L1 DRIFT AND L2 CATEGORY FORMATION IN SECOND LANGUAGE LEARNING[i]

Katharina S. Schuhmann[1] and Marie K. Huffman[2]

[1]Language Study Unit, Free University of Bozen, Italy; [2]Linguistics Department, Stony Brook University, USA
Katharina.Schuhmann@unibz.it and Marie.Huffman@stonybrook.edu

ABSTRACT

Assimilatory phonetic drift in L1 has been shown to occur in early second language learners when separate L2 categories have not been established. The direction and likelihood of drift is affected by degree of L1:L2 difference [2], and the need to maintain L1 distinctions [10]. We assessed the impact of explicit L2 phonetic training on L1:L2 interaction when novel L2 sounds could lead to a more crowded L1-L2 phonetic space. Native English-speaking college students completed a lesson on Spanish:English stop voicing contrasts midway through their first semester of introductory Spanish. Training led to improved Spanish VOT values, improved L1 and L2 category differentiation for most subjects, and L1 phonetic drift in voiceless and/or voiced stops for individual speakers. Thus, explicit instruction can facilitate L2 category learning even when this produces crowding among L1 and L2 categories. Furthermore, L1 drift is a common but not necessarily inevitable part of the process.

Keywords: second language learning, phonetic drift, dissimilation, category learning, explicit instruction.

1. INTRODUCTION

A key question in second language phonology is how multiple languages are represented in the brain of a speaker. It is by now well established that multilinguals can show interaction between the representations of their languages. At the sound level, for example, L1 or L2 values may be intermediate between those of monolingual speakers of the same languages [5, 8, 12]. Multilingual linguistic representations have further been shown to be dynamic, even for advanced bilinguals [15]. Recent research [2, 3] has highlighted the ways L1 and L2 interact in the early stages of non-native language learning and how this cross-linguistic effect can wane with increasing L2 experience [4]. Chang [3] reports striking assimilatory effects in L1 for English–speaking novice learners of Korean. The VOT values of these speakers' L1 English voiceless stops increase, apparently under influence of the higher VOT values of Korean aspirated stops.

Assimilatory effects in early L2 learning can be explained under exemplar accounts in which recent (and novel) input influences production targets (e.g., [14, 11, 4]). More advanced L2 learners may show dissimilation of L1 and L2 sounds, as a means of making phonetically similar forms in the two languages more different [6, 7]. Flege argues that this can take place when separate phonetic categories are established for similar sounds in the two languages. Ultimately, as Chang [3] argues, the linguistic differences between L1 and L2 sounds must be noticeable for L2 input to affect L1 values.

Here we examine whether this necessary condition is also a sufficient condition for assimilatory drift. Further, we test whether explicit phonetic instruction leads learners to notice L1:L2 differences such that they show improvements in L2 category formation and consequent L1 phonetic drift. Indeed, one factor that could limit L2 phonetic development and L1 phonetic drift is the possible threat to L1 contrasts [10]. The difference between voicing contrasts in English and Spanish stops lends itself well to test for the influence of the location of new L2 sounds within the existing L1 phonetic space. Assuming that early L2 phonetic production is based on comparable L1 categories, and with the different VOT values for the two languages arranged roughly as shown schematically in (1), it is possible that early stages of acquisition of Spanish could result in assimilatory downward drift of both voiceless and voiced stops in English as learners produce the lower VOTs of the Spanish stops.

(1) Relative spacing of VOT values for voiced (+VCE) and voiceless (-VCE) word-initial stops in Spanish and English on an abstract scale:

Low…………………………………..High
$+VCE_{Sp}$ $-VCE_{Sp}$
$+VCE_{E}$ $-VCE_{E}$

On the other hand, unlike the high VOT stops of Korean, the prevoiced stops of Spanish might be expected to be difficult for English speakers to acquire, given the aerodynamic challenges that stops pose for voicing [13]. If English voiced stops consequently do not drift downward under Spanish influence, then there might be systemic resistance to English voiceless stops lowering their VOTs, as this would diminish the distinctiveness of the two English stop categories. In fact, little change in L2 and L1 production was found in [10], which reports on the same English-speaking learners of Spanish as in the current study, focussing on the first six weeks of the Spanish course.

In this second part of the study, we investigated whether, and how, explicit phonetic instruction affected the course of early L2 learning, and how it affected the pronunciation of similar categories in L1. We predicted that such training would aid learners in progressing toward development of their L2 categories and that L1 values would shift as L2 values changed, in a pattern of assimilation, as found by [2,3], although as mentioned above, L1 drift might be constrained by L1 contrasts.

2. METHODS

2.1. Stimuli

Critical items in both languages were real words beginning with /p/ /b/ /t/ and /d/ followed by the vowels /i/ /e/ and /a/. English items were monosyllabic and Spanish words were disyllabic. Two lists of words were produced and used in alternate recording sessions. For each CV combination, three words appeared in each list. Efforts were made to match the consonant following the vowel, to minimize possible interference from coarticulatory effects of the consonant on the vowel. Items containing velars were not included because of the relative scarcity of basic Spanish vocabulary words fitting these constraints. Filler items were included in the list to distract subjects from repetition of similar consonants and vowels over multiple recording items.

2.2. Procedure

Subjects were volunteers taking a first-semester college Spanish course. Three females and two males participated in this phase of the project. All reported that English is the only language they use on a regular basis and all but one had no extensive experience with any other language (one spoke Hindi as a heritage language in addition to English). Recordings were made starting in the second week of the semester, continuing alternating weeks for a total of six sessions. Recording took place in a sound-booth with a PG42USB Shure Microphone attached to a Macintosh Desktop Computer, using a 44.1 Hz sampling frequency. In each recording session, the subjects read the list in each language three times. Spanish was always completed before English. Between Weeks 6 and 8, all subjects participated in a phonetics instruction session directed by the first author. The articulatory processes producing aspiration were explained and the differences between English and Spanish stop voicing contrasts were illustrated and practiced.

2.3. Analysis

VOT measures were taken in Praat [1]. Consonant release and onset of voicing were determined from waveforms; VOTs were calculated via a Praat script. We report here on VOTs for Weeks 6 and 10. This allows us to compare VOTs with the same stimuli, and allows us to probe whether any effect persisted three weeks after phonetic training.

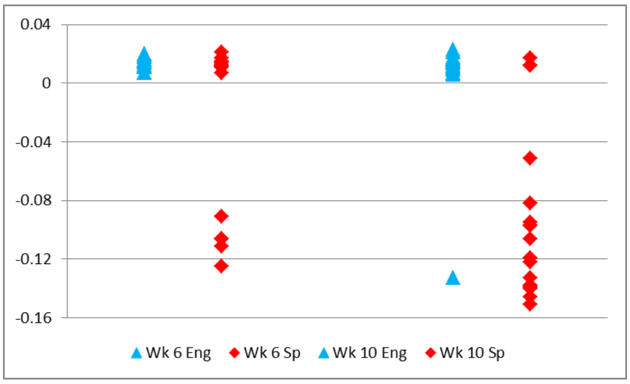
3. RESULTS

As also reported in [10], we found a fair diversity of patterns among our speakers. Some subjects showed little progression toward Spanish values; others showed more Spanish-like values for one type of stop (voiced vs. voiceless) but not always for the other.

Taking voiced stops first, at Week 6, three of the five speakers have prevoicing on some Spanish voiced stops (one has prevoicing on all of them). This subject and one other have prevoicing on some English items as well, but in all cases Spanish shows a higher number of prevoiced items, suggesting that the learners are beginning to associate different voicing patterns with the two languages. At Week 10, after phonetic training, most subjects show a greater number of lower VOT items for Spanish than at Week 6. Overall, Spanish VOT values for voiced stops are lower on average at Week 10 than at Week 6, an effect that is approaching statistical significance (F (1,179) = 3.260, p = .073). While two of the five speakers do not show a decrease in the average VOT values of Spanish voiced stops from Week 6 to 10, the other three speakers (6,7,9) show slightly reduced VOT values for Spanish voiced stops at Week 10 compared to Week 6, a statistically significant effect (F (1,107) = 15.165, p < .001*).

Did changes in Spanish voiced stop production lead to lower VOT values in the learners' L1 (English) voiced stops? There is no overall lowering of English voiced stop VOTs, but three of the five speakers (6,9,10) do show lowered average VOT values for English voiced stops at Week 10 compared to Week 6, a trend that is almost approaching significance (F (1,106) = 2.413, *p* = .123). As an example, Figure 1 shows the raw VOT data for Speaker 9. Spanish VOT values (red diamonds) are lower overall and extend to longer prevoicing values in Week 10. English VOTs (blue triangles) appear to be slightly lower at Week 10, plus there are two English items that are now prevoiced, otherwise not the typical pattern for this speaker. In sum, some learners show a slight trend toward assimilatory downward drift in English voiced stop VOTs from Weeks 6 to 10.

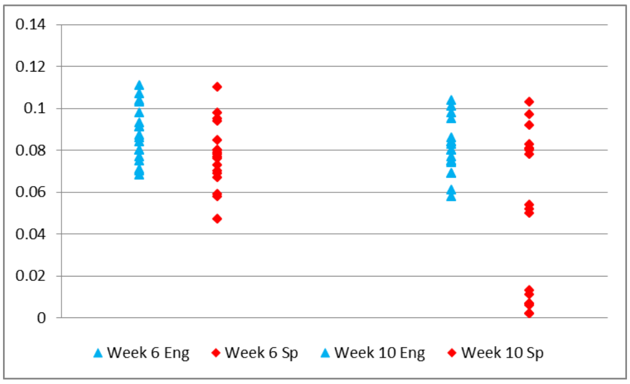
Figure 1. Range of English and Spanish voiced stop VOT values (in seconds) for Speaker 9, before (Week 6) and after (Week 10) phonetic training.

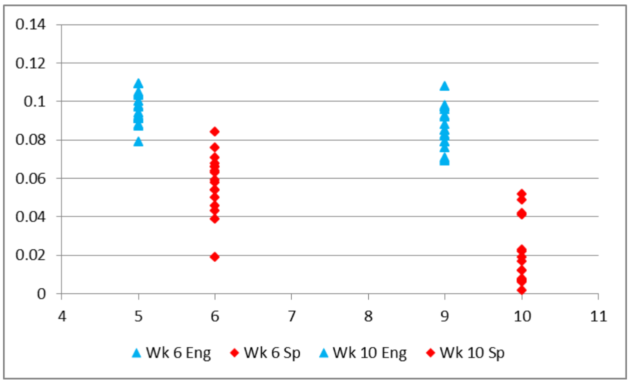


As for voiceless stops, at Week 6, all speakers have higher VOTs on average for English than Spanish stops, but for three speakers the difference between English and Spanish is small (10 to 25 msec). After instruction on the production of the voicing contrast in Spanish, two speakers show over 30 msec decrease in Spanish voiceless stop VOTs and another speaker shows a slight decrease, while the remaining two show essentially no change. Overall, there is a statistically significant difference between the higher VOT values of Spanish voiceless stops at Week 6 and the lower VOT values at Week 10 (F (1,176) = 14.882, $p < .001$*).

When there was a VOT decrease in Spanish, English voiceless stop VOTs also decreased, albeit slightly. While the difference between the VOT values of English voiceless stops at Week 6 (86 ms) and at Week 10 (82 ms) was only approaching significance (F (1,179) = 2.623, p = .107), there was a statistically significant difference for three (6,8,9) speakers who showed lower VOT values in English voiceless stops after phonetic instruction at Week 10 (F (1,107) = 17.791, $p < .001$*). Examples can be seen in Figure 2. For Speaker 6 (top panel), the move toward a separate Spanish voiceless stop category has begun at Week 10, though many VOTs remain fully within the English range. For Speaker 9 (bottom panel), category separation is already more advanced at Week 10. Although learners appear to be in the progress of forming separate L2 categories for Spanish voiceless stops between Week 6 and 10, we do not see L1 dissimilation (increased English voiceless VOT values) over this time period. Rather, there is an overall assimilatory downward trend in English VOTs for three of the five speakers.

Figure 2. Range of English and Spanish voiceless stop VOT values (in seconds) for Speaker 6 (top) and Speaker 9 (bottom), before and after phonetic training.





4. DISCUSSION

This preliminary study of English speaking learners of Spanish suggests that L2 category formation and ensuing L1 phonetic drift are affected by phonetic training. In addition, we have seen that there can be considerable differences between individuals. It appears that different learners are at different stages of developing separate L2 categories for Spanish stops that are separate from their English categories. Overall, most speakers showed a change toward more Spanish-like VOT values for one or both stop voicing categories, although the changes were generally small. Taken together, learners are able to reduce their VOT values for voiceless stops in Spanish to some degree after explicit phonetic instruction. Yet, as expected, some learners have more difficulties realizing prevoiced Spanish stops, despite phonetic instruction.

These modest phonetic gains in L2 production were in many cases found to be accompanied by L1 drift in the same direction, particularly for voiceless stops. Chang [4] argued that the strong L1 VOT increases in his data were motivated by the large difference in VOTs between Korean and English. Although Spanish and English employ an even greater difference in VOT on their voiceless stop categories, we found assimilatory drift in English stops to be limited to only some of the learners. This confirms that degree of difference between L1 and L2 categories is not sufficient to predict automatic L1 drift effects, and suggests that L1 contrast maintenance can be a constraining factor in L2 phonetic development and resulting L1 drift effects. Nonetheless, after explicit phonetic instruction, we see signs of movement toward more native-like L2 phonetic values, the beginning of a separation process between like L1 and L2 categories. Along with this movement toward L2 values, we see, in some cases, slight L1 assimilatory drift effects as well. Thus, it appears that instruction enhanced subjects' noticing and attending to phonetic differences between L1 and L2. Of course, without a control group we cannot say definitively how much of the change we saw was due to instruction, and how much was due to subjects' continued exposure to Spanish over the course of the semester. However, compared to the amount of change observed earlier in the term for these same subjects [10], improvement in L2 production increased more for the three weeks after instruction than for the four weeks prior to instruction.

In summary, we have seen that detailed phonetic analysis of learner pronunciation patterns can give insight into the early stages of development of L2 phonetic categories, and the role that the structure of L1 plays in how this development progresses. Specifically, L2 learners who are in the process of establishing separate L2 categories for similar sounds in L1 can show assimilatory (rather than dissimilatory) drift effects. At the same time, L1 drift effects seem to be mitigated by the need to maintain acoustic distinctiveness between contrasting elements in L1. This raises the interesting question of whether the forces that limit L1 drift (e.g., the tension between L2 phonetic goals and L1 contrastive needs) might have the result that in order to make progress in L2, unlike [3], learners in this study in essence *have to* more fully separate L1 and L2 sooner. Further research is needed to tease apart the role of additional L2 input in general, and of explicit instruction, in helping leaners notice linguistic differences that aid in establishing new phonetic categories in their L2.

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[i] This work was supported in part by The Stony Brook University Arts, Humanities and Lettered Social Sciences Initiative. We are particularly thankful to all our participants, and to the Bucknell University students in the first author's LING 205 and LING 220 courses (Fall 2014) who helped with the data collection and initial data analysis.