



Does listening to non-native speech impair speech perception?



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ABSTRACT

Previous research with highly fluent, very early, Catalan–Spanish bilinguals has shown that L1 Spanish bilinguals accept certain mispronounced Catalan words at extremely high rates, and even L1 Catalan bilinguals do so at surprisingly high rates. Using similarly highly fluent, very early Basque–Spanish bilinguals, we investigate why this occurs. We test three possibilities: (1) There could be a failure to distinguish two similar sounds at the phonetic level, (2) Listeners might store exemplars they have heard in their lexical representations, with one accurate and one mispronounced version, or (3) Listeners might map two different phonetic codes to a lexical representation, either during perception or in a developed representation. A discrimination test showed that the problem is not due to a failure in acoustic–phonetic processing. To test the dual-exemplar representation versus dual mapping alternatives, we taught our subjects new Basque words under conditions that only allowed for a single lexical representation. Listeners showed the same tolerance for erroneous pronunciations in these uniquely learned items, ruling out the dual lexical representation option and supporting dual mapping. In regions in which bilinguals routinely hear accented versions of their language, it is a useful adaptation to the resulting variation to treat certain sounds as allophonic for purposes of lexical access. Looked at this way, accepting a “wrong” pronunciation is really not an error at all – it is an efficient adaptation to the prevailing linguistic environment.

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Introduction

Using language to communicate is a quintessentially human activity, and there are fundamental syntactic, semantic, morphological, and phonological properties that characterize human language. Nonetheless, there is considerable variation in the way that these properties get instantiated from one language to another: Communication in Mandarin differs in many ways from communication in English, or in American Sign Language. Moreover, there is variation in the number of languages that a given

person can use to communicate: In some countries, most people only know one language, while in other countries multilingualism is the norm. Given the existence of roughly 6000 languages, and only 200 countries, multilingualism must be widespread. Even within the set of multilingual regions, there is wide variation in how the multiple languages are learned, and how they are used: In some settings it is routine for young children to learn multiple languages and use them extensively, whereas in other settings a second language may be taught to older children, with its use limited to more particular settings. Given the diversity of possible language learning and usage patterns, any attempt to characterize human language use must take into account an individual's personal path of language acquisition.

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In the current study, our focus is on language use by individuals who acquire two different languages at a very young age, but not simultaneously. These are people who are extremely fluent in both languages by virtue of the early acquisition of both, as well as continuing use of both in a strongly bilingual environment. Such individuals offer a very interesting test case because they still have both a first (L1) and a second (L2) language, while being fully fluent in both. As a result, it is possible to look for the perceptual and cognitive impact of the first language on the second, as well as any impact of the second language on the first, all in the context of extremely high proficiency in both languages.

Although multilingualism is widespread, there are not many places in which early learning of multiple languages, in a strongly bilingual setting, takes place conveniently near major psycholinguistic research laboratories. Perhaps for this reason, studies of speech perception by adults with very early L2 acquisition have been primarily on people who speak Catalan and Spanish, in and around Barcelona. In this region, both languages are used very widely, classes at all levels of education are taught in both languages, and there is no correlation between use of one or the other language and socioeconomic status. Children are exposed to both languages in school beginning around age three or four. If a child lives in a household that primarily uses either Catalan or Spanish, then he or she will have that language as L1, with acquisition of L2 beginning by age four.

These conditions are rather different than those in most other places with fluent bilinguals. For example, even though there are many very fluent Dutch–English bilinguals in the Netherlands, instruction in English typically begins around age 11, and English does not have the same status as Dutch. Studies of these bilinguals (e.g., Broersma, 2012; Weber & Cutler, 2004) provide interesting evidence about proficient L2 use, but not early L2 acquisition effects. Even in China, where national policy requires Mandarin instruction in the schools, such instruction typically begins around age 6 or 7, and it is often the case that Mandarin use is mostly limited to “official” settings (such as the schools), with the local language used at home and in everyday exchanges (cf. Zhang, Samuel, & Liu, 2012). In parts of Canada, there are many bilingual speakers of French and English, but studies have mostly been done on young children during acquisition, and there is more societal (and thus linguistic) separation than in the Catalan–Spanish case. Molnar, Polka, Baum, Menard, and Steinhauer (2014) have recently reported findings for such Canadian bilinguals, but the comparison was between monolinguals and simultaneous bilinguals, so that the L1/L2 distinction was not present as in the Catalan/Spanish case. Guion (2003) examined Quichua–Spanish bilinguals in Ecuador, including very early L2 Spanish, but her study only reported data on production differences, not perceptual effects. Thus, there are relatively few perceptual studies of adult bilingual populations with very early L2 acquisition in a thoroughly bilingual environment.

As recent studies are starting to make clear, what is meant by “early” L2 acquisition is changing as we learn more. For many years, the received wisdom was that there was a critical period for learning language, and that this

critical period ended at around the time of puberty. However, looking at processing of syntactic cues, Johnson and Newport (1989) concluded that up until the mid-teens, earlier is better for acquiring L2 – there was no evidence for any sudden change in learnability. As researchers examined this issue more carefully, the positions have become more nuanced, with both earlier ages and more specific functions being implicated. There have been a number of studies that suggest that learning L2 before approximately age seven leads to significantly better processing ability than after age seven (e.g., Caramazza, Yeni-Komshian, Zurif, & Carbone, 1973; Dufour, Kriegel, Alleesaid, & Nguyen, 2014; Kim, Relkin, Lee, & Hirsch, 1997; Silverberg & Samuel, 2004), or perhaps by age five or six (Sundara & Polka, 2008). As we will discuss thoroughly below, there is also a large body of work on Catalan–Spanish bilinguals showing that even learning L2 as young as age four does not convey native-level ability. In fact, very recent research (Costa & Sebastian-Galles, 2014; Molnar, Polka, Baum, & Steinhauer, 2014) shows that even simultaneous bilinguals may not process language in the same way that monolinguals do, consistent with the notion that a bilingual is not simply two monolinguals sharing a brain.

The experiments in the current study were conducted with bilinguals who are extremely fluent in Basque and Spanish. These bilinguals are comparable to those from the Barcelona area in terms of having very early L2 acquisition, and in terms of the highly bilingual nature of the society that they live in – the Basque Country, in northern Spain. Our study of this population pursues a pair of quite intriguing findings that have been reported for the Barcelona bilinguals. Pallier, Bosch, and Sebastian-Galles (1997) reported the first of these, in a study that focused on a vowel contrast present in Catalan that is not present in Spanish. Spanish has a simple five-vowel system, while Catalan has eight vowels. The contrast of interest was /e/ versus /ɛ/, a contrast that exists in Catalan that does not exist in Spanish. Pallier et al. synthesized a test continuum that ranged between /e/ and /ɛ/, and conducted an identification test with two groups of listeners. Both groups were highly fluent in both Catalan and Spanish, having gone through the bilingual school system in the Barcelona area, and having lived their whole lives in a highly bilingual society. The members of one group had originally been raised in monolingual Catalan households, while those in the second group came from monolingual Spanish households. As would be expected, the native Catalan speakers accurately identified the members of the /e/-/ɛ/ test series. Surprisingly, despite having acquired Catalan by age four, having used the language extensively since then, and having lived in a society where the language is pervasive, the L1 Spanish bilinguals were unable to accurately categorize the members of the test series. In a second experiment, the test syllables were used in a same-different discrimination test, providing further evidence for different perception by the two groups. The L1 Catalan listeners produced the typical discrimination function for speech syllables, with a discriminability peak near the category boundary; the function for the L1 Spanish listeners did not have such a prominent peak. Pallier et al. concluded that the different

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