Intervocalic Rhotic Pronunciation by Adult Learners of Spanish as a Second Language

Timothy L. Face
University of Minnesota

1. Introduction

The amount of work on the second language acquisition of Spanish phonology is relatively small in comparison to other areas of Spanish second language acquisition. Of the work on the second language acquisition of Spanish phonology, much focuses on the non-linguistic factors that influence pronunciation as a whole (i.e., without focusing on particular sounds or features in that pronunciation; e.g., Elliott 1995a, Reeder 1997, Simões 1996) or on the effects of instruction on progress toward a native-like pronunciation (e.g., Castino 1992, Elliott 1995a, 1995b, 1997, González-Bueno 1997). Work that has focused on the acquisition of specific Spanish sounds has shared a couple of characteristics. First, studies have tended to cluster around certain types of sounds and issues. Certainly the most studied sounds are the voiceless stops (e.g., González-Bueno 1997, Nathan 1987, Reeder 1997, Zampini 1994, 1998), where much attention has been paid to the fact that the same phonological stops, /p, t, k/, exist in both Spanish and English, but with the considerable phonetic difference that voice onset times are much shorter in Spanish than in English. Another characteristic of studies that have focused on the second language acquisition of particular Spanish sounds is that often there is a focus on how non-linguistic factors (e.g., context of learning, field dependence/independence, age, attitude) lead to improvement in the pronunciation of particular sounds (e.g., Díaz-Campos 2004, Elliott 1995a, 1995b, 1997, Rosenman 1987). Finally, a third characteristic of studies on the acquisition of particular Spanish sounds is that many studies tend to consider accuracy in achieving the target sound, and in some cases improvement in accuracy, but not the development of pronunciation en route to consistent accuracy. That is, even those studies that examine improvement in the pronunciation of particular Spanish sounds often consider only the increase in accuracy in achieving the target over time without considering the changes in error types and what such development might tell us about the acquisition process.

The present study diverges from each of the three common characteristics mentioned above for studies on the second language acquisition of specific Spanish sounds. First, by considering the pronunciation of rhotics, I examine sounds that have received considerably less attention in studies of Spanish second language phonology than have other sounds. Second, rather than look at the effects of non-linguistic factors on the pronunciation of intervocalic rhotics, I consider the effects of level of proficiency in the second language (though certainly other studies have included this as well) in order to provide a cross-sectional view of development in the production of these sounds. Lastly, while the present study certainly considers the increase in accuracy of producing the target sounds across proficiency levels, of just as much interest are the non-target productions in order to gain insight into the developmental process of learners in acquiring the Spanish rhotics.

The present study investigates the acquisition of Spanish rhotic pronunciation by speakers of American English, and therefore it is pertinent to briefly consider the rhotic systems of these two languages. American English has a voiced alveolar approximant [ɹ] that varies in the details of the specific articulation, being retroflex for some speakers and not for others, being truly alveolar in articulation for some speakers while post-alveolar for others, having varying degrees of lip rounding,

* I am grateful to two anonymous reviewers for their useful comments on an earlier version of this paper. Any errors are, of course, my own.

etc. But all of these articulatory variants represent mechanisms to achieve the acoustic characteristics associated with American English [ɹ] (Ladefoged & Maddieson 1996). For the purposes of the present study, where the details of the articulation are of less importance than the employment of the American English rhotic in attempting to pronounce the Spanish rhotics, I shall refer to this consonant simply as a voiced alveolar approximant. The voiced alveolar approximant is the only rhotic in American English, and is a sound that is not present in any variety of Spanish.[1]

Spanish falls among the relatively small number of languages to have more than one rhotic. All varieties of Spanish have two rhotics, though there is some variation as to the nature of one of them. All varieties have a voiced alveolar tap [ɾ] and a second rhotic, which most commonly is a voiced alveolar trill [r]. While some varieties of Spanish have another sound instead of the voiced alveolar trill, such as a voiced uvular trill or an assibilated trill (Canfield 1981, Lipski 1994), the voiced alveolar trill is not only by far the most common across varieties, but is also uniformly the sound taught to students studying Spanish as a second language in the United States. As the voiced alveolar tap [ɾ] and the voiced alveolar trill [r] are the two Spanish rhotics presented to American English speaking students studying Spanish, these are the rhotics that will serve as target sounds in the second language and, therefore, that will be discussed here. It should be noted, however, that even in varieties of Spanish that have these two rhotics, other sounds are sometimes substituted for them, especially in the case of the trill (e.g., Blecua 2001, Hammond 1999).

The Spanish alveolar tap [ɾ] is nearly identical to the American English alveolar tap produced as an allophone of /t/ and /d/ in post-tonic position (e.g., *later*, *ladder*). But while native speakers of American English have an alveolar tap in their first language, they do not associate this tap with a rhotic, and this could provide some difficulty of re-categorization of this sound in acquiring Spanish. Furthermore, in American English the alveolar tap occurs exclusively intervocalically in post-tonic position, while in Spanish it occurs intervocalically in both pre-tonic and post-tonic positions, and it also occurs word-finally, syllable-finally, and as the second member of a complex syllable onset. Therefore, while American English speaking learners of Spanish should be able to produce the alveolar tap with no difficulty, given its existence also in the first language, they must learn to both produce this sound in contexts in which it does not occur in their first language and also associate the sound with a rhotic rather than view it as an allophone of /t/ and /d/ as in American English.

The Spanish alveolar trill is unlike any sound in American English. The lack of similarity can make sounds easier to acquire in a second language since there is no need to re-categorize a sound that exists in the first language or to recognize a small and not very salient distinction between a sound in the first language and a similar sound in the second language (e.g., Flege 1995). However, while the lack of similarity of the Spanish alveolar trill to any sound in American English might seem to favor its rapid acquisition, the alveolar trill is articulatorily difficult, requiring very precise control of aperture and airflow with minimal deviation. The articulatory precision required to produce the alveolar trill (e.g., Ladefoged & Maddieson 1996, Recasens 1991, Solé 2002) leads not only to difficulty for the second language learner in acquiring this sound, but also to it being acquired quite late, and from six months to two years later than the tap depending on the criterion used in determining acquisition, by children acquiring Spanish as their first language (e.g., Goldstein 2000).

The two Spanish rhotics contrast with each other in intervocalic position, with numerous minimal pairs existing (e.g., *pero* ‘but’ vs. *perro* ‘dog’ and *caro* ‘expensive’ vs. *carro* ‘cart’, where in orthography <r> represents the tap and <rr> represents the trill). In all other positions there is neutralization of the contrast between the two rhotics, with context determining which of the two occurs. While second language learners of Spanish, then, must learn to produce both the alveolar tap and the alveolar trill in other positions as well, intervocalic position is the only position in which they must learn to produce both rhotics, and to do so consistently so as to adequately communicate the contrasts signaled by the difference between these two sounds. It is for this reason that the present study focuses on the production of rhotics specifically in intervocalic position.

[1] Blecua (2001) documents alveolar approximant realizations for both the tap and, to a lesser extent, the trill in Peninsular Spanish. This is not the same type of alveolar approximant as English has, however, as there are differences both in duration and r-coloring.

2. Previous studies of the second language acquisition of Spanish rhotics

There are two primary studies dealing with the second language acquisition of Spanish rhotic pronunciation by native speakers of American English. Major (1986) tracks four beginning learners in their pronunciation of the Spanish rhotics throughout an intensive eight week, seven hours per day, Spanish course. The subjects read a word list and a sentence list containing the target sounds during seven recording sessions throughout the span of the intensive course. The data from the two tasks were lumped together since there were potential confounding factors if task type were to be considered. Major presents the results in terms of the number of correct productions of the target sounds, and also reports the number of non-target productions that can be classified as transfer errors and the number that can be classified as developmental errors.

For the target intervocalic tap, there was improvement for three of the four subjects. Two subjects showed considerable improvement over the span of the study, with one increasing from 3% accuracy in achieving the target in the first session to 79% accuracy in the final session, and another increasing from 10% to 73% accuracy. A third subject showed a slight improvement, increasing in accuracy from 43% to 57%. The fourth subject showed no improvement at all over the course of the study. For the intervocalic trill, Major reports improvement for two of the four subjects. One subject improved from 48% accuracy to 71% accuracy from the first to the last recording session, while another improved from 52% to 100% accuracy. The remaining two speakers not only showed no improvement, but also no accuracy in producing the target trill sound. Over the span of seven recording sessions and a combined 347 opportunities to produce the target trill, these two subjects combined to produce only one trill.

The focus of Major's study is on the interaction between accuracy in achieving the target, transfer errors (i.e., non-target sounds produced due to the influence of the learner's first language), and developmental errors (i.e., non-target sounds not attributable to the influence of the learner's first language), as he attempts to support his Ontogeny Model, which makes predictions about the interactions of these three elements in interlanguage phonology. While he does provide a list of principle developmental errors (21 different sounds produced for the target trill and 4 for the target tap) at the end of his study, he provides no indication of the speakers' progression in using these.

The second study to consider the second language acquisition of Spanish rhotics by native speakers of American English was carried out by Reeder (1998). Reeder conducted a cross-sectional study of the acquisition of the Spanish intervocalic trill by 40 learners, with ten at each of four stages of Spanish language study. His subjects included university students in a first semester Spanish course, a third semester Spanish course, upper division undergraduates and graduate students, and full time faculty teaching Spanish at the university level. The subjects read words in carrier phrases, identified items represented in pictures, and produced a 30-second narration in response to a written cue. Reeder, however, pools the data from all tasks together and does not consider the possible effects of task-type on the production of the Spanish alveolar trill.

Reeder presents his results in terms of accuracy in achieving the target trill, which was examined acoustically where an accurate production consisted of multiple alveolar closures. There is no discussion of the nature of non-target-like productions. The results clearly show higher accuracy in producing the trill as the learner's level of Spanish study increases. First semester students showed 7% accuracy, third semester students 13%, upper division undergraduates and graduate students 37%, and faculty 83%. While this increase in accuracy as the level increases is what one would expect to find, it is noteworthy how low the accuracy is for all levels except faculty. What we cannot determine based on the manner in which the results are reported is whether there are individuals with relatively high accuracy and others with almost no accuracy, as in Major's (1986) study. If this is so, it could explain why the percentages are so low when subjects are considered together. Nonetheless, it is interesting that two of Major's beginning level subjects showed accuracy levels nearly as high as the faculty in Reeder's study. One certainly wonders whether explicit pronunciation instruction was given in the intensive Spanish course from which Major's subjects were selected.

While the two aforementioned studies are the only ones to look in any sort of detail at the pronunciation of Spanish rhotics by native speakers of American English, other studies have

occasionally reported that there is more improvement for the target trill in Spanish than for sounds more similar to ones that exist in American English (e.g., Elliott 1995b, 1997). While this mention of improvement of the trill is certainly of interest, one must wonder how much improvement there is and what the developmental path to accuracy in trill production looks like. None of the studies carried out to this point examine the development of pronunciation of the Spanish rhotics other than to comment on the percentage of accuracy in achieving the target. In addition, none of these studies make direct comparison to actual production patterns by native Spanish speakers, an important point given that the target sounds are not always produced even by native speakers.

3. Experimental methods

The present study is a cross-sectional study involving 41 native speakers of American English studying Spanish at the university level, as well as a control group of 5 native speakers of Spanish. Of the native English speakers, 20 were enrolled in a fourth semester university language course – the final course required to complete a foreign language requirement – and 21 were Spanish majors or minors enrolled in an upper division elective course. In order to be enrolled in the fourth semester course, students were required to achieve a certain score on a placement test or to have completed the third semester language course. These learners would be considered to be at an intermediate level of university-level language study. The more advanced group of majors and minors had reached a significantly higher level of proficiency in Spanish. To reach that level, they were required to advance beyond the fourth semester level to a sequence of advanced language skills courses and then beyond that to a set of core upper level courses reserved for majors and minors. Having completed those two additional levels beyond the fourth semester in order to reach the upper division elective courses, the students were considerably more advanced in their Spanish abilities than fourth semester students. This group of Spanish majors and minors would be considered to be at an advanced level of university-level language study. All of the native English-speaking subjects were born and raised in the midwestern United States. None have parents who speak a language other than English at home, nor do any of the subjects speak any language other than English and Spanish. Each of the subjects began studying Spanish after adolescence, beginning their language study either in high school or at the university level.

The five native Spanish-speaking subjects represent both Peninsular and American varieties of Spanish, and are pursuing graduate study in Spanish in the United States. As discussed above, the voiced alveolar tap [ɾ] and the voiced alveolar trill [r] are the target rhotics for which American English-speaking learners of Spanish aim, yet the trill does not exist in all varieties of Spanish. Therefore, in order to make a valid comparison with native speakers, the native speakers were selected from varieties of Spanish that do make use of the voiced alveolar trill.

Subjects were recorded reading a short story of approximately 1750 words in Spanish. The story offers a text of considerable length with a developing plot so that subjects could not focus closely on their pronunciation as they might in a word list where all attention can go to a single word. While the reading of the story cannot be considered to be identical to spontaneous speech, we know that there is a continuum of speech style that can be affected by the task that subjects perform and the amount of attention the task allows them to pay to form (e.g., Major 2001, Tarone 1979, 1983). The story provides a less guarded style, nearer on the style continuum to the style of spontaneously occurring speech than to that of closely guarded speech, while still providing the target sounds in identical contexts for all subjects, and thus assuring that differences between subjects are not due to contextual differences in which the tokens occurred. The recording sessions took place in a digital language laboratory, with the recordings saved as .wav files. Subjects were told that they were part of a study examining how speakers of American English learn Spanish by comparing the Spanish of learners at different levels of language study with each other and with that of native speakers of Spanish. While no particular mention was made of pronunciation, it is certainly possible that some subjects were aware that their pronunciation was the target of investigation since they were reading a story rather than creating language on their own. Nonetheless, it was felt that this realization would be offset by the task, since students could not focus heavily on form.

Ten occurrences in the story of each of the two target rhotics (i.e., the voiced alveolar tap and the voiced alveolar trill) in intervocalic position were selected, and production of these same target rhotics was analyzed in each subject's reading of the story. Cognates were avoided to the extent possible in order to avoid enhancing transfer of the American English rhotic to pronunciation of the Spanish rhotics beyond the extent that this would occur in words that are not cognates.[2] Words containing the sounds to be analyzed were isolated and examined both aurally and acoustically through a waveform and/or a spectrogram within the PCquirer computer program for acoustic analysis. Tokens where a mispronunciation led to the rhotic not being intervocalic were excluded since the present study investigates only the pronunciation of the target rhotics in intervocalic position. In the analysis it was noted whether the sound produced was an accurate production (i.e., successful production of the target tap or trill, depending on the specific case) and, when not, what non-target sound was actually produced. A successful tap was considered to be produced when a brief closure was evidenced in the waveform or spectrogram as a result of the tongue tapping the alveolar ridge. A successful trill was considered to be produced when voiced airflow was interrupted by a series of brief obstructions resulting from the vibrating tongue approaching the alveolar ridge multiple times. It was fairly common for the tongue to create an alveolar obstruction but not a full closure on one or more of its approaches to the alveolar ridge during a trill (though in all but one case there was at least one complete closure as well). These cases were counted as trills as the tongue did trill in creating the multiple alveolar obstructions and results in a canonical-sounding production of the trill as determined through consultation with three native speakers. Such lack of closure was not considered a target-like production of the tap, however, since the tongue did not tap the alveolar ridge and did not result in a canonical-sounding production of the tap.

4. Results

Table 1 reports the accuracy for achieving each target rhotic by subjects at each of the three levels (i.e., the two learner levels and the native speakers). As can be seen in the table, the native speakers produced the target tap 92% of the time and the target trill 86% of the time.[3] While the more advanced learner group produced the tap with fairly high accuracy (78.7%), the same is not the case for the trill. Overall, there is a highly significant difference in accuracy across levels for both the target tap ($\chi^2(2) = 60.53$, $p < .0001$) and the target trill ($\chi^2(2) = 138.01$, $p < .0001$). Furthermore, pairwise comparisons between the native speakers and the advanced learner group shows a statistically significant difference for both the target tap ($\chi^2(1) = 5.44$, $p < .05$) and the target trill ($\chi^2(1) = 61.48$, $p < .0001$). For the learners, there is considerably higher accuracy for both the tap and the trill at the more advanced level. The differences by level are statistically significant for both the target tap ($\chi^2(1) = 41.02$, $p < .0001$) and the target trill ($\chi^2(1) = 37.18$, $p < .0001$). The tap was produced by 14 of the 20 fourth semester learners in the present study, and 13 of those produced it accurately at least 50% of the time. The tap was produced by all 21 advanced subjects, and 20 of those produced it accurately at least 50% of the time. The trill, on the other hand, as might be inferred from the combined numbers in Table 1, was produced by fewer learners and at a lower rate of accuracy when it was produced. The trill was produced by only 6 of the 20 fourth semester learners, and 4 of those produced only one trill each. While the trill was produced by 17 of the 21 advanced learners, only 4 of those produced it accurately at least 50% of the time. This is in stark contrast to the native speakers, where 4 of the 5 subjects produced the trill at least 80% of the time, and the fifth subject produced the trill 60% of the time. A very small percentage of the more advanced learners, then, even approach the frequency with which the native speakers produce the trill.

Table 2 presents the non-target productions for the target tap by level. Only four productions of the target tap were not produced as taps by native speakers. In each of these four productions an

[2] In order to include ten intervocalic instances of target trills, some cognates were included among the words containing the ten target trills.

[3] Recall from Section 1 and the references cited there that native speakers produce sounds other than the tap and trill, though these are the most common productions. As can be seen by the percentages here, the native speakers in this study produced the target sounds in the vast majority of cases.

alveolar approximant was produced that was extremely brief, having approximately the same duration as a tap, but lacking complete closure. In other words, the tap gesture was made, but the tongue, while obstructing airflow at the alveolar ridge, did not block the airflow entirely. In Table 2 this sound is listed as a "voiced alveolar approximant (non-Eng)," indicating that this is different from the voiced alveolar approximant that results from English transfer, which is considerably longer in duration and has the "r coloring" typical of the English rhotic. The most common non-target production at both learner levels is the voiced alveolar approximant attributable to transfer from English. In addition to increased accuracy, the higher level also shows a smaller percentage of non-target productions that are attributable to transfer, and a higher percentage of developmental errors. It is also notable that the non-target productions tend to be simpler at the more advanced level. Early on, when learners do not transfer their English rhotic pronunciation, they may be doing more to distinguish their productions as different from the English rhotic, but later even their production errors come closer to the "simple" articulation of the Spanish tap. Even so, only 6 of the 44 non-target productions by the more advanced group of learners match the non-target sounds produced by the native speakers.

Level	Target	Accuracy	
		N	%
4th semester	tap	96/198	48.5%
	trill	10/195	5.1%
Advanced majors/minors	tap	163/207	78.7%
	trill	55/207	26.6%
Native	tap	46/50	92%
	trill	43/50	86%

Table 1: Accuracy in rhotic pronunciation by level and target

Level	Production	N	% of non-target productions for level
4th semester	deleted	2	2%
	glide	1	1%
	tap + voiced alveolar approximant (Eng)	3	3%
	trill	1	1%
	voiced alveolar approximant (Eng)	94	92%
	voiced alveolar approximant (Eng) + tap	1	1%
Advanced majors/minors	deleted	3	7%
	lateral	2	5%
	voiced alveolar approximant (Eng)	32	73%
	voiced alveolar approximant (non-Eng)	6	14%
	voiced fricated trill	1	2%
Native	voiced alveolar approximant (non-Eng)	4	100%

Table 2: Non-target productions for the target tap by level

The non-target productions for the target trill for each level of learner are given in Table 3. Of the 7 non-target productions by native speakers, 5 of these were taps, and another is a voiced alveolar approximant resulting from a tap gesture but lacking complete closure at the alveolar ridge. The fourth semester learners show transfer of the voiced alveolar approximant from American English for just over half of their non-target productions, and the tap is also a fairly common non-target production for these learners. The advanced majors and minors show considerably less transfer of the American

English voiced alveolar approximant, but overgeneralize the tap, producing it not only for the target tap but also for the target trill. It is worth noting that 78% of the non-target productions by the more advanced learners are the tap, which is the most common non-target production by native speakers as well. While the advanced learners show other non-target productions of the target trill, the biggest difference from native speakers is clearly not the nature of the non-target productions, but rather the infrequency with which they produce the voiced alveolar trill.

Level	Production	N	% of non-target productions for level
4th semester	glide	2	1%
	deleted	2	1%
	lateral	2	1%
	tap	58	31%
	tap + voiced alveolar approx (Eng)	20	11%
	voiced alveolar approximant (Eng)	96	52%
	voiced alveopalatal fricative + voiced alveolar approximant (Eng)	1	1%
	voiced fricated trill	1	1%
	voiced uvular approximant	1	1%
	voiced velar approximant + voiced alveolar approximant (Eng)	1	1%
	voiceless trill	1	1%
Advanced majors/minors	glide	1	1%
	tap	119	78%
	tap + voiced alveolar approximant (Eng)	6	4%
	tap + voiced alveolar fricative	3	2%
	voiced alveolar approximant (Eng)	16	11%
	voiced alveolar approximant (Eng) + tap	1	1%
	voiced alveolar fricative	1	1%
	voiced fricated trill	1	1%
	voiced velar approximant	1	1%
	voiceless alveolar fricative	1	1%
	voiceless fricated trill	1	1%
	voiceless trill	1	1%
Native	tap	5	71%
	voiced alveolar approximant (non-Eng)	1	14%
	voiced alveopalatal fricative	1	14%

Table 3: Non-target productions for the target trill by level

Let us now compare the non-target productions for the target tap and the target trill for the two groups of learners. Considering the different types of non-target productions and the rate of occurrence

of each among the non-target productions, three observations can be made. First, transfer of the American English voiced alveolar approximant is much more common for the target tap than for the target trill for learners at both proficiency levels. Secondly, sound sequences are more common non-target productions for the target trill than for the target tap (13% to 4% of non-target productions for fourth semester, and 7% to 0% for advanced majors and minors). Thirdly, there are more types of non-target productions for the target trill than there are for the target tap. There are 11 different non-target sounds produced for the target trill for fourth semester learners, but only 6 different non-target sounds for the target tap. For advanced majors and minors, there are 12 different non-target sounds produced for the target trill and only 5 for the target tap. Taken together, the three observations just made seem to indicate that learners likely recognize the trill but not the tap as considerably different from, and perhaps more complex (in that it requires more articulatory precision in various facets of its pronunciation) than, their American English rhotic.

5. Discussion

Accuracy for both the Spanish target tap and the target trill are significantly higher for the more advanced learners in the present study, but there is a considerable difference even for these advanced learners in the rate of accuracy for the two rhotics. While the advanced learners accurately produce the target tap 78.7% of the time, they accurately produce the target trill only 26.6% of the time. It seems, then, that learners may have an easier time re-categorizing the voiced alveolar tap–a sound which exists in their first language–as a rhotic in their second language than they do in acquiring the articulatorily more demanding voiced alveolar trill–a sound that does not exist, nor has a similar counterpart, in the first language. Previous studies have shown greater improvement in the production of second language sounds that are less similar to sounds in the first language than in sounds that are similar to first language sounds (e.g., Flege 1995, Major 1987, 2001). Despite the initial appearance that the results of the present study contradict these studies on similarity, they actually do not.

If we look at the increase in accuracy in producing the two target rhotics in the present study as the proficiency level of the learner increases, we see quite clearly that there is greater improvement in achieving a target-like production of the trill than there is in achieving a target-like production of the tap. Across levels, accuracy in producing the trill increases 422%, while accuracy in producing the tap increases 62%, in spite of the lower overall accuracy in producing the trill. Two things should be kept in mind in considering these numbers. First, there is more at play here than just similarity, as there also is a considerable disparity in the articulatory precision and gestural control required to produce the two Spanish rhotics. While the lack of similarity may lead one to believe that the trill would be acquired more easily than the tap, which requires a re-categorization of a similar sound in the first language, the trill is more difficult to produce in terms of articulation in general (i.e., without regard to what sounds exist in the first language). As mentioned in Section 1, even children acquiring Spanish as a first language acquire the trill rather late in their phonological development (e.g., Goldstein 2000). Secondly, perhaps what the results of the present study point out with regard to improvement is that looking at improvement may hide other important facts, such as the rate of accuracy, and may appear great due to a low rate of accuracy at early stages of acquisition.

For learners at both proficiency levels, the vast majority of non-target productions for the target tap are voiced alveolar approximants that can be attributed to transfer from American English. Developmental errors are relatively few. For the target trill, however, fewer non-target productions are due to transfer. For learners at the lower level, still over half of the non-target productions are due to transfer, with the tap being the second most common non-target production. For learners at the more advanced level, the tap is produced at a high rate of accuracy, but it is also the most common non-target production for the target trill. While accuracy in producing the trill remains low at the more advanced level, at this level learners largely abandon transfer and instead overgeneralize the tap–the Spanish rhotic that they have already learned to produce with a fairly high degree of accuracy. This overgeneralization can be viewed as a development error, as it cannot be accounted for either by transfer from the first language or by achieving the target sound in the second language. While the target has not been achieved, learning is certainly in progress. This is even more evident when it is considered that the tap is the most common non-target production of the trill produced by native

speakers. Nonetheless, the tap is a relatively infrequent production for the target trill by native speakers (10%), while it is the most common production for the target tap by the more advanced group of learners (57%).

Let us now consider the interaction of three categories of productions by the learners: achieved targets, transfer errors, and developmental errors. Figure 1 shows the percentage of each of these types of production for the target tap by proficiency level, while Figure 2 shows the same information for the target trill. For the target tap, there is essentially a trading between achieved target productions and transfer errors across levels, with developmental errors remaining steadily few. For the target trill, transfer errors decrease considerably as the proficiency level increases, with the difference split nearly evenly between the improvement in achieving the target and the increase in developmental errors.

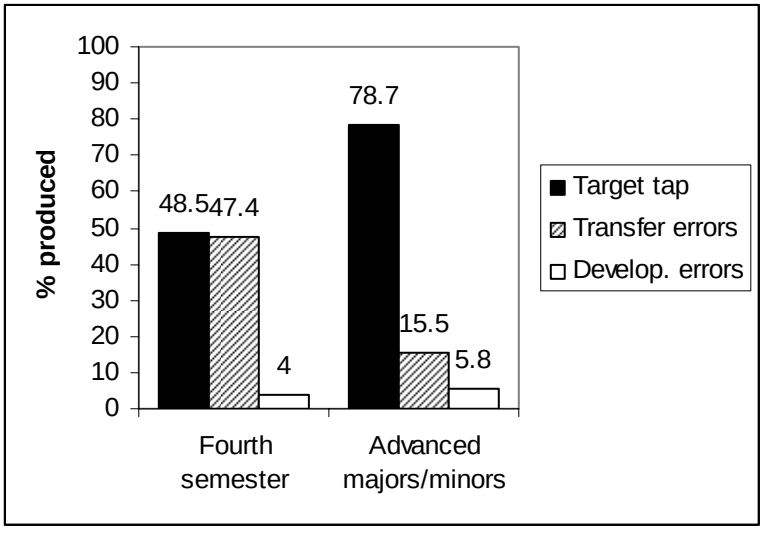

Figure 1: Percentage of achieved target tap, transfer errors, and developmental errors

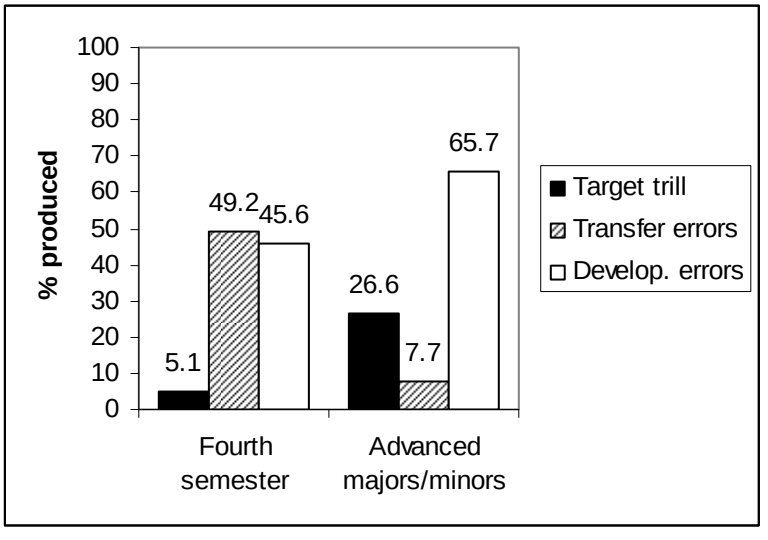

Figure 2: Percentage of achieved target trill, transfer errors, and developmental errors

Major's (1987, 2001) Ontogeny Model claims that over time transfer errors (from L1) decrease, target productions (of the L2) increase, and developmental errors (due to universals) not attributable to either L1 or L2 increase and then decrease. Major (2001:85-6) gives the following summary explanation for this interaction of these components in interlanguage (IL):

> At the beginning stages the L1 influence is so strong that it prevents U[niversals] from exerting its influence. Later the learner realizes (often unconsciously) that the L1 is not a sufficient substitute for the L2. As a result of this, as well as continued L2 exposure, L2 components start to develop. However, because much of the L2 may be beyond the learner's reach or is nebulous in the learner's mind, simultaneously U starts to exert its influence, which results in phenomena that are neither part of the L1 nor L2. Thus, at an early stage L1 obliterates the effect of U so nothing in U is evident that is not already in the L1; that is, U remains dormant. However, at a later stage U awakens and has a life of its own, so to speak. Then in later stages, the influence of U decreases as the L2 becomes more developed. The decreasing influence of U means that after a U principle has operated and has been "correctly" instantiated in the IL (i.e., it is nativelike), U has "done its work" so to speak and therefore does not appear as a nonnative part of the IL – but rather as part of the L2 component of the IL.

We seem to see the beginning of this pattern for the target trill in Figure 2, where target productions have increased in apparent time (i.e., across proficiency levels), transfer errors have decreased, and developmental errors have increased. Presumably (and hopefully, from a pedagogical perspective) developmental errors would eventually decrease (for a higher level of learner than those considered here) as target productions continued to increase. For the target tap in Figure 1, it is possible that we are seeing a later stage than what is seen for the target trill in Figure 2. The trading relationship between target productions and transfer errors, with developmental errors remaining relatively steady, may indicate that developmental errors have already increased and then decreased between the two groups of learners under consideration. On the other hand, it may be that there is no increase and decrease of developmental errors in the acquisition of the target tap, but rather a shift directly from transfer to target productions. Intermediate stages between the two groups of learners included in the present study would be necessary in order to determine which of these explanations is correct. In spite of this uncertainty with respect to the role of developmental errors in the acquisition of the target tap, the results of the present study, and especially those for the target trill, seem to provide at least partial support for the Ontogeny Model.

6. Conclusion

The results of the present cross-sectional study show that there is a considerable and statistically significant increase in accuracy of producing the two Spanish rhotics by native speakers of American English as their level of proficiency in Spanish increases. While the more advanced learners were more accurate in producing both Spanish rhotics, accuracy was fairly high for the voiced alveolar tap, but fairly low for the voiced alveolar trill. Transfer errors are very frequent for learners at the lower level for both Spanish target rhotics. For learners at the more advanced level, a high percentage of their non-target productions for the tap are due to transfer (although recall that they have relatively few non-target productions). For the trill, on the other hand, the advanced learners produce few transfer errors, but rather overgeneralize the tap and use it where Spanish phonology requires the trill (although taps are occasionally produced by native speakers). Therefore, while there is an increase in accuracy as the proficiency level of the learner increases, the development is quite a bit different for the target tap and the target trill. For the target tap, a high level of accuracy is achieved and most of the non-target productions are attributable to transfer from the first language. For the target trill, even the advanced students have a low level of accuracy, but instead of showing transfer of the American English rhotic they overgeneralize the tap that they have learned to produce with a high degree of accuracy in Spanish. Thus learning is evident in both cases. For the target tap this is evidenced through the high level of accuracy achieved, while for the target trill it is evidenced through the abandoning of transfer and overgeneralization of another sound from the second language. The learning, then, while present for both Spanish rhotics, is more advanced for the tap than for the trill.

There are three issues that I would like to suggest for investigation in future studies. First, the present study leaves unclear whether in the developmental path of the Spanish alveolar tap by native speakers of American English there is an increase and then a decrease in developmental errors or whether there is a direct trading relationship between transfer and target achievement. This should be

examined in future studies in order to better understand the learning process of second language phonological acquisition, and specifically the interaction of transfer, target achievement, and developmental errors in acquiring second language sounds. A second issue to be considered in future studies is the development of rhotic pronunciation at more advanced stages of learning than those considered here. This is especially of interest for the Spanish trill, where accuracy remained low even for the advanced learners in the present study. Finally, future studies should address the development of the two Spanish rhotics in positions other than intervocalic position. Colantoni and Steele (this volume) provide one such study where they look at the acquisition of stop + liquid (including the tap) sequences, but both Spanish rhotics in other contexts should also be examined. Since both rhotics exist in other positions, but only contrast in intervocalic position, it will be of interest to compare their development in positions in which they do not contrast with their development in intervocalic position.

References

Blecua, Beatriz. 2001. Las vibrantes del español: manifestaciones acústicas y procesos fonéticos. Barcelona: Universitat Autònoma de Barcelona dissertation.

Canfield, D. Lincoln. 1981. Spanish pronunciation in the Americas. Chicago: University of Chicago Press.

Castino, Joe Mitchell. 1992. Markedness as a predictor of difficulty in the second language acquisition of Spanish phonology. Pittsburgh: University of Pittsburgh dissertation.

Colantoni, Laura, and Jeffrey Steele. This volume. Native-like attainment in the acquisition of Spanish stop-liquid clusters.

Díaz-Campos, Manuel. 2004. Context of learning in the acquisition of Spanish second language phonology. Studies in Second Language Acquisition 26.249-73.

Elliott, A. Raymond. 1995a. Field independence/dependence, hemispheric specialization, and attitude in relation to pronunciation accuracy in Spanish as a foreign language. Modern Language Journal 79.356-71.

Elliott, A. Raymond. 1995b. Foreign language phonology: field independence, attitude, and the success of formal instruction in Spanish pronunciation. Modern Language Journal 79.530-42.

Elliott, A. Raymond. 1997. On the teaching and acquisition of pronunciation within a communicative approach. Hispania 80.95-108.

Flege, James E. 1995. Second language speech learning: theory, findings, and problems. Speech perception and linguistic experience: issues in cross-language research, ed. by Winifred Strange, 233-77. Timonium, MD: York Press.

Goldstein, Brian. 2000. Cultural and linguistic diversity resource guide for speech-language pathology. San Diego: Singular Publishing Group.

González-Bueno, Manuela. 1997. The effects of formal instruction on the acquisition of Spanish stop consonants. Contemporary perspectives on the acquisition of Spanish, vol. 2: production, processing, and comprehension, ed. by William R. Glass and Ana Teresa Pérez-Leroux, 57-75. Somerville, MA: Cascadilla Press.

Hammond, Robert M. 1999. On the non-occurrence of the phone [r̆] in the Spanish sound system. Advances in Hispanic linguistics, ed. by Fernando Martínez-Gil and Javier Gutiérrez-Rexach, 135-51. Somerville, MA: Cascadilla Press.

Ladefoged, Peter, and Ian Maddieson. 1996. The sounds of the world's languages. Oxford: Blackwell.

Lipski, John M. 1994. Latin American Spanish. London: Longman.

Major, Roy C. 1986. The ontogeny model: evidence from L2 acquisition of Spanish *r*. Language Learning 36.453-504.

Major, Roy C. 1987. A model for interlanguage phonology. Interlanguage phonology: the acquisition of a second language sound system, ed. by Georgette Ioup and Steven H. Weinberger, 101-25. New York: Newbury House/Harper & Row.

Major, Roy C. 2001. Foreign accent: the ontogeny and phylogeny of second language phonology. Mahwah, NJ: Lawrence Erlbaum.

Nathan, Geoffrey S. 1987. On second-language acquisition of voiced stops. Journal of Phonetics 15.313-22.

Recasens, Daniel. 1991. On the production characteristics of apicoalveolar taps and trills. Journal of Phonetics 19.267-80.

Reeder, Jeffrey T. 1997. Mimephonic ability and phonological performance in adult learners of Spanish. Contemporary perspectives on the acquisition of Spanish, vol. 2: production, processing, and comprehension, ed. by William R. Glass and Ana Teresa Pérez-Leroux, 77-90. Somerville, MA: Cascadilla Press.

Reeder, Jeffrey T. 1998. English speakers' acquisition of voiceless stops and trills in L2 Spanish. Texas Papers in Foreign Language Education 3.101-18.

Rosenman, Alba A. 1987. The relationship between auditory discrimination and oral production of Spanish sounds in children and adults. Journal of Psycholinguistic Research 16.517-34.

Simões, Antônio R.M. 1996. Phonetics in second language acquisition: an acoustic study of fluency in adult learners of Spanish. Hispania 79.87-95.

Solé, Maria-Josep. 2002. Aerodynamic characteristics of trills and phonological patterning. Journal of Phonetics 30.655-88.

Tarone, Elaine. 1979. Interlanguage as chameleon. Language Learning 29.181-91.

Tarone, Elaine. 1983. On the variability of interlanguage systems. Applied Linguistics 4.142-63.

Zampini, Mary L. 1994. The role of native language transfer and task formality in the acquisition of Spanish spirantization. Hispania 77.470-81.

Zampini, Mary L. 1998. The relationship between the production and perception of L2 Spanish stops. Texas Papers in Foreign Language Education 3.85-100.

Selected Proceedings of the 7th Conference on the Acquisition of Spanish and Portuguese as First and Second Languages

edited by Carol A. Klee and Timothy L. Face

Cascadilla Proceedings Project Somerville, MA 2006

ISBN 1-57473-409-1 library binding

Ordering information

Orders for the library binding edition are handled by Cascadilla Press.
To place an order, go to www.lingref.com or contact:

Cascadilla Press, P.O. Box 440355, Somerville, MA 02144, USA
phone: 1-617-776-2370, fax: 1-617-776-2271, e-mail: sales@cascadilla.com

Web access and citation information

This entire proceedings can also be viewed on the web at www.lingref.com. Each paper has a unique document # which can be added to citations to facilitate access. The document # should not replace the full citation.

This paper can be cited as:

Face, Timothy L. 2006. Intervocalic Rhotic Pronunciation by Adult Learners of Spanish as a Second Language. In *Selected Proceedings of the 7th Conference on the Acquisition of Spanish and Portuguese as First and Second Languages*, ed. Carol A. Klee and Timothy L. Face, 47-58. Somerville, MA: Cascadilla Proceedings Project.

or:

Face, Timothy L. 2006. Intervocalic Rhotic Pronunciation by Adult Learners of Spanish as a Second Language. In *Selected Proceedings of the 7th Conference on the Acquisition of Spanish and Portuguese as First and Second Languages*, ed. Carol A. Klee and Timothy L. Face, 47-58. Somerville, MA: Cascadilla Proceedings Project. www.lingref.com, document #1274.