Unlearning to perceive and produce epenthetic vowels: the case of L1 Brazilian Portuguese/L2 English sequential bilinguals

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Speech communication in second language (L2) requires both production and perception. Previous examination of the perception-production link in learning novel phonological contrasts has yielded mixed results [4, 5]. The nature of this link is equally unclear for phonotactics [2, 8]. The lack of consensus regarding the production-perception link suggests a complex relationship between the two domains in language learning. The present study examines the generalization of phonotactic constraints from L2 to L1 by looking at production and perception of vowel epenthesis in Brazilian Portuguese (BP) by learners of L2 English. More generally, it asks whether acquisition of phonotactically permissible sounds in the L2 can alter L1 representations that constrain these same sounds in the L1. In BP, the stop consonants /p, t, k, b, d, g/ are illegal in coda position and are repaired via an epenthetic /i/. This phonotactic repair is attested in both perception as an illusory vowel [7] and in production as an epenthetic vowel [3]. Importantly, no such phonotactic restriction exists in English.

Three groups of native BP speakers were tested in production and perception tasks: monolinguals living in Brazil with no or limited knowledge of English (n=15), English learners living in Brazil (n=14), and BP/English sequential bilinguals living in the United States (n=13). For production, subjects read aloud 24 sentences in Portuguese containing target words with illegal coda stops triggering epenthesis (e.g. *obter, ignorância, captar*). Target words were analyzed in Praat [1] and coded for the presence/absence of an epenthetic vowel. Figure 1 shows the rate of epenthesis for the three groups. A mixed-effects logistic regression model yielded statistically significant group differences: monolinguals produce epenthetic vowels more frequently than Brazil bilinguals (p<.05) and US bilinguals (p<.001). The difference between the L2 English speakers in Brazil and the US was not significant (p=.074).

The same subjects (as well as a group of L1 English control listeners, n=16) also completed a perception task in which they heard 128 BP non-words with a VC(i)CV structure produced by a female simultaneous BP/English bilingual. Half of the words contained an epenthetic /i/, 36-40 ms long, after the first consonant, while the other half had no vowel between the two consonants. Subjects completed a forced-choice identification task in which they listened to the non-words and chose the orthographic representation (e.g., <ebda> or <ebida>) that best matched the auditory stimuli (e.g., [ebda]). The results were analyzed within the signal detection framework [6]. Figure 2 shows accuracy scores (d-prime) for the four groups. A one-way ANOVA was performed with listener group as the independent variable and d-prime score as the dependent variable. The model was significant ($F(3, 54)=34.14$, p<.0001), and post-hoc tests revealed significant differences between all groups except the L2 English listeners in the US and Brazil.

A Spearman's rho correlation between the d-prime scores from the perception task and the rates of epenthesis from the BP word reading task was significant: S=3693.3, p<.01, r_s=0.61(see Figure 3). Combined, the results show that subjects with knowledge of English were able to transfer of phonotactic constraints from L2 to L1. The correlation results indicate a perception-production link suggesting susceptibility of both domains to L2-L1 influence.
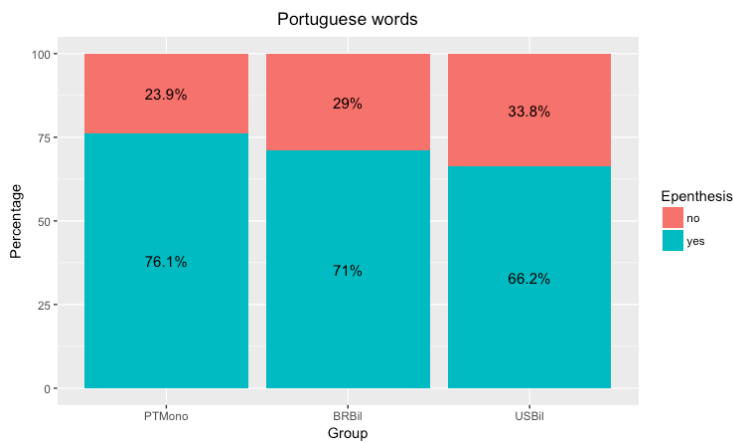
Figure 1. Rates of production of epenthesis in BP words (PTMono=BP monolinguals; BRBil=BP/English subjects in Brazil; USBil=BP/English subjects in US)
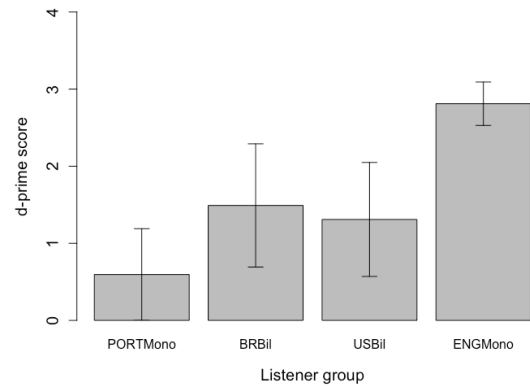

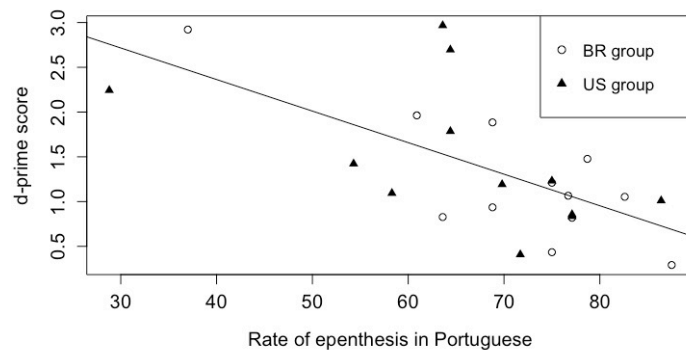*Figure 2. Average d-prime scores for listeners.*

Figure 3. Scatterplot of average production (x-axis) and perception (y-axis) results for each talker/listener.

References

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