

Sound Change in Si-Xian Hakka Vowels: From the Comparison of Vowel Normalization Procedures

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This paper addressed the issues of acoustic normalization of Si-Xian Hakka vowels and of normalization procedures. An acoustic study of Si-Xian Hakka vowels, produced by native speakers in Mainland China and in Taiwan, was conducted. Twenty native speakers from Mei-Xian, Mainland China and thirty from Taiwan participated in the current study. Due to the geographical reasons, speakers from Taiwan were further divided into two subgroups: fourteen participants in Miao-Li (in the northern part of Taiwan) and sixteen participants in Mei-Nong (in the southern part of Taiwan). It was historically recorded that native speakers in these three areas spoke the same dialect of Hakka, that is, Si-Xian Hakka. Mei-Xian Hakka in Mainland China was regarded as the source region, where Miao-Li Hakka and Mei-Nong Hakka in Taiwan were originated. These participants were invited to read a wordlist of Hakka with six vowels embedded in different contexts (i.e. in different tones, in different phrase positions). Acoustic cues of F0, F1, F2, and F3 were automatically fetched. Nine normalization procedures, including five vowel-intrinsic procedures (i.e., HZ, LOG, BARK, MEL, and S&G) and four vowel-extrinsic procedures (i.e., LOBANOV, NEAREY1, NEAREY2, and GERSTMAN), were applied to these acoustic measurements. Discriminant analysis was conducted to examine and compare these procedures. Discussions were made on how effectively these procedures preserved phonemic information (i.e., six vowels), how they preserved the sociolinguistic information (i.e., the talker's regional background), and how they minimized physiological variation (i.e., gender difference). Results demonstrated that vowel-extrinsic procedures performed better than the vowel-intrinsic ones and that formant-intrinsic procedures performed better than the formant-extrinsic ones. Based on the discussion on these normalization procedures of Si-Xian Hakka vowels, implications for relevant linguistic issues and suggestions for future research were provided.

Key words: acoustics, normalization procedures, Si-Xian Hakka vowels