

Acoustic properties of plain and glottalized stops in Gitksan

Una Y. Chow

University of British Columbia

Gitksan stops:

Gitksan is an endangered language of the Tsimshian language family, spoken mainly along the Skeena River in Northwestern British Columbia. Phonemically, Gitksan has no voiced stops (Rigsby & Ingram, 1990). Its phonemic inventory comprises voiceless pairs of plain and glottalized stops at the bilabial, alveolar, pre-velar, labialized-velar, and uvular places of articulation: /p pʰ/, /t tʰ/, /kʲ kʲʰ/, /kʷ kʷʰ/, and /q qʰ/ (Brown et al., 2016). Previous studies (Brown et al., 2016; Rigsby & Ingram, 1990) claim that these voiceless stops undergo certain allophonic processes: (i) voiceless plain stops become voiced prevocally (e.g., *daax* /ta:xʰ/ → [da:xʰ] 'circumference') and (ii) voiceless glottalized stops become lenis ejectives word-initially.

Observation and research questions:

The corpus for this study consists of over 1000 Gitksan word tokens that I elicited (and recorded) in fall 2018 using translation and storyboard methods. The words were elicited in isolation and in natural sentences from three Gitksan language consultants: a female first-language (L1) speaker from Kispiox, of the Eastern Gitksan area, and two male L1 speakers from Gitsegukla and Kitwancool, of the Western Gitksan area. From a sample of the tokens, I observed that not all three speakers voice prevocalic plain stops word-initially (e.g., *daax* /ta:xʰ/ → [ta:xʰ]). Since word-initial glottalized stops surface as lenis ejectives, they can be potentially confusable with voiceless plain stops (e.g., [tʰ] in [tʰa:p] 'to hammer' versus [t] in [ta:xʰ] 'circumference'). My research questions are (i) which acoustic properties distinguish plain stops from glottalized stops in Gitksan? and (ii) are there dialectal variations in the production of these stops?

Methods:

From the corpus, I obtained words that contain a plain or glottalized stop initially, medially, or finally. The word-initial stops were prevocalic (e.g., /kʷ/ in /kʷanks/ 'fountain'; /kʷʰ/ in /kʷʰast/ 'be broken'). The word-medial stops were intervocalic (e.g., /t/ in /ʔata:wq/ 'story'; /tʰ/ in /hatʰaʰ/ 'cedar'). The word-final stops were post-vocalic (e.g., /q/ in /ʔa:q/ 'mouth'; /qʰ/ in /naqʰ/ 'dress'). The adjacent vowel was either /a/ (or /a:/) or /e/ depending on the speaker's natural pronunciation of the word (e.g., /a/ in /kʲat/ or /e/ in /kʲet/ 'man'). Then, following Vicenik's (2010) acoustic measures for Georgian plain and ejective stops, I measured (i) the duration of voicing into the stop closure relative to the duration of the closure, (ii) the positive voice onset time (VOT) from the stop burst to the following onset of voicing, (iii) the intensity of the stop burst relative to the intensity of the following vowel, and (iv) the spectral mean frequency of the burst.

Results:

The preliminary results (of 158 tokens) show quantitative differences between plain and glottalized stops for all four measures. However, voicing during stop closure and positive VOT provide greater acoustic differences between the plain and glottalized stops than relative intensity and spectral mean frequency of the stop bursts. Additionally, the amount of differences varies depending on the stop's position in the word. The results also reveal variations in the production of the stops among the three speakers, with no distinct patterns of variations between the Eastern and Western Gitksan speakers. These variations in production may be inter-speaker or they may indicate variations of three different dialects. Continued research on this project is in progress. Findings from this study contribute to the documentation of this endangered language.

References

- Brown, J., Davis, H., Schwan, M., & Sennott, B. (2016). Gitksan. *Journal of the International Phonetic Association*, 46(3), 367–378.
- Rigsby, B., & Ingram, J. (1990). Obstruent voicing and glottalic obstruents in Gitksan. *International Journal of American Linguistics*, 56(2), 251–263.
- Vicenić, C. (2010). An acoustic study of Georgian stop consonants. *Journal of the International Phonetic Association*, 40(1), 59–92.