Interaction between lexical tones and stress is affected by individual variation in language attitudes and L2 experience

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The suprasegmental properties of bilingual speakers' first language (L1) and second language (L2) may influence each other, particularly in the direction from L1 to L2 [1]. A particularly interesting case is the interaction between lexical stress and lexical tone in learners of stress languages (e.g. English) whose L1 is tonal (e.g. Cantonese). Although both stress and tone use fundamental frequency (f0) as an acoustic correlate, the information value of f0 in cueing stress and tone is different [2]. Identification of tones is almost solely based on f0 height and the direction of f0 change (e.g. for Cantonese see [3]), while for stress f0 is but one of several correlates (e.g. for English see [4]) and vowel quality often provides a more robust cue to stress [5].

Previous studies have shown that speakers of tone languages recruit their L1 tonal systems for producing L2 stress contrasts. For example, Mandarin speakers produce significantly higher f0 in English stressed syllables compared to native English speakers [1]. Language experience factors such as L2 proficiency and amount of L2 use are likely to affect the probability and magnitude of such transfers. Greater L2 experience helps bilingual speakers better discern phonetically similar L1 and L2 segments and thus produce and perceive them more accurately [6, 7]. Therefore, we may expect similar effects for suprasegmental properties. Additionally, language attitudes may play a role in bilingual speakers' production of f0 in their L2 [8, 9]. However, little is known about how language attitudes might affect the interaction between L1 and L2 suprasegmental systems in bilingual speakers. Therefore, the present study was designed to investigate how Cantonese-English bilingual speakers' individual variation in language attitudes, L2 proficiency and L2 use affect their production of f0 in the service of L1 lexical tone and L2 stress.

Twenty Cantonese-English bilingual speakers living in Hong Kong participated in the study. Their attitudes toward both languages, their L2 proficiency and their amount of L2 use were quantified using a detailed questionnaire combining the Bilingual Language Profile [10] and the Language Experience and Proficiency Questionnaire [11]. In two reading tasks, participants produced monosyllabic and disyllabic cross-language near homophones under conditions emphasizing English or Cantonese language mode on separate days. Near homophones were used to control for factors that could affect suprasegmental properties such as word length, segmental composition and syllable structure. Examples are 咳 "cough" [kɐt55] and *cut* [kʌt], and 碩士 "Master's" [sɛk22si22] and *sexy* [ˈsɛksi]. The tonal properties of the tokens were acoustically quantified in terms of f0 range and slope and compared to the participants' language attitude scores, L2 proficiency and amount of L2 use.

Results indicate that the acoustic properties of Cantonese tones and English stress produced by the participants do vary according to individual differences in language attitudes and L2 proficiency and L2 use. Specifically, speakers with more positive attitudes toward Cantonese produced a higher f0 range in Cantonese compared to participants with less positive attitudes. English f0 range, however, was not affected by Cantonese attitudes. On the other hand, speakers with higher English proficiency and use produced significantly shallower f0 slopes in English than those with lower English proficiency and use, indicating less influence of the speakers' tonal system on their realization of English stress.

Taken together, these results suggest that higher L2 proficiency and use reduces the influence of the L1 suprasegmental system on that of the L2 in fluent bilinguals. This finding is analogous to the effect of L2 experience observed in production of L2 segments [6, 7]. Speakers with more L2 experience are more successful at realizing a distinction between L1 tones and L2 stress. Meanwhile, speakers with more positive attitudes toward their L1 implement a bigger acoustic

difference between their two languages by rendering their Cantonese f0 more tone-like. These findings suggest that suprasegmental properties of bilinguals' L1 and L2 are flexible and subject to influence of language experience, proficiency, and attitudes.

References

[1] Zhang, Y., Nissen, S. L. & Francis, A. L. (2008). Acoustic characteristics of English lexical stress produced by native Mandarin speakers. *Journal of Acoustical Society of America, 123*(6), 4498-4513.

[2] Cutler A., Dahan, D. & van Donselaar W. (1997). Prosody in the comprehension of spoken language: A literature review. *Language and Speech, 40*(2), 141-201.

[3] Gandour, J. (1981). Perceptual dimensions of tone: Evidence from Cantonese. *Journal of Chinese Linguistics*, *9*, 20–36.

[4] Gordon, M., & Roettger, T. (2017). Acoustic correlates of word stress: A cross-linguistic survey. *Linguistics Vanguard, 3*(1), 1-11.

[5] Zhang, Y., & Francis, A. (2010). The weighting of vowel quality in native and non-native listeners' perception of English lexical stress. *Journal of Phonetics, 38*(2), 260-271.

[6] Aoyama, K. & Flege, J. E. (2011). Effects of L2 experience on perception of English /r/ and /l/ by native Japanese speakers. *Journal of the Phonetic Society of Japan*, *15*(3), 5-13.

[7] Flege, J. E., Bohn, O. & Jang, S. (1997). Effects of experience on non-native speakers' production and perception of English vowels. *Journal of Phonetics*, *25*, 437-470.

[8] Ohara, Y. (2001). Finding one's voice in Japanese: A study of the pitch levels of L2 users. In A. Pavlenko, A. Blackledge, I. Piller & M. Teutsch-Dwyer (Eds.), *Multilingualism, second language learning, and gender* (pp. 231-256). Berlin: Mouton de Gruyter.

[9] Dmitrieva, O., Law, W. L., Lin, M., Wang, Y., Conklin, J., & Kentner, A. (2015). Language attitudes and listener-oriented properties in non-native speech. In The Scottish Consortium for ICPhS 2015 (ed.), *Proceedings of the 18th International Congress of Phonetic Sciences*. http://www.icphs2015.info/pdfs/Papers/ICPHS0953.pdf.

[10] Birdsong, D., Gertken, L.M., and Amengual, M. (2012). *Bilingual Language Profile: An Easy-to-Use Instrument to Assess Bilingualism*. https://sites.la.utexas.edu/bilingual/.

[11] Marian, V., Blumenfeld, H. K., and Kaushanskaya, M. (2007). The language experience and proficiency questionnaire (LEAP-Q): Assessing language profiles in bilinguals and multilinguals. *Journal of Speech, Language and Hearing Research*, *50*, 940-967.