CorpusPhon2, LabPhon20 (Montréal)

Phonetic Transfer of Code-switching in a Hong Kong Trilingual Corpus

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SCAN ME!

Introduction

- **Code-switching (CS)**
  - = A linguistic behaviour of using more than one language in a conversation
  - Common among multilinguals
  - **Code-switching in Hong Kong (HK)**
    - Intra-utterance CS as the most common behaviour among the trilinguals
      - L1 HK Cantonese (matrix language, i.e., provide grammatical structure) + L2 HK English (embedded language, i.e., insert words)
        - E.g., 我 present 完　去 食 lunch
          I present finish go eat lunch
          'I am having lunch after my presentation.'
      - Other combinations are possible, yet with lower frequencies [1]
- How current speech models predict phonetic interactions during CS?
  - **Revised Speech Learning Model (SLM-r)** [2]
    - A common phonetic space that allows interactions across languages without specifying the direction → account for interaction
  - **Inhibitory Control Model (ICM)** [3]
    - Asymmetrical transfer in CS for unbalanced multilinguals, where L2 affects L1 but not vice versa → account for both interaction and directionality
- Code-switching data is often collected in **monologue/controlled settings**
  - carrier sentence / paragraph reading , repetition, imagination (e.g., [4, 5, 6])
  - → potentially limit the generalizability of their findings to conversation
- **Corpus-based continuous CS speech** collected through interactive sessions
  - → Offer a more ecologically valid source
- **Research Question**
  - During intra-utterance CS, do phonologically similar vowels interact between L1 Cantonese (matrix) and L2 English (embedded) in Hong Kong trilinguals?

A Hong Kong Trilingual Corpus

- **Trilingual Speech Corpus**
  - Hong Kong Cantonese (HKC), English (HKE), and Cantonese-accented Mandarin
  - 93 Hong Kong multilinguals (Younger: 30F/30M; Older: 22F/11M)
    - All are L1-HKC speakers who grew up in Hong Kong
    - Younger (20.8±2.2); Older (66.1±5.8)
  - Originally designed for forensic phonetics research (e.g., [7])
    - Experimenter roleplayed as a police officer
    - Participants roleplayed as a suspect under a financial dispute investigation
  - Data Collection Procedure:
    1. Read speech: give a scripted statement to the officer
    2. Semi-spontaneous speech: undergo interrogation by the officer
    3. Repeat 1. & 2. in a fixed order (HKC → accented-Mandarin → HKE)
    4. Go over the details again in HKC with English target words provided
  - **4 Speech Conditions**
    1. Hong Kong Cantonese *Monolingual Speech (*Semi-Spontaneous)*
    2. Hong Kong English *Monolingual Speech (Read & Semi-Spontaneous)*
    3. Accented Mandarin *Monolingual Speech (Read & Semi-Spontaneous)*
    4. *Code-Switching (CS) Speech* with HKC as matrix and HKE as embedded
  - **2 Key Features**
    1. ★ All **three languages** are produced by the **same** speakers
       - Rarely found in existing corpora
       - → valuable for within-speaker comparisons
    2. ★ CS speech is **spontaneous** yet **controlled**
       - Participants constructed their utterances using target words
       - → closely resemble **natural code-switching behaviour**

Method

- **Current Study**
  - 12 L1-HKC younger participants (6F, 6M; 20.9±2.0) from the above corpus
    - Comparable English proficiency based on IELTS or equivalent scores (≈6.5)
  - Conditions selected:
    1. HKC Monolingual speech
    2. HKE Monolingual speech
    3. Code-Switching speech
  - Data Selected: Corner vowels from two conditions in each language
    - Cantonese: /iː, aː, uː/ in *Monolingual speech* & *CS speech* (matrix)
    - English: /i, ʌ, u/ in *Monolingual speech* & *CS speech* (embedded)
  - Data Processing
    1. Midpoint F1 and F2 values were extracted
    2. Formant values were normalized using ΔF method within language
    3. Formant values were compared between conditions and within language

Results

1. Vowels extracted from the Hong Kong Trilingual Corpus

	Condition	
HKC	Monolingual	CS (matrix)
/iː/	680 (46.6%)	161 (48.2%)
/aː/	681 (46.7%)	159 (47.6%)
/uː/	98 (6.7%)	14 (4.2%)

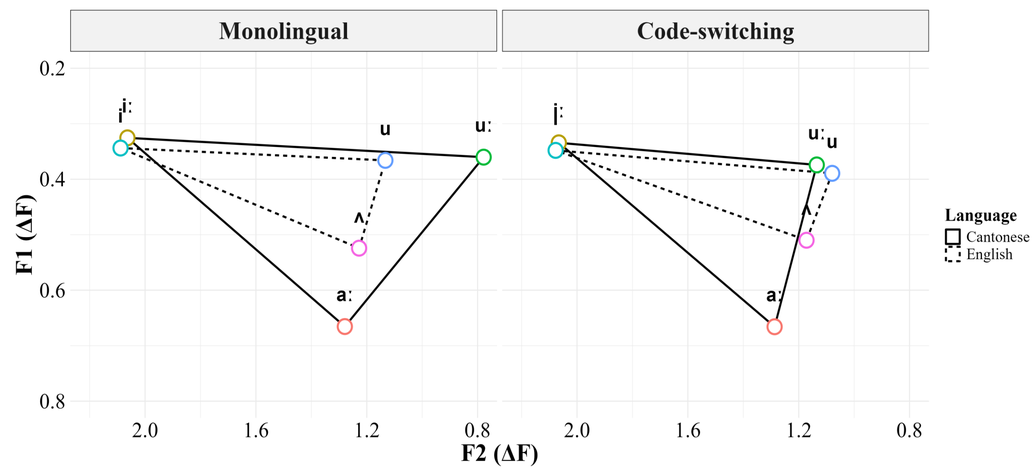
	Condition	
HKE	Monolingual	CS (embedded)
/i/	409 (59.4%)	92 (73.0%)
/ʌ/	130 (18.9%)	21 (16.7%)
/u/	150 (21.8%)	13 (10.3%)

- ✓ The relative distribution of the vowels reflects their own frequencies in its own language [8, 9], **supporting the naturalness of the corpus data**
  - HKC: /iː/ ≈ /aː/ > /uː/; HKE: /i/ > /ʌ/ ≈ /u/

2. Formant values between monolingual and code-switching speech

Linear Mixed-effects Models (LMMs):
- *F1 ~ Condition(Mono/CS)*Vowel + (1|speaker) + (1|word)*
- *F2 ~ Condition(Mono/CS)*Vowel + (1|speaker) + (1|word)*

- Hong Kong Cantonese
  - **/uː/ is fronted in code-switching** (β = 0.36, *SE* = 0.06, *t*(1293) = 5.96, *p* < .0001)
- Hong Kong English
  - No vowels show any significant changes between conditions



Discussion

- **Unidirectional transfer** in **F2**
  - = **L1 is affected** by L2, but not vice versa
  - HKC (L1) /uː/ **becomes** acoustically more **similar** to its phonological **fronter** counterpart HKE (L2) /u/ during code-switching speech
- The transfer supports…
  1. SLM-r's notion of a common phonetic space
     - the flexibility of L1 and L2 categories, in which distinct categories can merge into a composite category → **transfer**
  2. Inhibitory Control Model
     a) higher activation level due to regular use of L1 → more inhibitory resources needed to suppress it when it was the non-target during code-switching
     b) residual inhibition of L1 persists even when it is active on surface
     c) more susceptible to be influenced by L2 → **unidirectional transfer**
- Vowel-specific nature of this transfer **remains unclear** (i.e., Why F2 of HKC /uː/?)
  - HKE /u/ is generally fronted [10, 11] → the specific transfer observed may be driven by the acoustic salience of this corner vowel
- The corpus used in this study is suitable for **cross-linguistic comparisons**
- **Future directions**
  - Examine the interaction between tone and intonation during code-switching between the tonal and non-tonal languages
  - Examine how Hong Kong Cantonese influences Cantonese-accented Mandarin

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*The Cantonese read speech is considered semi-spontaneous as the statement was provided in written Chinese and participants constructed their own sentences using spoken Cantonese sentence structures and words.