

Fundamentally challenging: The role of f_0 in cross-language speaker discrimination

Leah Bradshaw^{1,2}, Julien Plante-Hebert³ and Elizabeth Allyn-Smith³

¹*Department of Computational Linguistics, University of Zurich, Switzerland*

{leah.bradshaw}@uzh.ch

²*JP French International, UK.*

{leah.bradshaw}@jpfrench.com

³*Département de Linguistique, Université du Québec à Montréal, Montréal, QC, Canada*

{plante-hebert.julien | smith.elizabeth_allyn}@uqam.ca

This project investigates how bilingualism affects speaker discrimination, focusing specifically on how language-dependent variation in fundamental frequency (f_0) influences cross-language indexical processing. Indexical information conveys speaker-specific traits such as identity, accent, and emotional state, enabling listeners to recognise and distinguish individuals (Abercrombie, 1967). However, indexical processing is highly variable and context dependent, particularly when speakers shift language or speaking style (e.g., (Bartle & Dellwo, 2015; Perrachione, 2017; Stevenage et al., 2021)). Despite bilingual speakers representing approximately 43% of the global population (Jayanath, 2021), research on cross-language voice processing has largely focused on monolingual listeners encountering unfamiliar languages, leaving bilingual speech processing comparatively understudied. This gap is especially relevant in forensic phonetics where multilingual speakers are increasingly common yet difficult to reliably analyse.

Previous research demonstrates a robust Language Familiarity Effect (LFE), whereby listeners recognise and discriminate voices more accurately in familiar than unfamiliar languages (overview papers: Levi, 2019; Perrachione, 2017). Studies across several languages show that even when listeners become familiar with bilingual speakers, recognition accuracy decreases when those speakers switch languages (Goggin et al., 1991; Orena et al., 2019; Winters et al., 2008). One possible explanation lies in bilingual speech production itself: bilingual speakers often exhibit systematic language-dependent shifts in acoustic properties, particularly f_0 . Such differences have been reported for Japanese–English (Graham, 2015), Korean–English (Cheng, 2020), Russian–English (Altenberg & Ferrand, 2006), and French–English bilinguals (Schwab & Goldman, 2016). It is known that f_0 is a well-established cue for speaker identity (e.g., Dellwo et al., 2018; Nolan et al., 2011; Skarnitzl & Vaňková, 2017), therefore, these shifts may directly impair listeners’ ability to identity speakers across languages.

The present study will examine whether variation in f_0 affects cross-language speaker discrimination. Specifically, we ask: (1) how naturally occurring f_0 variability contributes to indexical processing, and (2) whether consistent versus inconsistent f_0 patterns across languages facilitate more accurate speaker discrimination when bilingual speakers switch languages. Read speech recordings were collected from 6 early French–English bilinguals in Montréal who acquired both languages before school age. Participants completed two recording blocks, one in French and one in English, with randomised order across speakers. Using controlled acoustic manipulations in Praat, these recordings were used to generate stimuli for a perceptual experiment whereby individual speaker stimuli was created with both consistent and inconsistent f_0 patterns across languages. The perceptual experiment will be conducted with three listeners groups: Canadian English monolinguals, Canadian French monolinguals and Quebec French–English bilinguals. Participants will complete a cross-language voice discrimination task in which they will judge whether the speech was produced by the same or two different speakers. In all trials, listeners will be presented with a pair of voices with one snippet presented in English and one in French. For same-speaker trials, stimuli will either have the speakers’ natural f_0 variability across the two languages, or their median f_0 will be manipulated to be the same in the two samples. It is predicted that listeners will discriminate speakers more accurately when f_0 is held consistent across the two languages.

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