VOICING IN PERSIAN WORD-FINAL OBSTRUENTS

Mercedeh Mohaghegh

1Dept. of Linguistics, University of Toronto, 100 St. George St., Toronto, Canada, M5S 3G3
mercedeh.mohaghegh@utoronto.ca

1. INTRODUCTION

Analysis of voiced-voiceless contrast in final position in various languages has been the topic of numerous studies (see e.g. Charles-Luce, 1985, for German; Dmitrieva et al., 2010, for Russian). Some studies show that word final voiced obstruents get fully devoiced, resulting in complete, phonological neutralization (e.g. Jassem & Richter, 1989). Others provide evidence that final devoicing is phonetically incomplete with resulting obstruents being different from their voiceless counterparts (e.g. Burton & Robblee, 1997).

Persian obstruents exhibit a two-way voicing contrast, (voiced vs. voiceless), which is also maintained in word-final position. These obstruents can appear both as single (e.g. /x/z/ “jump” vs. /x/z/ “wet”) as well as in clusters (e.g. /Gæzb/ “receipt” vs. /habs/ “imprison”). Previous studies have noted that voiced obstruents may be partially devoiced when occurring word-finally (e.g. Mahootian, 1997:288). However, there haven’t been any phonetic studies of this process in Persian.

The goal of the present study was to investigate the acoustic properties of voicing of Persian obstruents in both word-final single consonants and clusters, and to find whether any instances of devoicing (or voicing), if present, is partial or complete. For this purpose an acoustic analysis of voicing in Persian word-final obstruents is conducted based on the data gathered from 6 Persian native speakers.

2. METHODS

2.1 Participants

Six Persian native speakers, three females and three males, were recorded. All of them were native speakers of the Tehran dialect of Persian, ranging in age from 22-29 years old, except for one participant who was 51 years old. None of them had ever lived outside of Iran for more than 5 years or had any history of hearing or speaking disorders.

2.2 Materials

Speech materials consisted of 22 words presented within the carrier sentence, “hala begin ___.” (“now say __.”). Among these words, 10 ended in a cluster (C1C2: stop+fricative or vice versa) as in /dæzb/ “attract”, and 6 ended in a single consonant (C#) as in /æzb/ “night”. The target consonants were fricatives [s] and [z] and stops [p] and [b] in the context of the vowel [æ] (or [a] in 6 words). Six words with the same consonants in intervocalic position (VCV) were recorded as controls as in /Gæzb/ “anger”. All items were real Persian words with high frequency of usage, except four nonsense words. Each sentence was repeated six times throughout the recording session.

2.3 Acoustic Measurements

Three temporal measurements were applied to the target fricatives and stops: 1- duration of the consonant: longer stop closure or frication duration is associated with voicelessness (e.g. Dinnse & Charles-Luce, 1984), 2-duration of the preceding vowel: duration of the vowels followed by a voiced consonant is often longer compared to the vowels preceding voiceless consonants (e.g. Burton & Robblee, 1997), and 3- duration of the voice bar: voiced consonants often have a visible voice bar at lower frequencies; on the other hand, voiceless or partially devoiced consonants have no or very short voice bars (e.g. Warner et al., 2004).

3. ANALYSIS AND RESULTS

Separate sets of two and three-way repeated measure ANOVAs were run for fricatives and stops for each of the three measurements. Three independent factors were: 1- Position (C1: the first consonant in a cluster, C2: the second consonant in a cluster, VC, and VCV). Only the results related to the first three levels are discussed in the current paper. 2- Context voice (voiced and voiceless): underlying voicing of the neighbouring obstruent within a cluster. 3- Voice (voiced and voiceless): underlying voicing of the obstruent.

As indicated in Table 1 the interaction between the factors Position and Voice was in most cases significant except for consonant duration and vowel duration for stops. The interaction between the factors Voice and Context voice was also significant except for duration of voice bar. On the other hand no significant interaction between Position and Context voice was indicated for any of the measurements.

Table 1. Summary results of 2-way and 3-way repeated measure ANOVAs for all measurements.
For consonant duration and vowel duration (Figure 1a,b), the results of t-test and Tukey HSD post hoc analysis indicated that final voiced and voiceless stops or fricatives in clusters (C2) were not significantly different when preceded by a voiceless consonant. The same results were observed when the target sounds were followed by a voiceless consonant. However, overall in all cases where there was an interaction between Position and Voice, voiceless consonants were significantly longer compared to their voiced counterparts regardless of their position. For duration of voice bar (Figure 1c), no significant difference was indicated between voiced and voiceless fricatives in C2 and voiced and voiceless stops in C2 and VC (also C1) positions (μ=1.2 ms).

In addition to final devoicing, the results also indicate that voicing assimilation in favour of the voiceless sound affects obstruents within word-final clusters in Persian. Since there were cases of both regressive and progressive voicing assimilation, no particular preference for direction of assimilation was observed.

Whether the current results can be generalized to other types of Persian word-final single consonants and consonant clusters is a question which needs to be investigated further in future studies. In addition it will be of interest to include results of other known measures such as spectral information and amplitude differences, among others.

REFERENCES


ACKNOWLEDGEMENTS

I am most grateful to Dr. Alexei Kochetov, Dr. Daphna Heller and Prof. Elan Dresher for providing much help with their useful insights on this topic. This work was supported by a SSHRC Institutional Grant (SIG) award.