Dynamic phonetic interactions in Spanish heritage bilingual and trilingual speech production

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Heritage speakers are early bilinguals who have been exposed to the minority (heritage) language and the majority language early in life, either by growing up speaking both languages since birth (simultaneous bilinguals) or having been brought up in a monolingual setting in early childhood and becoming bilingual after starting school in the majority language at around ages 5 or 6 (sequential bilinguals). Since recent studies have shown differences between the pronunciation of heritage speakers and monolingual speakers of the minority language (Au et al., 2002; Bullock, 2009; Chang et al., 2009), the question that arises is whether these early bilinguals maintain separate and independent phonetic systems due to early exposure and extensive experience with both languages, or if their L1 and L2 sounds are interrelated and coexist in a common phonetic space, with the bilingual sound system being a combination of the two languages' segmental inventories (Flege, 1995). In the second case, the bilingual sound system will, by consequence, be prone to cross-linguistic phonological transfer. More specifically, we must distinguish between two types of cross-linguistic phonetic influence: static interactions as a result of long-term traces of one language influencing the other, and dynamic interactions, which is the result of interactions between representations that are simultaneously activated in working-memory. When speakers are using two or three languages, the representations of each language are simultaneously activated, creating competition between languages, and we can thus expect a deviation of the target phonetic implementation towards the non-target language during online speech processing. The current study investigates the flexibility of the sound systems of Spanish heritage speakers, with a specific focus on dynamic phonetic interactions in bilingual and trilingual speech.

Experiment 1

In experiment 1, forty Spanish heritage and twenty L2 Spanish speakers participated in a reading-aloud task to investigate their acoustic realization of /l/ in English and Spanish. Spanish clear /l/ has a high F2 value and a large difference between F2 and F1 whereas English dark /l/ is associated with lower F2 values and a smaller F2-F1 difference (Barlow, 2014). Each participant produced 320 laterals in word-initial and word-final position (160 Spanish and 160 in English) in three different sessions to elicit monolingual and bilingual modes: a Spanish session, English session, and a mixed Spanish/English session. The results show that language dominance influences these bilinguals' F2 range in their lateral production (i.e., either clear or dark). The acoustic analyses also reveal phonetic convergence as a result of language mode: in the bilingual session Spanish-dominant and English-dominant heritage speakers produced laterals in Spanish and English that displayed intermediate F2 values in comparison to their productions in the monolingual English and Spanish sessions. Crucially, only the non-dominant language was affected in bilingual mode.

Experiment 2

Experiment 2 investigates the acquisition of Japanese /k/ by five Spanish heritage speakers and five English monolinguals and enrolled at the same level of Japanese language study. A group of

five native Japanese speakers learning English was recorded as a control group. Specifically, this production experiment investigates the acquisition of voiceless velar stops /k/ in each of their languages in order to ascertain if these speakers create separate phonological categories in Spanish, English, and Japanese. In addition to examining the acquisition of novel Japanese sounds as a L2 or L3, the effect of the state of activation of each language at a given point in time during speech production, as a result of cognate status of the experimental stimuli and language mode (Grosjean, 1998) is also explored. The crucial manipulation in the experiment is that participants were asked to participate in separate experimental sessions: monolingual mode(s), bilingual mode(s) and trilingual mode. Participants completed a reading-aloud task in the language(s) they had acquired, and produced either 144 (bilinguals) or 432 (trilinguals) target items, for a total of 3,600 tokens of /k/ in word-initial position. The results show that even though the bilingual and multilingual individuals maintain language-specific VOT patterns for each language, they produce /k/ in bilingual and trilingual sessions that display less native-like VOT values in each language in comparison to the same productions in the monolingual sessions. In terms of cognate status, the acoustic analyses also reveal cross-linguistic effects in the direction of cognates produced with more influence from their dominant language for all participant groups.

Conclusions

These findings provide evidence of language dominance effects on the acoustic realization of laterals in both languages of the bilingual individual, and of the impact of language mode on the ability of early and late bilinguals to produce language-specific laterals in each language. Furthermore, these findings also demonstrate that increased activation of the non-target language(s) in the multilingual experimental condition creates cross-linguistic phonetic convergence in the acoustic realization of the VOT in these target phonemic categories (i.e., evidence of dynamic interference), however, it does not impede these multilingual individuals from maintaining language-specific categories in each language (i.e., no evidence of static interference). The discussion addresses the theoretical implications of these findings and how they need to be accounted for by models of L2 phonology.

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