THE IMPACT OF EXPLICIT INSTRUCTION ON PHONOLOGICAL ACQUISITION

by

Nicole M. García

B.A., University of Rochester, 1999

Submitted to the Graduate Faculty of

Arts and Sciences in partial fulfillment

of the requirements for the degree of

Master of Arts in Hispanic Linguistics

University of Pittsburgh

2005

UNIVERSITY OF PITTSBURGH

FACULTY OF ARTS AND SCIENCES

This thesis was presented

by

Nicole M. García

It was defended on

July 25, 2005

and approved by

Dr. Suzanne Curtin

Dr. Dawn McCormick

Dr. Robert DeKeyser
Thesis supervisor

THE IMPACT OF EXPLICIT INSTRUCTION ON PHONOLOGICAL ACQUISITION

Nicole M. García, MA

University of Pittsburgh, 2005

To what extent does explicit instruction of Spanish phonology lead to improvement in L2 pronunciation by native speakers of English? This experimental study aims to test the effectiveness of three different techniques designed to support the learning problems associated with generalizing an L1 phoneme with allophonic variation (/l/ → /ɬ/ word finally) to all L2 environments, learning that an L1 allophone (/t/, /d/ → /ɾ/ word-medially before an unstressed syllable) has phonemic status in the L2, and learning an L2 phoneme that does not exist in the L1 (/r/).

All the experimental groups received equal exposure to the three target segments. The only difference between the groups was the treatment. The exercises for the experimental groups included equal exposure to the three target segments, but exclusively covered either articulatory practice, contrasting environments for the same sound or English-Spanish pairs. Each treatment in the study was predicted to be optimally effective for one segment in particular, based on the learning problem associated with each of the three segments included in the study. The effectiveness of each treatment was measured quantitatively based on improvements in test scores measuring pronunciation accuracy before and after the treatment period.

The 53 study participants were native speakers of English between the ages of 18 and 32. All participants were enrolled in first-semester Spanish at the University of Pittsburgh. Subjects were divided into three experimental groups and one control group. With the exception of the

control group, course instructors engaged students in brief, daily imitation drills over a four-week period.

In order to assess and compare the results of the treatments within and between groups, subject performance was evaluated by means of a word list recording for the pretest and posttest. The data were rated on a three-point scale (1 = incorrect target sound, 2 = approximates target sound, 3 = target sound). The main and interaction effects of time, treatment and position for each of the target sounds were analyzed using a 3-way ANCOVA with GPA and a Likert scale for motivation as the covariates. In addition, a second set of 3-way ANCOVAs measured the effects of time, position and test item frequency for each sound.

Although significant effects showed a tendency for articulatory practice to be more effective than some of the other treatments, none of the outcomes supported the hypotheses that predicted each treatment would be maximally effective for one of the target sounds. A variety of factors, such as attendance and variation in instruction, can be identified that may have influenced overall improvements in accuracy. Most importantly, it is possible that some or all of the treatments might have produced significant outcomes had the treatment been longer. Despite the lack of statistically significant outcomes, the results do suggest that explicit instruction in pronunciation can have a positive effect on pronunciation accuracy.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

Dedico esta investigación a mi querida madre, Gloria Curci García, por su constante apoyo.

1. STATEMENT OF THE PROBLEM

Phonology is an important yet often overlooked aspect of language learning. Often explicit phonological training in the perception and production of phonemes not found in the L1 inventory as well as in suprasegmental features of the target language is at best incomplete and inconsistent. Yet without accurate pronunciation, rhythm and intonation, intelligibility and comprehensibility at the word and discourse levels suffer. Furthermore, I would argue that while certain errors such as producing an English retroflex 'r' instead of a Spanish trill do not inhibit comprehension, they can be both distracting to and stigmatized by a native speaker. On this point, it is up to the individual student to determine what level of satisfaction with regard to their pronunciation they are aiming for.

The communicative approach identifies pronunciation as an aspect of communicative competence. In practice, pronunciation instruction and practice in formal foreign language classrooms tends to be minimal at best and fails to address the variety of learning problems that the phonological system presents. Where pronunciation is addressed techniques lack variety. Typically instruction and feedback are limited to modeling and repetition. This can be problematic, frustrating and simply ineffective when it comes to phonemes or allophones not present in the students' native inventory. Moreover, curricula are not always designed to move from perception to production, to provide simple articulatory explanations for new segments or to highlight pronunciation differences between isolated words and connected speech. Besides the lack of time and attention allotted to pronunciation, the effectiveness of the instruction

techniques typically employed in foreign language classrooms is questionable. To what extent does explicit instruction of Spanish phonology lead to improvement in L2 pronunciation?

This experimental study aims to test the effectiveness of three different techniques designed to support three particular learning problems typical among native English speakers studying Spanish. In order to narrow the scope of the study three segmentals corresponding to three distinct learning problems were examined.

Among the sounds students of Spanish commonly find problematic are:

1. the voiceless alveolar approximant, light /l/
2. the voiced alveolar tap or flap, /ɾ/
3. the voiced alveolar trill, /r/

These segments are difficult for learners to produce accurately for different reasons. In the case of the light /l/ and the tap, both segments exist in the English inventory. So, presumably, the difficulty that students experience does not lie in production of the segments. However, this difficulty stems from two different learning problems.

In the case of /l/, students must learn a new environment for an L1 phoneme. The **phoneme /l/** in North American English has as an allophone a velarized dark /ɬ/**, which surfaces in word final position**. In English the **light /l/** and dark /ɬ/ are in complementary distribution. That is to say, they are not used to contrast meaning. A light /l/ is produced before vowels while a dark /ɬ/ is pronounced syllable final. In Spanish light /l/ is a phoneme and is pronounced as a voiced alveolar approximant in all environments. Since dark /ɬ/ does not exist in Spanish, English speakers of Spanish must learn to generalize the light /l/ to all environments. Typically students follow the allophonic distribution of the English liquid /l/ resulting in the velarization of

word-final /l/ in words like ‘papel’ [papeɬ] (‘paper’). In learning Spanish their challenge is to avoid transferring the rule for English to the Spanish sound system.

Like the light /l/, the tap also exists in North American English, but it is not as widely distributed as it is in Spanish. More importantly, it exists in English as an allophone whereas in Spanish it is at times a phoneme and at others an **allophone of the trill**. In North American English the tap occurs intervocalically as a rarely occurring allophone of /t/ or /d/ immediately after a stressed vowel and immediately before an unstressed vowel in words like ‘water’ [waɾɚ˞], ‘butter’ [bʌɾɚ˞] and ‘muddy’ [mʌɾi]. The environment also applies across word boundaries to include instances such as ‘pot of tea’ [pʰaɾʌvti]. Native English speakers may not even realize that what they are producing in this environment is a flap and that it is a separate sound from either /t/ or /d/. Furthermore, beyond this orthographic confusion, the English tap is also related to prosody, which is not an issue for the Spanish tap. The tap should not be articulatorily difficult for Americans and Canadians since they have the same sound for their intervocalic /t/ or /d/. “The problem with the tap is instead phonemic and orthographic: students can and do use it, but they resolutely regard it as a /t/ or /d/ according to the laws of English phonology and spelling, not as an /r/” (Whitley, 2002, p. 23).

In Spanish the tap and the trill are in contrastive distribution syllable initially (word internally). This rule produces minimal pairs such as ‘pero’ [pe.ɾo] (‘but’) versus ‘perro’ [pe.ro] (‘dog’) and ‘caro’ [ka.ɾo] (‘expensive’) versus ‘carro’ [ka.ro] (‘car’). The tap and the trill also occur in complementary distribution as allophones of /r/. The tap always occurs in coda position (i.e. amor, ‘love’ = [a.moɾ]) whereas the trill occurs both word initially and following a nasal or a liquid (i.e. rata, ‘rat’ = [ra.ta], alrededor, ‘around’= [al. re.ðe.ðoɾ], ‘Enrique’ = [en.ri.ke]). So,

the problem with the tap remains its correspondence to the single orthographic 'r' and its word internal syllable initial environment.

In the case of the trill, it has no counterpart in the English inventory. It is a completely new sound for the learner. The difficulty in acquisition of a new sound can be related to articulation. According to Whitley:

> [t]he apex may be wrongly placed, the body of the tongue may be raised too high, the vocal cords may be spread (yielding a voiceless version), airflow may be too weak, or the tongue may be too tensed in anticipation of the legendary bete noire of Spanish phonology. Students can usually master the trill if they know precisely what to do (with far more precision than most textbooks offer), truly wish to do it, practice doing it, and fine-tune it with guidance from a teacher who can diagnose problems and who expects mastery. (2002, p. 25)

Difficulty with the articulation of the trill can be further compounded by the problems discussed above of distribution and sound-letter correspondence.

Having identified the particular learning problems associated with the light /l/, tap and trill, it seems logical that in a classroom setting they should be presented and practiced explicitly in a way that addresses their corresponding learning problem. The aim of this study was to test the effectiveness of techniques tailored to the three particular learning problems presented by the light /l/, tap and trill. The effectiveness was measured quantitatively based on improvements in test scores measuring pronunciation accuracy before and after the treatment period.

Each treatment in the study was predicted to be optimally effective for one segment in particular based on the learning problem associated with each of the three target segments included in the study. All of the treatments included the tap, trill and light /l/. Furthermore, the exercises for each treatment group were systematically designed and arranged to provide subjects

with equal exposure to each of the three target sounds and their respective environments. The only difference between the three experimental groups was the randomly assigned treatment, i.e. the technique applied to instruction and practice. The exercises for the experimental groups exclusively covered either articulatory practice, contrasting environments for the same sound or English-Spanish pairs.

Predictions for the treatment outcomes were made based on the compatibility between the exercise types and the learning problems presented by the three target sounds. First, articulatory practice involved explicit description of the shape of the articulatory organs for each sound followed by imitation drills led by the instructor. This exercise type was predicted to be of particular value for the development of the trill since it was the only target sound that did not occur in the subjects' L1.

Second, exercises which contrasted environments for the target sounds (or in the case of the trill, its closest approximate, retroflex /r/) juxtaposed words in English and Spanish where the orthographic representations of the target sound occurred in the same environments, but had different phonological realizations. This treatment was anticipated to be most helpful for improving accuracy of the light /l/ because the word lists drew attention to the phonemic status in Spanish of an L1 allophone.

Third, exercise types that provided Spanish-English pairs were predicted to be most effective for the development of accuracy with the tap. This is because these imitation drills, in the case of the tap, paired Spanish words containing the target phoneme with English words containing an allophonic tap represented orthographically in certain intervocalic environments as 't,' 'd,' 'tt,' or 'dd.' The idea was to make subjects aware of the allophonic status of the tap in English and

facilitate the transference of this sound to its corresponding orthographic representation and environments in Spanish.

2. LITERATURE REVIEW

Pronunciation is an aspect of second language acquisition that has received little attention in both research and instruction. Over the last century phonetics has not had a fixed place in the second language classroom. To begin, the Grammar-Translation method emphasized reading and writing over speaking and listening skills. Subsequently, under this method phonetics was not necessary for a coherent curriculum and was typically omitted. With the appearance of the audio-lingual method, phonetics reentered the classroom. In addition, features such as segmentals, their environments and allophones, suprasegmentals and manner of articulation were often explicitly addressed in language textbooks. Typically the accompanying language laboratory books incorporated listening and repetition exercises.

Later, advocates of the Natural Approach, such as Purcell and Suter (1980), proposed that explicit instruction in pronunciation was not necessary because pronunciation developed naturally from received input. As the communicative language teaching (CLT) approach began replacing these earlier ones pronunciation moved to the back seat once again and became the stepchild of the CLT instructional framework. Whereas the audio-lingual approach placed primary stress on accuracy, the communicative framework of instruction placed greater emphasis on speaking fluency and intelligibility. The aspects of pronunciation most important to these objectives are those features that impact meaning. These would include phonological contrasts (i.e., the tap versus the flap in minimal pairs such as 'pero' [pɛro] and 'perro' [pero]), intonation (i.e., 'Hablaron↘.' vs. 'Hablaron?↗') and word stress (i.e. 'hablo' [ˈa.blo] vs. 'habló' [a.ˈblo]).

Consequently, errors in pronunciation that do not impact meaning, such as producing a [b] as opposed to the allophone [β], could be justifiably ignored.

Although the CLT approach has not completely eliminated pronunciation from the classroom, its adherents have not been clear about how instructors should treat it. More and more educators have become proponents for the integration of pronunciation instruction into the framework of the developing communicative approach to language teaching. Pronunciation instruction plays a role in communicative competence and is most easily linked to listening skills (perception) and speaking skills (production). The question to be addressed here is what techniques are optimally effective in improving the pronunciation accuracy of Spanish learners.

Pronunciation has not been given neither the importance nor the attention within the second language classroom that it deserves. Some might argue the near cursory treatment of pronunciation in the CLT curriculum and lack of textbook support for pronunciation is in part due to the lack of conclusive evidence on the value of classroom instruction for second language sound systems and suprasegmental features. There has not been sufficient research to reliably demonstrate the effects of explicit pronunciation instruction or, assuming that it yields a positive effect on production, to demonstrate how long second language students retain their improvements.

Within the CLT framework pronunciation continues to be largely ignored. It has been valued only in a limited sense and only in relation to issues of communicative competence, that is, where sound contrasts impact meaning. So, the current use of pronunciation instruction in the second language classroom is far from comprehensive. The benefits of correct pronunciation extend beyond issues of communicative competence and add to the argument for its further integration into the second language curriculum.

While certain errors may not compromise intelligibility they can still prove to be damaging to communication from a sociolinguistic perspective. First, inaccurate pronunciation can be extremely irritating to native speakers and this distraction could indirectly interfere with communication. Furthermore, the native speaker may judge the interlocutor's accent to be an indicator of overall language ability or intelligence. Second, certain errors carry a stigma and this may impact the confidence level or affective filter of the second language learner.

Third, pronunciation instruction is important for improving accuracy. In his article "On the teaching and acquisition of pronunciation within a communicative approach," Elliott (1997) showed that input alone was not sufficient for significant improvements in pronunciation (as cited in Arteaga, 2000). The results of the study indicated that pronunciation improved in response to explicit instruction. The techniques that were part of the treatment include the contrasting of L1 and L2 sounds, explanation of allophonic distribution and the referencing of speech organs (Arteaga, 2000, p.341).

3. METHODOLOGY

3.1. Study Design

This experimental study was designed to test the effectiveness of three different techniques designed to support three particular learning problems typical among native English speakers studying Spanish. In order to systematically test the effectiveness of materials designed for the explicit instruction and practice of the light /l/, tap and trill, three groups were exposed to three different treatments. Each treatment was predicted to be optimally effective for one segment in particular based on the learning problem associated with each of the three segments included in the study. A fourth group, serving as the control, did not have any explicit pronunciation techniques or practice incorporated into their course content.

3.2. Treatment

This longitudinal study was carried out over a four week period during the second half of the spring semester. It was important that the treatment be longitudinal; however, due to department curriculum objectives the pronunciation lessons could not exceed five minutes. The lessons were brief, but daily (classes met Monday-Friday) with the goal of maximizing automatization and minimizing the fossilization of errors. The target sounds were presented in a systematic fashion

to ensure that students had equal exposure to each of the three segments and their respective environments.

The difference between the four groups was the treatment. All of the treatments included the light /l/, tap, and trill, but they differed in the technique applied to instruction and practice. The control group did not receive any explicit instruction in pronunciation. As the Spanish department does not formally integrate pronunciation into their curriculum this lack of treatment had no negative effect on the control group's progress in the Spanish program.

The exercises compiled for the three experimental groups targeted the three learning problems identified earlier: generalizing an L1 phoneme with allophonic variation ([l] → [ɬ] word finally) to all L2 environments, learning that an L1 allophone (/t/, /d/ → [ɾ] word medially before an unstressed syllable) has phonemic status in the L2, and learning an L2 phoneme that does not exist in the L1 (ø; /r/). The exercises for the experimental groups exclusively covered either, contrasting environments for the same sound, English-Spanish pairs or articulatory practice. The idea was that each type of exercise would be maximally effective for one of the target sounds given the learning problem posited for that segment.

3.3. Instruction

The instructors for each group were different to avoid a confound between teacher and method. Two of the instructors had formal training in linguistics and are presently pursuing graduate degrees in the field. The other two instructors were PhD students in Hispanic literature and did not have any previous linguistic training. Instructors were provided with overhead transparencies for each lesson and instructions on how to present and practice the target

segments. In addition, the instructor who focused on articulatory positions had a diagram of the articulatory organs on an overhead transparency to accompany the explanations. Regardless of the thoroughness of the instructions provided to the instructors, there was no way to control what they actually did in the classroom. Finally, instructors were asked to provide as much feedback as they had time for.

3.4. Subjects and Setting

The experimental study took place in the University of Pittsburgh's Hispanic Languages and Literatures department. The subjects were students enrolled in first semester Spanish classes for the Spring of 2005. The study began with 70 students, but only 53 of them completed it. The 24% attrition rate was due to midterm and end of the semester dropouts and chronic absenteeism. Also, two students were eliminated from the analysis because they were non-native speakers of English. Of the 53 students who completed the study 20 were male and 33 were female. Participants ranged in age from 18-32 years old, but the majority of them were between 18 and 22 years old. 81% of participants or 43 out of the 53 subjects had previous formal instruction in Spanish, mostly at the high school level. So, the majority of the subjects, then, can be labeled false beginners.

The students were aware that they were participating in a research study and that their daily classroom practice and test scores did not factor in any way into their course grade. Participants knew that pronunciation of the tap, trill and light /l/ was the focus of the study, but they were not told which treatment they were receiving nor what outcomes were predicted. Their only contact with the experimenter was during the pretest and posttest recording sessions.

3.5. Hypotheses

H1: The three experimental groups (B-D) will improve more than the control group (A) in their accuracy in producing the target segments. This is because, regardless of the effectiveness of each technique in maximizing student progress for one of the sounds, the experimental groups will have had focused practice on pronunciation of all three target segments while the control group will have had none.

H2: Group B will show more improvement than the other groups in accuracy for the trill. Because the trill is not part of the English sound inventory, articulatory instruction will be more beneficial for the development of the trill than that of the light /l/ or tap.

H3: Group C will improve more than the other groups in production of the tap. Since the exercises for this experimental group highlight the phonemic status in Spanish of an English allophone, they should be most indicative of the learning problem for the tap.

H4: Scores for group D will be higher than other groups in pronunciation accuracy for the light /l/. Students must eliminate an English allophone, the dark /ɬ/, to conform their pronunciation to the Spanish sound inventory. As the exercises for this group contrast the environments in which a sound occurs in English and Spanish, it is predicted to be more effective for the light /l/ than for the tap or trill.

3.6. Instruments

In order to assess and compare the results of the treatments within and between groups, subject performance was evaluated by means of a word list recording. The lists were compiled so that each of the three target segments appeared in multiple environments. For the light /l/ these were word or syllable-final, word or syllable-initial and consonant clusters. The environments for the tap were intervocalic, consonant cluster and word or syllable-final. Finally, the trill was presented in intervocalic and word-initial positions.

The pretest and posttest differed in two ways. First, none of the items elicited in the pretest were repeated in the posttest. Second, the posttest took into account word frequency to control for the practice effect. In order to see if students were applying the rules and recognizing the environments that the treatment lessons addressed, the words for each segment and environment ranged from relatively high to low frequency. Word selection was based on the course textbook's unit vocabulary lists. The high frequency words were taken from the first half of the semester and were items such as function words (i.e., articles), basic action or auxiliary verbs and common adjectives. Items of intermediate frequency were words that had been recycled, but were not used on a daily basis. Finally, tokens for low frequency were words students wouldn't have encountered more than once or twice, if ever. Many of them were taken from textbook chapters they had not yet covered.

Students recorded the word lists in the Robert Henderson Language Media Center at the University of Pittsburgh using Sound Recorder. Each item in the list was repeated three times to avoid a list effect. The aim was to slow their production so that the items were pronounced as separate prosodic units. The rating focused on the second utterance of each word. The data collection occurred within two weeks of the start of the treatment and within a week after it

ended. Because the groups were tested in the lab simultaneously during class time, some degree of background noise was unavoidable.

The pretest was accompanied by a questionnaire that addressed individual differences such as age, gender, previous language instruction, motivation for improving pronunciation and L1. As the arrangement of the subjects into the three experimental groups and the control group was not random, GPA and a Likert scale for motivation served as covariates for the data analysis. In a couple of cases students could not provide a GPA because they were in their first semester at the university.

In promoting automatization, treatment and testing focused on form by presenting the sounds at the word level without any further contextualization and avoiding spontaneous speech. When practice or testing involves spontaneous speech, student progress can be deceiving. Until a target sound is fully automatized, accuracy will be inconsistent. Even with automaticity, the amount and quality of attention the learner can devote to pronunciation will vary. This variation will depend on the type of activity the learner is engaging in. According to Haldich, Holden and Montes:

> [o]ne learning problem common even to those who are able to produce the fricative or trill sound immediately is the development of facility in its use. The fact that a learner can produce the sound correctly in imitation is no guarantee that it will be easily available to him at any time he wishes to express himself in words and phrases containing /r/. In other words, practice is required before a student consistently uses in conversation a trilled /r/ (or the fricative variant) which is as good as his best production in pronunciation practice. (1968, p. 147)

The heavier the processing load, the less focus there will be on any given aspect of language. Subsequently, the learner will be more susceptible to pronunciation errors. With this in mind the study design purposely kept the cognitive processing load to a minimum. The sounds were never contextualized beyond the word level, avoiding spontaneous speech.

3.7. Rating

The treatment effect was measured by comparing the average pretest and post-test scores for each of the three segments. The rating system that was applied to the evaluation of the pretest and posttest was taken from Elliott (1995). The target sounds were rated on a three-point scale according to the following specifications:

1 = incorrect target sound

2 = approximation of target sound

3 = correct target sound.

The middle rating is vague in the sense that it represents a broad range of possibilities. It is somewhat imprecise because it collapses a continuum of incorrect approximations into one rating. A score of 2 was only common in the case of the trill. This was because students presumably recognized that there was a contrast between the intervocalic tap and trill, but could not yet articulate the difference. Whereas in many instances the tap sounded like the English retroflex, the trill often sounded like a single tap as opposed to multiple taps.

With the exception of the trill, all of the sounds important to the data analysis for this study are a subset of the English sound system. Although the trill does not occur in English, it is salient enough that perception by a non-native Spanish speaker is not problematic. The superset-

subset relationship between English and Spanish allows me, a native speaker of English, to justify my role as a rater in this study**.**

However, recognizing that as a non-native speaker I filter what I hear through my native language, a native speaker of Spanish was used as a second rater due to ambiguities with the light /l/ in word-final position. A random sampling of students from all four groups was scored by a native Spanish speaker to measure inter-rater reliability for pronunciation of the light /l/ in final position. Inter-rater reliability was based on rater evaluation of three items containing light /l/ in final position from both the pre-test and posttest for two randomly selected subjects from each of the four groups. The intraclass correlation coefficient for each of the three words was 0.70, 0.77 and 0.75. As this test of reliability considers anything over 0.70 acceptable, it confirmed the reliability of my ratings. As an additional measure, the Pearson correlations were calculated at 0.73 ($p = 0.04$), 0.79 ($p = 0.21$) and 0.79 ($p = 0.20$). According to this test, correlations are significant at the 0.05 level. So, the Pearson correlation provided additional confirmation for the reliability of my scores as a non-native Spanish speaker.

4. RESULTS

The data were organized according to treatment group and segment position. Tables 1 and 2 gloss the letter and number codes.

Table 1. Treatment groups

Group	Treatment
A	None
B	Articulatory practice (trill)
C	Contrasting environments (tap)
D	Spanish-English pairs (light /l/)

Table 2. Target sound environments

Segment	Position	Description
1. Light /l/	1	Word or syllable final
	2	Word or syllable initial
	3	Consonant cluster
2. Tap	1	Intervocalic
	2	Consonant cluster
	3	Word or syllable final
3. Trill	1	Intervocalic
	2	Word initial

For each of the three target segments two sets of tests were run to test for significance. First, the pre-test and posttest scores were analyzed using a 3-way ANOVA for each of the three target segments. The pre-test and posttest scores for each of the three target sounds were averaged and the outcome variables were analyzed using a 3-way ANCOVA (treatment x position x time) with student GPAs and Likert scale scores for motivation as covariates to test for significance (as subjects were not randomly assigned to their groups). The two covariates were evaluated at the following values: GPA = 3.18 and motivation = 2.16. In comparing the pre-test and posttest scores the independent variables were the treatment, segment position and time. The dependent variable was pronunciation accuracy as measured by the posttest scores. It was assumed that high averages indicated high accuracy.

Second, using just the posttest scores another 3-way ANCOVA was applied to the data to test for the main and interaction effects of treatment, position and item frequency. The primary goal of the second set of tests was to determine if the level of frequency of the posttest words had an effect on pronunciation accuracy. The second set of tests found almost no statistically significant effects on pronunciation accuracy while the results of the first set were only slightly more interesting.

According to the first set of results, which compared T1 and T2, the 3-way ANCOVA for the light /l/ shows no significant changes in accuracy based on treatment for any of the groups.

Table 3. Descriptive statistics for light /l/

		Pre-test			Posttest	
Treatment	Position	Mean	SD		Mean	SD
A (n=12)	1	1.25	0.59		1.33	0.43
	2	2.96	0.10		2.81	0.58
	3	2.93	0.13		2.83	0.58
B (n=14)	1	1.46	0.65		1.29	0.34
	2	2.99	0.04		3.00	0.00
	3	2.86	0.53		2.99	0.04
C (n=10)	1	1.10	0.21		1.20	0.32
	2	2.60	0.84		3.00	0.11
	3	3.00	0.00		2.83	0.53
D (n=12)	1	1.25	0.57		1.44	0.74
	2	3.00	0.00		3.00	0.00
	3	3.00	0.00		3.00	0.00

The results summarized in Table 3 do not support H4, which predicted that practice with Spanish-English pairs (group D) would be maximally effective for eliminating the dark /ɬ/.

The only significant effect for the light /l/ was with respect to the position of the segment over treatment and time. In comparing the effect of position the data indicates that subjects did worse with position 1 than with 2 and 3. Within and across groups the average for final position (1) was 1.30 while the mean score for initial position (2) and a cluster (3) were 2.92 and 2.93, respectively. Although these statistically significant averages closely approximate a native-like score of 3.00, the results of the main effect for position are misleading. As pronunciation of the segment in positions 2 and 3 coincide with English pronunciation, they should not pose a problem for native English speakers. Consequently, subjects score high on those items by default.

With respect to the tap, the interaction of treatment and time was significant (0.04) regardless of position. Treatment groups B and D showed greater improvement than groups A and C (see Table 4).

Table 4. Treatment x Time for the tap

Treatment	Time*	Mean	Standard Error
A	1	1.48	0.15
	2	1.36	0.18
B	1	1.45	0.14
	2	1.99	0.17
C	1	**1.26**	0.17
	2	**1.34**	0.20
D	1	1.18	0.16
	2	1.64	0.20

* Time 1 = pre-test; Time 2 = posttest

However, this disproves the second hypothesis, which predicted that the exercises based on contrasting environments (C) would be maximally effective for the tap.

In the case of the trill there were two significant outcomes. First, treatment by time (0.02, $p < .05$) showed that treatment group B did better than any of the other groups (see Table 5).

Table 5. Treatment x Time for the trill

Treatment	Time*	Mean	Standard Error
A	1	1.35	0.15
	2	1.32	0.19
B	1	**1.44**	0.14
	2	**2.17**	0.18
C	1	1.36	0.17
	2	1.96	0.21
D	1	1.35	0.15
	2	1.96	0.20

* Time 1 = pre-test; Time 2 = posttest

Second, interaction of treatment and time by position (0.03, $p<.05$) indicates that although there were no significant differences between treatments for position 1, treatment group B improved significantly more than group A for position 2 (see Table 6).

Table 6. Treatment x Time x Position for the trill

Treatment	Time	Position	Mean	Standard Error
A	1	1 2	1.48 1.21	0.18 0.14
	2	1 2	1.56 1.10	0.20 0.20
B	1	1 2	1.74 1.13	0.18 0.13
	2	1 2	2.26 2.08	0.20 0.20
C	1	1 2	1.39 1.33	0.21 0.16
	2	1 2	2.11 1.80	0.23 0.23
D	1	1 2	1.49 1.21	0.19 0.14
	2	1 2	2.10 1.81	0.21 0.21

Figures 1 and 2 compare the slopes for each group making the degree of improvement among groups more salient.

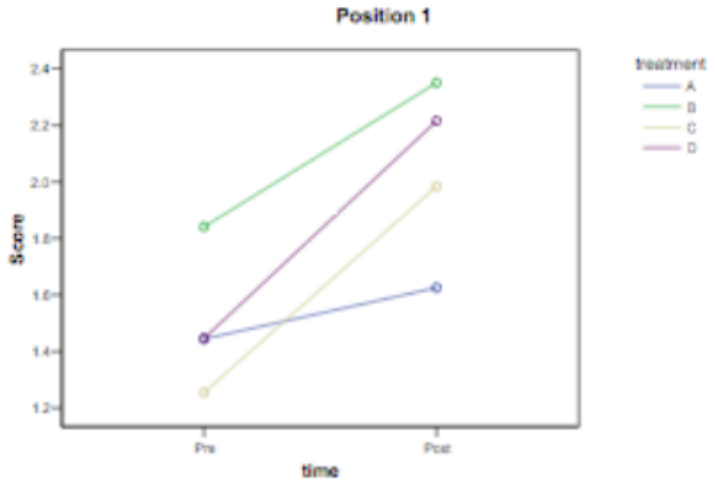

Figure 1. Treatment by Time Interaction for Sound 3 (position 1)

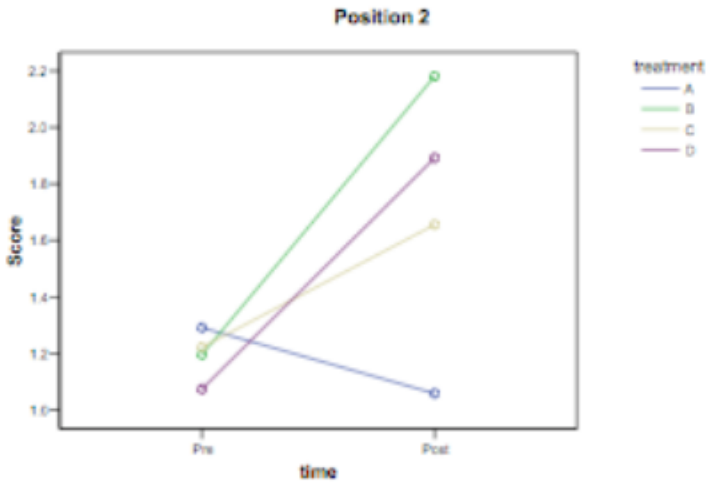

Figure 2. Treatment by Time Interaction for Sound 3 (position 2)

These results provide partial support for H2, which posited that articulatory practice would be maximally effective for the trill.

The second set of tests analyzed the posttest in terms of treatment, position and frequency (high, mid, low) of the test items, but found no interesting effects for frequency. The results show that a frequency effect only occurs in the case of light /l/ in final position (1). Subjects did well for all levels of frequency for positions 2 and 3, but in position 1 the averages were highest for low frequency words.

5. DISCUSSION OF RESULTS

As suggested in the previous section, the statistically significant averages for the light /l/ in positions 2 and 3 are misleading because the contrast between the Spanish and English /l/ in those two positions was treated as negligible for the purpose of this study. The Spanish phoneme /l/ is closer in quality to the English light /l/ than its velarized allophonic counterpart (Teschner, 2000, 152). Furthermore, according to Teschner:

> La diferencia principal entre el alófono no velarizado español y su equivalente más próximo inglés es que en la articulación de la [l] española, los dos bordes de la lengua se elevan hacia el paladar, curbiéndolo case en su totalidad. En la articulación de la [l] inglesa, en cambio, los dos bordes de la lengua no se elevan tanto. El alófono español es por consiguiente más tenso que su equivalente inglés y tiene un sonido aún más parecido al de la vocal [i], mientras que el efecto acústico de la [l] inglesa es el de la vocal [u]. (2000, p. 152)
>
> The primary difference between the non-velarized Spanish allophone and its closest English equivalent is the articulation of the Spanish [l]. The edges of the tongue are raised towards the palate almost covering it completely. In the articulation of the English [l], on the other hand, the sides of the tongue are not as high. Consequently, the Spanish allophone is more tense than its English equivalent. Furthermore, it is more similar to the vowel [i] while the acoustic effect of the English [l] is more like the vowel [u]. (2000, p. 152)

However, for the sake of this study the light /l/ in English was considered equivalent to the light /l/ in Spanish. In the course of rating the problem arose of how to score the test tokens that, according to the rules in both languages, call for the light /l/. To maintain consistency the light

/l/ in word and syllable initial position and in a cluster was scored as a '3' so that it would not obscure the averages within and between groups. The alternative solution would have been to eliminate those two positions from the study.

The range of variability was much greater for the light /l/ in final position, but this also made scoring more difficult from a native speaker perspective. In a few instances the pronunciation of the preceding vowel provided an obvious clue to the quality of the /l/. For example, in tokens like [fes.ti.βal] and ['ul.ti.mo] were typically pronounced ['fɛs.tə.vaɬ] and ['uɬ.tɪ.mo]. The general tendency was to transfer the English vowel inventory to Spanish. Figure 3 combines the vowel spaces of American English and Spanish with the inventory of the later indicated in bold. The comparison in Firgure 3 shows the American English vowels [ɑ] and [u] are more back than the target Spanish vowels [a] and [u].

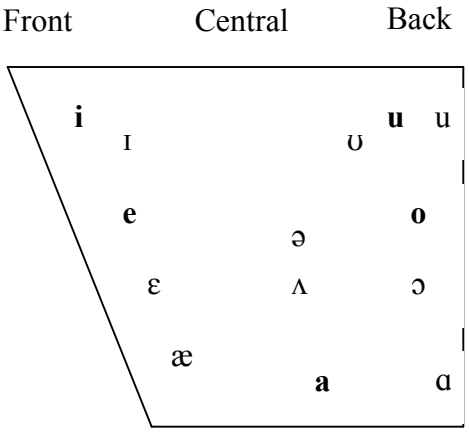

Figure 3. Combined vowel spaces of American English and Spanish

The application of these back American English vowels could prompt the velarization of the /l/ for ease of articulation. The possibility also exists that the opposite is true. Rather than back vowels triggering a dark /ɬ/, it is the velarization of the /l/ that pulls the vowels back. The presence of the reduced vowel, schwa, indicates that subjects also resyllabified the word

according to English rules. These salient differences in vowel articulation provided some clarity in a few instances. But to compensate for ambiguities encountered in the overall scoring of the /l/ in final position, inter-rater reliability was measured using a native Spanish speaker.

Three of the groups showed a small improvement for final position, but in no case were these positive outcomes significant. The lack of significant improvement with the light /l/ in final position may have been compounded by vowel pronunciation errors. In addition, pronunciation of the posttest items for light /l/ in word-final position, 'festival' and 'último,' may have been further influenced by their similarities to English: 'festival' and 'ultimate.'

The data showed a significant effect for treatment by time for the tap with groups B and D doing better than groups A and C. Group A's mean score decreased over time. Although treatment group C improved some, it was not maximally effective as predicted by H3. This could be due to ineffective treatment, but other possible explanations include length of treatment and ineffective instruction. Group B's mean score increased more than Group D's average over time. It could be the case that the articulatory practice aimed at improving the trill was helpful for the tap since it is a component of the trill.

It was not the case that students improved significantly more with position 1 than position 2 for the trill. It seemed reasonable to expect more improvement for position 1 for two reasons. First, intervocalically the trill is represented orthographically by the double 'r' making the contrast with the intervocalic tap visually more salient. This contrast would seem to act as a clue and make it easier for subjects to map the sound to its representation. Second, articulation is easier between vowels than in word initial position.

It seems possible that the treatment for group B was more effective than this study indicates. First, it is impossible to know if students scored low because they were not applying

the rules for the trill or because they could not produce the sound. Second, as testing did not address perception, it is not clear if the subjects noticed the contrast between the tap and the trill. In the case of the trill, it is possible that the treatment helped improve students' perception and awareness more than their accuracy in articulation.

6. CONCLUSIONS

A variety of factors can be identified that may have influenced overall improvements in accuracy. First, although the results of this study did not support the hypotheses, it is also possible that some or all of the treatments might have produced significant outcomes had the study been longer. Second, scores may have been affected by poor attendance. As instructors frequently commented on the problem of chronic absenteeism in their courses, it would have been interesting to take the number of absences into account when analyzing the individual test scores. Third, there was no way to control for variation in instruction. Although the instructors received verbal and written instructions on when and how to carry out the treatment, there is no guarantee that they followed the directions. There may have been inconsistencies in the way the material was presented to the subjects reducing the internal validity of the study. In light of this possible source of variability, classroom visits would have provided the opportunity to note error and inconsistency.

It is impossible to identify the problems affecting performance. As perception is not being tested, there is no way to know what is causing inaccuracy for sounds like the trill. It could be the case that students got better at perceiving contrasts, but in reading the word lists they were not mapping the sounds to their respective environments. Furthermore, improvement in accuracy as demonstrated by significant test scores are subject to a margin of error. As subjects have not reached automaticity, inconsistencies and fluctuations in accuracy could be indications of backsliding.

Fourth, the significant outcomes produced by group B may be attributable, at least in part, to the instructor. Although it cannot be demonstrated quantitatively, the instructor for group B was the most interested in and enthusiastic about the study. As the only non-native speaker and one of the only instructors with linguistic training, he may also have been more sensitive to the stigmatizing errors the project was targeting and at the same time better prepared to guide students through the treatment. More importantly, he had the most formal training in foreign language instruction, as well as teaching experience, of all the instructors who participated in the study. The instructor for group B had taken numerous courses and seminars in language teaching as an undergraduate and graduate student. In addition, he was finishing his fifth year of teaching at the time of the study. In contrast, the other instructors in the study had only recently begun teaching undergraduate courses and had only received the training course provided by the Spanish department. Hence, lack of training and experience may have affected the quality of instruction the subjects in groups A, C and D received and, subsequently, the extent of their improvement.

Despite the fact that the results were not statistically significant enough to prove the hypotheses, the study suggests that explicit instruction in pronunciation can improve the accuracy of native speakers of English learning Spanish as a foreign language. With only five minutes of practice a day over a four week period, positive changes were observed among the treatment groups. It is possible that subjects experienced improvements (i.e., an increased awareness of the target segments) that the study was not designed to measure, but that may contribute to their future progress in pronunciation accuracy. Another possibility exists that treatments interacted in ways that I had not considered when formulating the predictions. For example, articulatory instruction and practice with the trill inevitably reinforces the tap as the

later is a component of the former. In conclusion, this study demonstrates that the use of explicit instruction in pronunciation for classroom learning is worth further exploration.

7. SUGGESTIONS FOR FUTURE RESEARCH

If this experiment were repeated, the design might be modified in several ways. First, a future study could extend the treatment length beyond the four weeks this one was limited to. The study was originally designed to be longitudinal, but due to administrative setbacks the length of the study was halved. This limited the amount of instruction and guided practice the subjects received.

Second, the exercise types could be more varied to include pair or student-centered practice activities. As student progress could have been, at least in part, a function of the amount of practice and feedback they received, pair and group work would allow the instructor more time and opportunity to monitor students, diagnose problems and provide feedback.

Also, in response to the results for word final /l/ and the observations made about the segment's interaction with the preceding vowels in that environment, the treatment of the light /l/ might be improved by incorporating training in the Spanish vowel system. Assuming that the backness of English vowels provokes the velarization of /l/ in word-final position, prefacing the light /l/ practice exercises with explicit training in the Spanish vowel system may diminish the tendency to velarize the /l/.

Third, the scope of the experiment could be broadened to control for long-term effects. In this study the posttest was administered within a week after the treatment ended. A second posttest could be added to determine whether improvements in pronunciation were maintained.

Fourth, all pretest and posttest tokens should be ordered randomly to avoid a confound between position and word order. In this study the words were listed by segment. They were

systematically arranged within each segment by environment and, in the case of the posttest, within each environment from highest to lowest frequency. The systematic sequencing of test items constitutes a weakness in the study design. The strict order may have affected the results by inducing practice fatigue or boredom during the recording sessions.

Finally, future study might consider other aspects of pronunciation that are equally as stigmatizing as the segments treated in this study. In addition to the tap, trill and light /l/, two additional sources of error among English speakers of Spanish were particularly common and salient among all groups. First, most subjects transferred the English rule for the aspiration of voiceless bilabial stops to Spanish. Aspiration occurs in English after a voiceless stop (i.e., /p/, /t/, /k/) in initial position of a stressed syllable (i.e., [p^hlit]). A puff of air follows the consonant release and occurs when there is a delay in the onset of voicing (Rogers, 2000, p. 50). As a result, test items such as [ka.ɾo] and [pe.ro] were pronounced [k^h] and [p^h]. Second, subjects did not observe the Spanish rule that fricativizes voiced stops (i.e., /b/, /d/, /g/) in intervocalic position. Consequently, words like [mo.li.ða] and [ku.βa] were pronounced [mo.li.da] and [k^hu.ba].

APPENDIX A

Study Questionnaire

IDENTIFICATION NUMBER: ____ (use this number to name your sound file)

DATE: _____

GENDER: M ___ F___

AGE: ____

GPA: ____

WHAT IS YOUR FIRST LANGUAGE? _____

HAVE YOU STUDIED SPANISH BEFORE? YES ____ NO ____

IF SO, WHERE?_____

WHEN? _____

FOR HOW LONG?_____

HAVE YOU STUDIED ANY OTHER LANGUAGES? YES ___ NO___

IF SO, WHICH ONES? _____

WHERE? _____

WHEN? _____

FOR HOW LONG? _____

**** CONTINUE ON BACK ****

DO YOU HAVE ANY SPEECH PROBLEMS? IF SO, PLEASE EXPLAIN.

_____

READ THE STATEMENTS BELOW AND INDICATE BY NUMBER WHETHER YOU:

1 = strongly agree
2 = agree
3 = neither agree nor disagree
4 = disagree
5 = strongly disagree

___I do not like hearing myself speak Spanish with an American accent.
___I intend to study abroad in a Spanish speaking country.
___For me pronunciation is an important aspect of language learning.
___I want to sound like a native speaker.
___Speaking Spanish with a foreign accent is not desirable to me.
___Practicing correct pronunciation is an important activity.
___I am genuinely interested in studying a foreign language.
___I want to be taught proper pronunciation.

APPENDIX B

Pre-test

DIRECTIONS: Please record yourself reading the following list of words. Say each word **3 times**. Please speak directly into the microphone in a clear voice. Each time you finish a word place a check to the left of that word on the list to help you keep your place.

___ salsa
___ el
___ papel
___ mal
___ fácil
___ alto
___ la
___ lunes
___ hola
___ libro
___ luego
___ los
___ problema
___ playa
___ inglés
___ biblioteca
___ clase
___ habla
___ caro
___ pero
___ eres
___ número
___ ahora
___ para
___ profesor
___ tres
___ gracias
___ cuatro
___ nosotros
___ triste
___ perdón
___ escribir
___ señor
___ por

___ viernes
___ hermano
___ perro
___ carro
___ pizarra
___ barrio
___ aburrido
___ borrador
___ repetir
___ reloj
___ rápido
___ rico
___ romántico
___ responsable

APPENDIX C

Posttest

DIRECTIONS: Please record yourself reading the following list of words. Say each word 3 times. Please speak directly into the microphone in a clear voice. Each time you finish a word place a check to the left of that word on the list to help you keep your place.

___ español
___ fácil
___ dulce
___ delgado
___ festival
___ último
___ lo
___ hola
___ bailo
___ loco
___ Colombia
___ molida
___ inglés
___ playa
___ terrible
___ blanco
___ iglesia
___ plátano
___ hora
___ para
___ barato
___ verano
___ pura
___ cereza
___ profesor
___ tres
___ pobre
___ negro
___ entrada
___ agrio
___ tener
___ ir
___ parque
___ enfermo

___ peor
___ cerdo
___ carro
___ aburrido
___ pizarra
___ guitarra
___ error
___ agarra
___ rico
___ rápido
___ ropa
___ reloj
___ rodilla
___ reto

APPENDIX D

Practice exercises

Group: B
Learning problem: new sound
Treatment: extensive articulatory practice

DAY 2: Intervocalic Trill (written between vowels as 'rr')

Articulatory position for the 'trill':

1. To roll your 'r' produce fast multiple taps.
2. The tip of the tongue rises to the alveolar ridge exactly as for the tap.
3. If seen from above, the tongue would look concave with the tip of the tongue on the ridge and the rest of the tongue down.
4. Bring the tip of the tongue near the alveolar ridge and keeping the tongue very relaxed let it vibrate freely as air passes rapidly from your lungs through your mouth.
5. If the air does not pass through quickly enough to make the tip of your tongue vibrate, you will only hear a tap instead of a trill.

Listen and repeat:

1. pe**rr**o
2. ca**rr**o
3. ba**rr**io
4. bo**rr**ador
5. piza**rr**a
6. aho**rr**a
7. abu**rr**ido
8. pa**rr**a
9. co**rr**o
10. te**rr**ible

DAY 3: Word Initial Trill (written as 'r')

Listen and repeat:

1. **r**ico
2. **r**eloj
3. **r**ápido
4. **r**azón
5. **r**ubio
6. **r**evista
7. **r**efresco

8. **r**eunión
9. **r**adio
10. **r**ojo

APPENDIX E

Practice exercises

Group: C
Learning problem: phonemic status for L1 allophone
Treatment: practicing English/Spanish pairs

Practice with the 'tap'

One difference between English and Spanish is that the letter 'r' in English corresponds to only one sound (i.e., 'red') while in Spanish it corresponds to two different sounds (i.e. pero, perro).

We will practice these **two Spanish 'r' sounds**, known as the **tap** and the **trill**, over the next five lessons. We will start with the tap since it is a sound we have in English. When it occurs in English it is spelled with 't', 'tt', 'd' or 'dd.' If you can pronounce the word 'wa**t**er', then you know how to pronounce a tap.

Over the next three lessons you will practice the tap in all of its environments. The **tap** is pronounced whenever you see **'r' between vowels** ('pe**r**o'), **at the end of a word or syllable** ('i**r**') or in a **consonant cluster** ('**tr**iste').

Day 4: **Intervocalic Tap**	Day 5: **Word/Syllable Final Tap**	Week 2 – Day 1: **Consonant Cluster**
Pa**r**a	Seño**r**	**Gr**acias
Pe**r**o	Docto**r**	**Pr**onto
Ca**r**o	Profeso**r**	A**tr**activo
Ho**r**a	Amo**r**	**C**reativo
Cla**r**o	Come**r**	**Tr**es
Solte**r**o	Meno**r**	**Pr**ograma
Ene**r**o	ta**r** des	**Tr**abajo
Aho**r**a	pe**r** dón	Noso**tr**os
Núme**r**o	ve**r** dad	Siem**pr**e
Co**r**o	fo**r** mal	A**br**il

APPENDIX F

Practice exercises

Group: D
Learning problem: new context for L1 allophone
Treatment: contrasting environments for new sound

Practice with /l/

Day 1

In English we produce **two different sounds** for the orthographic /l/ depending on where 'l' is in a word. For example, notice where your tongue is when you pronounce the following words.

Listen and repeat: **LIKE, LEAF**

Now notice where your tongue is for the next pair of words.

Listen and repeat: **PULL, TOLL**

The **/l/ sound in Spanish** is **ALWAYS pronounced like the /l/ in 'like'** or **'leaf'** regardless of where in a word it appears. The /l/ in 'pull' does not exist in Spanish. In the following English-Spanish word pairs notice the **difference** in pronunciation.

Listen and repeat:

English:	Spanish:
1. bowl	bol
2. call	col
3. tall	tal

The /l/ sound you make in the following English words is **the same sound** you should be making for the following Spanish words.

Listen and repeat:

English:	Spanish:
1. leap	las
2. elegant	elegante
3. loose	los
4. plan	playa

APPENDIX G

Data

Table 7. Descriptive statistics for the tap

		Pre-test			Posttest	
Treatment	Position	M	SD		M	SD
A (n=12)	1	1.40	0.62		1.60	0.73
	2	1.56	0.76		2.10	0.79
	3	1.43	0.70		1.79	0.86
B (n=14)	1	1.57	0.65		1.99	0.82
	2	1.51	0.56		2.10	0.79
	3	1.20	0.25		1.79	0.86
C (n=10)	1	1.20	0.63		1.40	0.71
	2	1.28	0.66		1.38	0.81
	3	1.20	0.63		1.3	0.60
D (n=12)	1	1.25	0.35		1.94	0.95
	2	1.26	0.53		1.74	0.84
	3	1.17	0.48		1.36	0.68

Table 8. Descriptive statistics for the trill

		Pre-test			Posttest	
Treatment	Position	Mean	SD		Mean	SD
A (n=12)	1	1.43	0.66		1.65	0.66
	2	1.25	0.60		1.08	0.24
B (n=14)	1	1.80	0.70		2.35	0.66
	2	1.14	0.31		2.15	0.77
C (n=10)	1	1.23	0.40		2.02	0.81
	2	1.20	0.42		1.70	0.92
D (n=12)	1	1.52	0.70		2.12	0.74
	2	1.22	0.52		1.88	0.87

Table 9. Results of Treatment by Position by Time ANCOVA for Sound 1

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Subjects					
GPA	.495	1	.495	3.329	.075
Motiv	.090	1	.090	.602	.442
Treatment	1.212	3	.404	2.717	.057
Error	6.244	42	.149		
Within Subjects					
Time	.002	1	.002	.011	.918
time * treatment	.257	3	.086	.564	.642
Error(time)	6.392	42	.152		
Pos	3.648	2	1.824	9.770	.000
pos * treatment	.547	6	.091	.489	.815
Error(pos)	15.684	84	.187		
time * pos	.027	2	.014	.083	.920
time * pos * treatment	1.211	6	.202	1.226	.301
Error(time*pos)	13.819	84	.165		

Table 10. Results of Treatment by Position by Time ANCOVA for Sound 2

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Subjects					
GPA	7.944	1	7.944	5.849	.020
Motiv	3.889	1	3.889	2.863	.098
Treatment	7.977	3	2.659	1.958	.135
Error	57.043	42	1.358		
Within Subjects					
Time	.643	1	.643	1.073	.306
time * treatment	5.290	3	1.763	2.944	.044
Error(time)	25.155	42	.599		
Pos	.837	2	.419	2.781	.068
pos * treatment	.537	6	.089	.594	.734
Error(pos)	12.646	84	.151		
time * pos	.087	2	.043	.350	.706
time * pos * treatment	1.154	6	.192	1.550	.172
Error(time*pos)	10.430	84	.124		

Table 11. Results of Treatment by Position by Time ANCOVA for Sound 3

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Subjects					
GPA	5.830	1	5.830	6.992	.011
Motiv	1.639	1	1.639	1.965	.168
Treatment	7.832	3	2.611	3.131	.036
Error	35.021	42	.834		
Within Subjects					
Time	.401	1	.401	.881	.353
time * treatment	4.952	3	1.651	3.623	**.021**
Error(time)	19.137	42	.456		
Pos	.012	1	.012	.098	.756
pos * treatment	.317	3	.106	.843	.478
Error(pos)	5.274	42	.126		
time * pos	.324	1	.324	2.123	.153
time * pos * treatment	1.511	3	.504	3.300	**.029**
Error(time*pos)	6.411	42	.153		

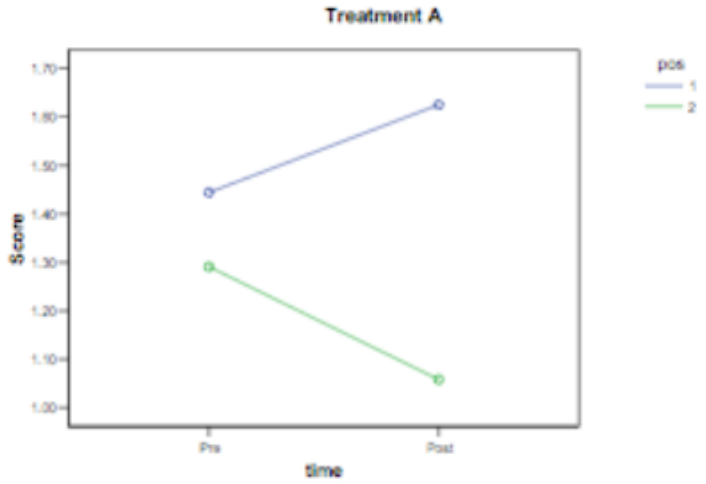

Figure 4. Position by Time Interaction for Sound 3 (Treatment A)

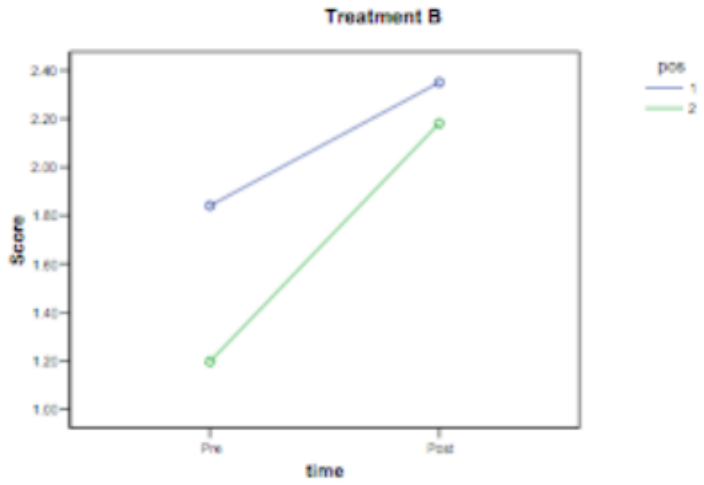

Figure 5. Position by Time Interaction for Sound 3 (Treatment B)

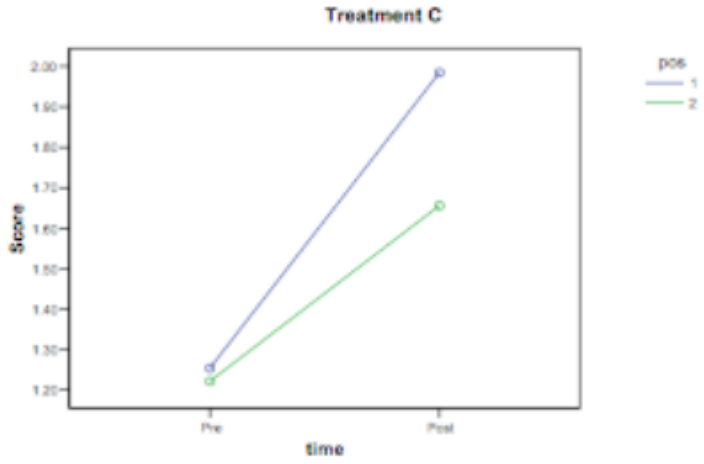

Figure 6. Position by Time Interaction for Sound 3 (Treatment C)

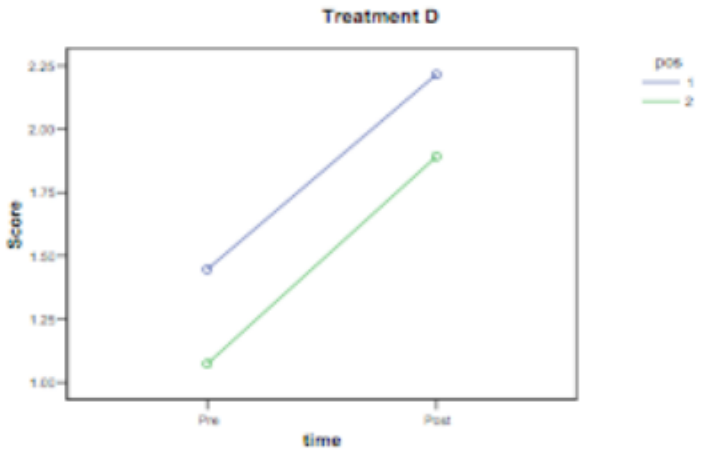

Figure 7. Position by Time Interaction for Sound 3 (Treatment D)

BIBLIOGRAPHY

Arteaga, D. (2000). Articulatory phonetics in the first-year Spanish classroom. *The Modern Language Journal*, 84(3), 339-354.

Elliott, R. A. (1995). Foreign language phonology: Field independence, attitude, and the success of formal instruction in Spanish pronunciation. *The Modern Language Journal,* 79(4), 530-542.

Haldich, R. L. et. al. (1968) *A drillbook of Spanish pronunciation*. New York: Harper & Row.

Purcell, E., & Suter, R. (1980). Predictors of pronunciation accuracy: A reexamination. *Language Learning,* 30(2), 271-287.

Teschner, R. V. (2000). *Camino oral: Fonética, fonología y práctica de los sonidos del español* [The oral path: phonetics, phonology and practice with the Spanish sound system]. Boston: McGraw Hill.

Whitley, M. S. (2002). *Spanish/English contrasts: a course in Spanish linguistics*. Washington D.C.: Georgetown University Press.