).

The presence of phonemes / / and / / is not a regular feature in all dialects of Punjabi however they are strongly present in Punjabi of some areas. So the focus of this study is not any particular dialect but a region where both these phonemes clearly exist as a part of the language. This region includes areas of Vazirabad, Gujrat, Phalia, Kharian up till Pothohar region in Pakistan.

These phonemes are also found in other NIA languages but / / is relatively rare.

2. PROBLEM STATEMENT

In this paper acoustic features of / / and / / will be analysed and based on this analysis an effort will be made to identify, to which class of sounds they belong. Initially a supposition is made that / / is a retroflexed lateral while / / is a nasal retroflex. This supposition will be verified against the results of experiments.

3. LITERATURE REVIEW

Most of the Punjabi consonants are those that are also present in Urdu except the two consonants / / and / /.

Both of them are retroflex. Retroflex are those consonants that are produced with our tongue tip curled back towards the hard palate (Encyclopaedia Britannica Deluxe, 2000).

/ / is a retroflexed flap. Tongue is curled back and on its way back to normal position it touches the palatoalveolar region. And during the articulation velopharyngeal port is open that is the consonant is nasalized (Ladefoged & Maddison, 1996).

/ / is also retroflexed but during its articulation tongue never touches the roof of oral cavity and it is squeezed laterally. Tongue is curled back to the hard palate region for a very brief interval of time and then rapidly acquires its original position. It is a bit harder to articulate because our tongue goes very back and instead of letting its volume accumulate in the back section of oral cavity we have to squeeze it and at the same time we have to keep it from touching the hard palate. Its difficult articulation might be the reason for its being so rare and for its extinction from many languages.

In Punjabi these phonemes do not exist word initially and they are never found together in a single syllable.

As long as / / is concerned it is present in all dialects of Punjabi except in areas of Lahore and Gujranwala where it is slowly merging with /n/. It is also found in other regional languages of Pakistan like Saraiki, Pashto, and Sindhi.

/ / is relatively less common and is not present in any other language of Pakistan although Masica reported the presence of retroflexed flapped lateral as a prominent feature in some Indian languages like Oriya, Gujarati, Konkani, Marathi, Bhili etc (Masica, 1991).

Ladefoged also reported the presence of an apical post alveolar retroflexed lateral approximant in Punjabi (Ladefoged & Maddison, 1996).

As I have already said presence of / / is not a general feature in Punjabi. It is found only in a specific region from Vazirabad to Pothohar. More than one dialects are being spoken in this region and none of them is completely covered by the region, so we cannot say that / / is a feature of any particular dialect of Punjabi, rather it is feature of Punjabi spoken in a particular area of Punjab.

Some other NIA languages that have // in their phonemic inventory lack // while // is absent from some languages that possess /. Punjabi is one among those few languages that maintain a contrast between //, / / and /l/ (Masica, 1991).

// is rapidly disappearing from many languages. In Dogri it is being replaced by / /. It was once present in Sinhalese (Sri Lanka) but in modern Sinhalese it merged with /l/ (Masica, 1991).

Although // is very strongly present in the Punjabi of above-mentioned region but in some areas it is at the verge of extinction and is being replaced by /l/, for example in areas near Pothohar region.

4. METHODOLOGY

To study acoustic features of // and / / and to compare them with /l/, / /, and /n/, such words were selected from Punjabi language that contained these phonemes in the same intervocalic context so that they might be compared easily. Three intervocalic contexts a_a, i_a, o_a were used. One set of words with these phonemes in the word final place was also selected. And as it is already mentioned that these phonemes never occur word initially so no such words could possibly be found. The words that were selected for recording and analysis can be seen in Table 1.

Table 1 Words selected for analysis and comparison.

ਤਲਾ	ਪਾਲਾ	ਸਾੜਾ	ਕਾਨੜਾ	ਕਾਨਾ
ταλα (lock)	πα/α (cold)	σα α (jealousy)	ka a (blind in one eye)	kana (cane stick)
ਟਿਲਾ	ਪਿਲਾ	ਬਿੜਾ	ਸਿੜਾ	ਸਿਨਾ
τιλα (straw)	πι)α (yellow)	βι α (button)	σι α (to sew)	σινα (chest)
ਪੋਲਾ	ਟੋਲਾ	ਕੋੜਾ	ਸੋੜਾ	ਸੋਨਾ
πολα (soft)	to)a (unit for measurement of gold)	κο α (bad, cursed)	so a (to sleep)	σονα (gold)
ਸਾਲ	ਵਾਲ	ਸਾੜ	ਵਾੜ	ਜਾਨ
σαλ (year)	ωα) (hairs)	σαα (burnt)	πα ()	δζαν (life)

These words were recorded as spoken by four Punjabi speakers from above mentioned region. Two of them were males and two females. They were asked to repeat each word five times. The software used for recording was Praat.

Next the spectrograms were generated using WinSnoori and Praat. These spectrograms were used to analyse the features of under consideration phonemes.

Their formant transition was studied to verify their retroflex nature because lowering of F3 is a clear clue for retroflexion.

To find out whether // is lateral and if so then to which class of laterals it belongs, its formant values were studied. Ladefoged during his analysis of different lateral approximants of Arrente Eastern (a language spoken in Australia) collected data to find out formants values for different places of articulation. I compared my results with these values (Ladefoged & Maddison, 1996).

Formant intensities of context vowels were also studied to verify whether they are context nasalized or not.

5. RESULTS

5.1 Analysis of / /

The acoustic effect of // articulation can be seen in Figure 1. There is a clear F3, and F4 transition to a level about 2500 Hz. This makes it obvious that // is a retroflex. One thing that was found different in this and all other Punjabi retroflex, was that if F3 is already on some such level that transition to 2500Hz will not be noticeable, then we can distinguish them by their clear F4 transition to the same level. This phenomenon can be seen in Figure 3. and Figure 5.

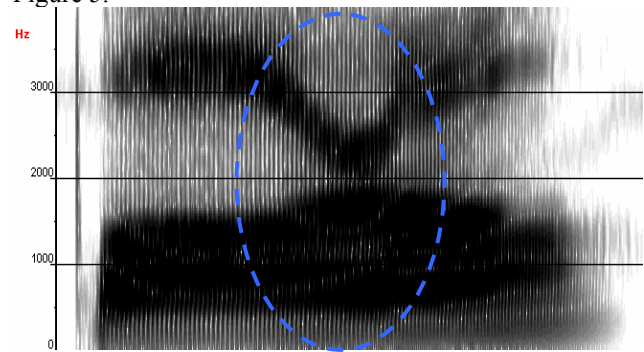


Figure 1 Spectrogram of /pa a/

If the F2 of preceding vowel is somewhere near 2500 Hz it may even rise to reach the level of 2500Hz.

It can also be seen in the figure that the formants are continuous there is no break, which shows that during the production of sound // there is never a complete closure in the oral cavity. That means that // is not a retroflexed stop or flap, as was predicted by Masica. The air keeps on flowing so it can be considered some sort of approximant.

The average duration of // is 118 ms. This duration was measured from the point where formants transition starts to the point where it ends.

The average formant values for // turned out to be 432Hz, 1343Hz and 2500Hz for F1, F2 and F3 respectively for male speakers and 550Hz, 1556Hz and 2500Hz for female speakers. Which does not match exactly with any of the lateral approximants categories proposed by Ladefoged. Ladefoged also suggests that apical post alveolars have an F3 near 1300 for males and 1800 for females. Another cue for apical post alveolar laterals is that their F2 and F3 are relatively farther apart as compared to laterals for

which F3-F2 is near 500 Hz. Coming down of F4 is also a characteristic feature of alveolar retroflex (Ladefoged & Maddison, 1996). Our data approximately satisfies these cues so we can say that // is identified as apical post alveolar retroflexed lateral approximant.

5.1.1 Comparison with /l/

If we compare the spectrograms of // with /l/ we can see that in /l/ there is a discrete change of intensity but there is no format transition before or after the consonant, while in // there is clear formant transition but no change in intensity.

Moreover in /l/ all formants are present and on there usual position. In />/ higher formants are absent while F3 and F4 tend to form a pinch on a level about 2500.

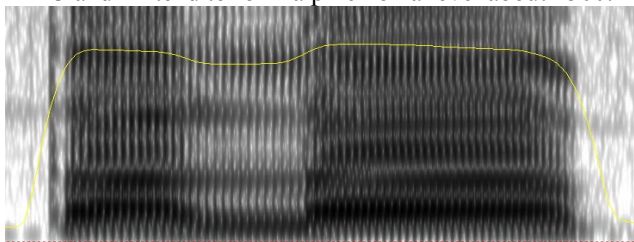


Figure 2 Spectrogram of /tala/. The line shows intensity.

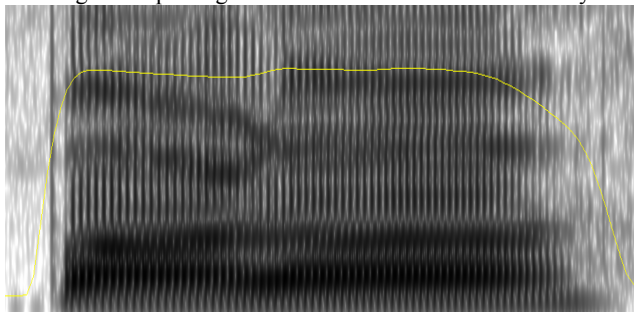


Figure 3 Spectrogram of /pa)a/. The line shows intensity.

5.1.2 Comparison with / /

If we compare the spectrograms of // and / / as given in Figure 4. We can see that // bears a stronger resemblance with / / rather than /l/.

In both cases there is sharp formants transition. F3 of preceding vowel rapidly comes down. Although it goes more downwards in / / than in //. Coming down of F3 shows that both of them are retroflex but / / is relatively more retroflexed.

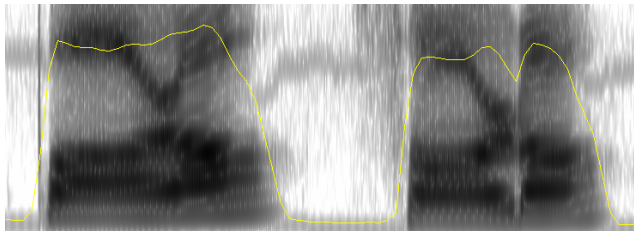


Figure 4 spectrograms of /pa a/ and /sa a/

Another similarity is that there formants transition duration is clearly longer than that of /l/. Total duration of

// is greater than / /, because in / / there is little or no transition after closer and formants acquire there usual position immediately after break, this makes the second half of / / smaller than that of //.

A major difference between the two is that there is a clear break in the case of / / and thus a sharp intensity fall, but there is no such break in //. This contrasting feature enforces our argument that acoustic features of />/ are clearly different from a usual flap.

5.2 Analysis of / /

Like //, the higher formants in spectrogram of / / in Figure 2. , also shows a downward trend. F3 comes down to a level of 2300Hz, which shows that it is also a retroflex. There is a clear downwards transition in F4 as well.

Again in / / there is a clear break in formants but the period of break is not voiceless and even the higher formants are present with a much lesser intensity than usual. Moreover the higher formants of context vowels are damped.

Average duration of / / is about 95 ms.

When it comes in the word ending it has a burst at the end.

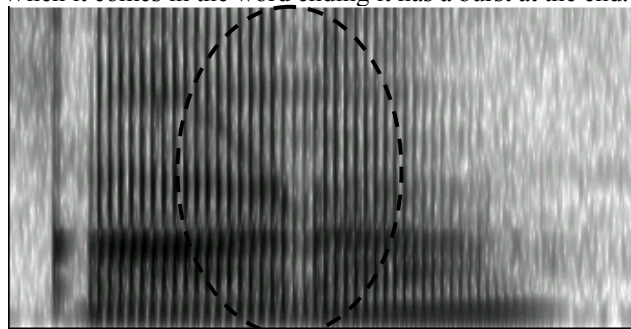


Figure 5 Spectrogram of word /ka a/

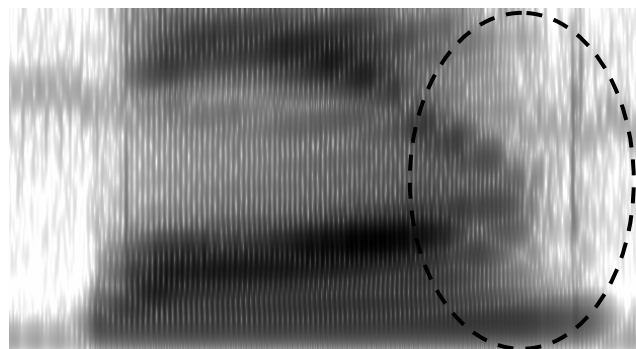


Figure 6 Spectrogram of /wa /. (word ending burst)

All these cues show that / / is a nasalized retroflexed flap. I have called it flap because presence of break in formants shows that there is a brief moment of closure during its articulation, but as the velum is lowered air escapes through nasal tract and that's why all formants are present though in a damped state.

5.2.1 Comparison with / /

/ / is quite similar to / / in its spectrogram because both are retroflex and thus have prominent common feature of falling F3 but they differ in that, that fall of F3 is more sharp in / /.

Duration of /nr/ is a little longer than / /. There is a break both in / / and / / which shows that there is a brief period of closure but in the case of / / the break is quite clear and there is no voicing or formants while in the case of /nr/ the break is not that clear there are some very damped formants this is due to the nasalization effect. The velopharyngeal port is open and that's why in spite of closure in oral tract air escapes through nasal tract and produces some voicing. It can also account for less sharp energy fall in / / as compared to / /.

In / / energy falls gradually and this fall starts in the middle of preceding vowel. In / / preceding vowel maintains its energy up till closure and then energy falls suddenly and rapidly. This is because velum starts lowering before consonant starts and similarly after consonant ends; it takes some time to form the closure again.

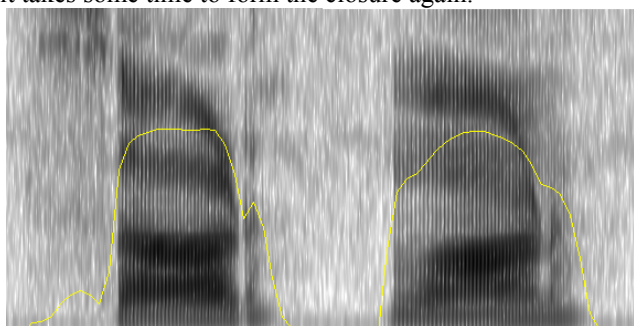


Figure 7 Spectrograms of /sa / & /wa /

The higher formants of context vowels are very slightly damped in / / while there is no such damping in / /. This shows that / / is context nasalized.

Another interesting feature that we can note while making comparison is that the vowel preceding / / is a little longer than usual, this phenomena is more clear when it comes in the word ending.

5.2.2 Comparison with /n/

/n/ and / / both are nasal and therefore bear some resemblance with each other. Both of them are context nasalized, that is the higher formants of their context vowels are damped. This damping is relatively clearer in /n/.

Duration of /n/ is much longer than that of / /. More over there is no sharp formants transition in /n/. Although the lower formants remain unchanged for both /n/ and / /.

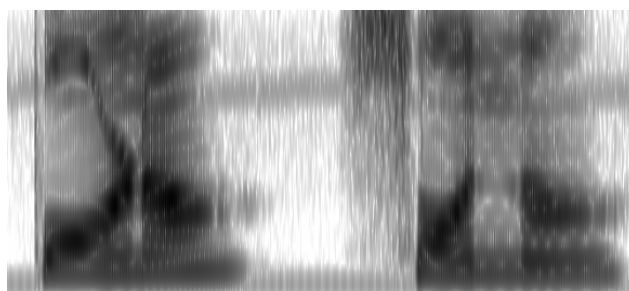


Figure 8 Spectrogram of /po a/ & /sona/

5.3 Distinction Between / / and / /

Acoustically / / can be easily distinguished from / / as there is a period of oral closure in / / during which there are only very damp formants due to nasalization, while in / /, although there is clear formant transition but otherwise formants are continuous and there intensity remains unaffected as can be seen in Figure 4.

6. DISCUSSION

During analysis of / /, I found that this phoneme is articulated somewhat differently in different areas. In some areas it is more retroflexed and its articulation is closer to / / while in others its retroflexion is not that clear. This difference in articulation changes its acoustic properties slightly. The major change in acoustic features is less sharp formants transition in less retroflexed version of / /, in such cases one has to rely on F4 transition, although even that is not as clear as it is in usual Punjabi retroflex.

REFERENCES

- Baart, Joan L.G. Bibliography of Languages of Northren Pakistan, Summer Institute of Linguistics & National Institute of Pakistan Studies, Quid-i-Azam University, 2001.
- Bukhari, Tanweer. Punjabi Urdu Lughat. Urdu science board, 299 Upper Mall Lahore.
- Catford, J.C. A Practical Approach to Phonetics. Clarendon Press, Oxford, 1992.
- Encyclopaedia Britannica Deluxe, 2000
- <http://www.punjabheritage.com>
- <http://www.punjabonline.com>
- Karamat, Nayyara. Phonemic Inventory of Punjabi. Akhbar-i-Urdu, April/May 2002.
- Ladefoged, Pette & Maddison, Ian. The Sounds of the World's Languages. Blackwell Publishers, 1996.
- Laver, John. Principles of Phonetics. Cambridge University Press, 1994 .
- Masica, Colin.P. The Indo Aryan Languages. Cambridge University Press, 1991.
- Pickett, J.M. The Acoustic of Speech Communication. Allyn & Bacon, 1999.
- Punjabi, Irshad Ahmd. Punjabi Lugat. Punjabi Adbi Lehr Bilal Ganj Lahore, 1999.
- Sidhi Dr, Abdul Majeed. Lisaniat-i-Pakistan. National Language Authority, Islamabad. March 1992.