

Individual differences of cue weights in bilingual speech are correlated across languages and contrasts: a case study of Changsha-Mandarin bilinguals' sibilant production

Motivation. Recent research has demonstrated substantial individual variability in how speakers weight acoustic cues when producing phonological contrasts. Prior studies have identified trade-off relationships between cues (e.g., Shultz et al., 2012; Hauser, 2023), such that greater reliance on one cue is associated with reduced reliance on another. Moreover, cue-weighting strategies appear to be stable across contrasts within a single language: speakers who assign greater weight to a cue (e.g., center of gravity, CoG) in one contrast (e.g., /s/–/ʃ/) tend to do so in other contrasts (e.g., /s/–/ç/) as well (Hauser, 2023). The present study extends this line of research to bilingual speech, a common linguistic context in mainland China due to the diglossic relationship between Mandarin and regional Sinitic varieties. We investigate whether individual cue-weighting strategies are shared across languages by examining Changsha (Xiang)–Mandarin bilinguals' production of sibilant contrasts in both Changsha and Mandarin.

Methods. Eight Changsha-Mandarin (F:4, M:4) bilingual speakers were recruited for a speech production experiment. Participants produced monosyllabic words featuring the sibilant onsets /s, ç/ in Changsha (a two-way contrast) and /s, ç, ʃ/ in Mandarin (a three-way contrast) followed by the vowel /a/. A total of 877 clean tokens were analyzed (Mandarin: 455; Changsha: 422). Following Schertz and Claire (2019), production cue weights for CoG and F2 onset were estimated using coefficients from Linear Discriminant Analysis (LDA). Pearson correlations were used to assess relationships among individual cue weights within and across contrasts and languages.

Findings. (i) Cross-linguistic correlations: Cue weights for both F2 onset and CoG in the Changsha /s/–/ç/ contrast were positively correlated with weights for the same cues in the Mandarin /s/–/ç/ contrast (F2: $r = 0.65$, $p = 0.08$; CoG: $r = 0.84$, $p < 0.01$). **(ii) Within-contrast cue trading:** An inverse relationship between F2 and CoG was observed within the Changsha /s/–/ç/ contrast ($r = -0.71$, $p = 0.05$) and the Mandarin /ʃ/–/ç/ contrast ($r = -0.77$, $p = 0.02$). **(iii) Cross-contrast consistency:** In Mandarin, higher F2 weights in /s/–/ç/ predicted higher F2 weights in both /s/–/ʃ/ ($r = 0.72$, $p = 0.04$) and /ʃ/–/ç/ ($r = 0.73$, $p = 0.04$), while higher CoG weights in /s/–/ç/ predicted higher CoG weights in /ʃ/–/ç/ ($r = 0.67$, $p = 0.07$).

Discussion. These findings replicate and extend Hauser (2023) by confirming both cue trading within contrasts and consistency of cue weighting across phonological contrasts. Crucially, the observed cross-linguistic correlations indicate that bilingual speakers deploy similar cue-weighting strategies across their two languages. This supports the view that bilinguals rely on a shared acoustic–phonetic representational system rather than language-specific phonetic implementations (Amengual, 2024; Flege, 1995). This implies that a speaker's idiosyncratic phonetic implementation is not language-specific but rather a unified property of their bilingual phonological system.