Acquisition of the complex three-way Korean plosive contrast by native English speakers

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Summary

We investigated perceptual learning of the Korean three-way plosive contrast (lenis, aspirated, and fortis) by native English speakers.

Unlike VOT continua in other languages, this contrast is distinguished by complex trading relations between VOT and pitch.

Participants learned a vocabulary of 18 Korean pseudowords comprised of six minimal triplets, e.g.: /pʰ an/ (pan) /p an/ (pan) /p an/ (pan)

Fortis stops most closely resembled listeners’ existing English voiced stop categories:

Lenis and aspirated stops were harder to distinguish because both were encompassed by listeners’ existing English voiceless stop categories.

Low proficiency learners acquired the fortis stop, but did not differentiate the lenis and aspirated stops.

High proficiency learners acquired the fortis stops, and exhibited progress at distinguishing the lenis and aspirated stops.

Both groups acquired these contrasts most accurately for bilabial stops and least accurately for alveolar stops.

Methods

Participants

N = 37 English monolinguals (12 M, 25 F)
Mean age 23.1 years (18-33, sd=3.7)
No prior experience with Korean

Stimuli

18 Korean pseudowords in 6 triplets
Produced by 4 native Korean speakers
Each word was associated with a distinct photograph of an object

Training Procedures

4 computer-based training sessions:
Daily familiarization of items in minimal triplets, including active practice with feedback
Daily attainment test with no feedback on the entire vocabulary (18 words × 4 talkers = 72 trials)
60 day follow-up (attainment test only)

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Training Vocabulary

Hangul Rom. Revised Roman. IPA Target

Training Vocabulary Phonetics

The acoustic-phonetics of our training vocabulary were consistent with the ranges reported in the literature:

Fortis: aspiration

Lenis: no aspiration, low onset F0

Aspirated:

VOT differed across the 3 laryngeal contrasts:

IPA: /pʰ an/ Revised Romanization: “pʰ” / “a” / “n” Hangul = “pan”

Acoustic Phonetics

Korean Plosive Categories

Stop consonants in Korean are distinguished by a 3-way laryngeal contrast. This contrast involves trading relations between voice-onset time (VOT) and onset F0.

Fortis stops have a short positive VOT, no aspiration, and a modal onset F0.

Lenis stops have a positive VOT, aspiration, and a modal onset F0.

Aspirated stops have a long positive VOT, aspiration, and a modal onset F0.

Vocabulary Learning

Learning Outcome

All learners improved after training, but individual attainment was highly variable:

High proficiency learners (HPL) mean vocabulary acquisition: 63% ± 5%

Low proficiency learners (LPL) N=23, mean vocabulary acquisition: 37% ± 7%

Patterns of Acquisition

HPL: fortis (63% ± 12%); lenis (55% ± 12%); aspirated (51% ± 11%)
LPL: fortis (50% ± 17%); lenis (32% ± 11%); aspirated (30% ± 15%)

Both groups learned bilabial stops best (HPL: 70%; LPL: 44%); then velar (HPL: 63%; LPL: 44%); and both found alveolar (HPL: 57%; LPL: 22%) most challenging.

Identification Matrix (onset consonant confusions)

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