

# Tonogenesis in early Contemporary Seoul Korean: A longitudinal case study

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Received 23 July 2012; received in revised form 3 May 2013; accepted 4 June 2013

Available online 8 August 2013

## Abstract

A series of recent apparent time studies observed that Seoul Korean is undergoing a tonogenetic sound change whereby the VOT contrast between aspirated and lenis stops in phrase-initial position is being merged and the contrast between the stop categories is more reliably signalled by difference in F0 of the following vowel. This paper presents an instrumental phonetic study of aspirated and lenis stops in early 20th century Seoul Korean based on audio recordings of elementary school textbooks from 1935. The two speakers examined in the 1935 recordings are one 41-year-old male speaker and one 11-year-old male speaker. The data from the 1935 is also compared to the speech of the child speaker from 1935 re-recorded 70 years later in 2005 at the age of 81 to examine the change of a speaker's speech over his lifespan. The results confirm that a tonogenetic sound change has been in progress over the last century or so in Seoul Korean; the 1935 adult male speaker relied almost exclusively on VOT difference for the stop contrast unlike Present Day Seoul speakers of comparable age and gender, who make use of both VOT and F0 cues to signal the stop contrast; the 1935 child speaker rely on F0 cue for stop contrast more than the 1935 adult in line with the general direction of sound change; the 1935 child speaker at the age of 81 in 2005 showed even more F0 differentiation than he did 70 years earlier showing that the speaker underwent change in the direction of community-level sound change over his lifespan. The study is significant in that this is the first longitudinal instrumental phonetic study of tonogenetic sound change.

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**Keywords:** Korean; Tonogenesis; F0; Voice onset time; Sound change

## 1. Introduction

Tonogenesis is a commonly attested sound change whereby consonantal contrasts of voicing, aspiration and glottalization, or phonation contrast of breathiness and creakiness give rise to and eventually become replaced by tonal contrasts (Haudricourt, 1971; Maran, 1973; Matisoff, 1973; Hombert, 1978; Hombert et al., 1979; Thurgood, 2002; Kingston, 2011). In many cases, tones start out as redundant phonetic attributes of consonantal contrast (e.g., ba vs. pa), then develop into a robust distinction coexisting with the original consonantal contrast (bà vs. pá), and finally become the primary contrastive feature (pà vs. pá), as the original consonantal features are lost. Many studies reconstruct tonogenetic sound change by comparing linguistic data from different time periods of a language or synchronic data from related dialects and languages, where some of the dialects and languages retain the earlier state of consonantal contrast while others have replaced the consonantal contrasts with tonal contrasts (Karlgrén, 1966; Haudricourt, 1971; Matisoff, 1973;

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Kingston, 2005). There are also a number of instrumental phonetic studies of languages in a state of transition from consonantal to tonal contrast (Mazaudon and Michaud, 2008; Chen, 2011; DiCiano, 2012) and also a phonetic study that compares different endpoints of sound change by examining related dialects of a language, one that retains the original consonantal contrast and another that replaced the consonantal contrast with a tonal contrast (Svantesson and House, 2006). Also, there are studies that examine contact-induced synchronic variation in the realization of tonal contrast along a tonogenetic trajectory (Pearce, 2009; Brunelle, 2009). Relatively rare are instrumental studies that examine the diachronic sound change within a single speech community. Hyslop (2009) and Abramson et al. (2004) are notable exceptions in that they examined variation within a speech community with an eye to tracking diachronic sound change but these studies are limited in their scope. Also, as far as we know, there is no instrumental study that examines a tonogenetic sound change in a single dialect of a language across real time or a longitudinal study of same speakers over time.<sup>1</sup>

Contemporary Seoul Korean (1890–present) presents an ideal opportunity to examine this sound change in progress. Korean has a three-way laryngeal contrast of voiceless stops, among aspirated stops /p<sup>h</sup>, t<sup>h</sup>, k<sup>h</sup>/, lenis stops /p, t, k/, and fortis stops /p', t', k'/. Previous studies show that the contrast is signalled by a combination of acoustic cues including voice onset time (VOT) of the stop and fundamental frequency (F0) and amplitude difference between the first and the second harmonics (H1–H2) of the following vowel; aspirated stops have the longest VOT values, fortis stops have the shortest values, and lenis stops have intermediate values; F0 on the following vowel is higher for aspirated and fortis stops than for lenis stops; vowels following aspirated and lenis stops have breathier voice quality than vowels following fortis stops as indicated by higher H1–H2 values (Cho et al., 2002; Hardcastle, 1973; Han and Weitzman, 1970; Kang and Guion, 2008; Kim, 1965, 1994; Lisker and Abramson, 1964).

There are a number of recent apparent-time studies on the emergence of tonal contrast in Seoul Korean (Silva, 2002, 2006; Wright, 2007; Kang and Guion, 2008; Kang, submitted for publication). These studies show that Seoul Korean is in fact in the process of losing the VOT (Voice Onset Time) contrast between aspirated and lenis stops (/p<sup>h</sup> t<sup>h</sup> k<sup>h</sup>/ vs. /p t k/) in phrase-initial position and the formerly redundant pitch difference—a high pitch on vowels following aspirated stops and a low pitch on vowels following lenis stops—is replacing the VOT difference as primary cue of the contrast. A similar change is reported for dialects of Korean spoken in Chinese (Jin, 2008) and in Toronto (Kang and Nagy, 2012).

An Accentual Phrase (AP) is a crucial unit in the realization of tones in Present Day Korean. An AP is a unit of prosodic structure that is above Prosodic Word and below Intonational Phrase in prosodic hierarchy of Seoul Korean (Jun, 1993). Accentual Phrases (AP) are marked by boundary tones and the initial boundary tones vary between LH and HH depending on the laryngeal feature of the AP-initial consonant; AP's that begin with a lenis stop or affricate or a sonorant are marked by LH boundary tones with L falling on the initial syllable and H on the second, while phrases that begin with a fortis or aspirated stop or affricate, /h/, or coronal fricatives, are marked by HH boundary tones with H falling on each of the first two syllables (Jun, 1993). The consonant-induced F0 difference extends far beyond the initial portion of the immediately following vowel indicating that the F0 perturbation is not an automatic consequence of physiological restrictions in laryngeal articulation (Jun, 1996; Kim, 2000; Silva, 2006). Recent perception studies also find that F0 is a crucial perceptual cue for stop distinction, for lenis-aspirated stops in particular (Kim et al., 2002; Kim, 2004; Lee and Jongman, 2011; Kong et al., 2011). So, this recent change in Seoul Korean is consistent with a process of tonogenesis, whereby consonant-induced F0 perturbation is exaggerated and reinterpreted by learners as a primary contrast, eventually replacing the original voicing or phonation contrast of consonants (Hombert et al., 1979; Kingston, 2011).

The merger of VOT is almost complete in the speech of younger female speakers, a population known to lead many sound changes, and the least advanced in the speech of older male speakers. The F0 contrast is further enhanced in younger and female speakers' speech. Fig. 1, reproduced from Kang (submitted for publication), shows the variation in VOT values of sentence-initial stops and F0 at the midpoint of following vowel by speakers' age and gender based on the NIKL (The National Institute of the Korean Language) acoustic corpus of Standard Seoul Korean (2005).

It is notable that even the oldest male speakers shown in Fig. 1, i.e., those born in the 1930s, exhibit substantial consonant-induced pitch difference of around 2 semitones at the midpoint of following vowel, indicating that the tonogenetic process have already advanced fairly far in Present Day Korean. At the same time, these speakers show a robust contrast of VOT between aspirated and lenis stops, showing a difference of over 40 ms in mean VOT values, indicating that the sound change has not progressed far enough for F0 to overtake VOT as the primary exponent of the contrast. Given what we know about the general trajectory of tonogenetic sound change (cf. Maran, 1973), we expect that the preceding stage of Seoul Korean had a similarly more robust VOT contrast between aspirated and lenis categories but less distinctive F0 difference between the two stop categories.

In apparent-time studies (Labov, 1963; Bailey et al., 1991), it is assumed that the individual speakers' speech remains more or less stable across life span reflecting the state of language at the time they learned the language and that differences among speakers of different generations at a single point in time mirror diachronic change in real time. While it

<sup>1</sup> Zsiga (2008) examined the change in the realization of contour tones in Thai but not the emergence of tones themselves.

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