The Effect of Pronunciation Instruction on the Perception of /s/ Aspiration

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Abstract

This study examines whether pronunciation instruction can improve listening comprehension in a second language. At the most basic level, listening comprehension involves the perception of individual sounds and sound contrasts, a process that is known to be related to production, or pronunciation, within the L2 phonological system. As improving listening comprehension has been cited as a reason to teach pronunciation in the L2 classroom (Arteaga, 2000; Brown, 1992; Gilbert, 1995), this study tests whether the positive relationship between pronunciation instruction and perception can be born out empirically using the case of /s/ aspiration in Spanish with native English speaking students.

Keywords: pronunciation instruction, perception, listening comprehension, L2 phonological acquisition, aspiration, Spanish

Background

Many reasons are often cited in support of teaching pronunciation in the second language classroom. One suggestion we find is that better pronunciation will improve students' listening comprehension (Arteaga, 2000; Brown, 1992; Gilbert, 1995). The belief is that if students understand the phonological processes that take place in native pronunciation of the target language, they will be able to identify them within native speech, and this will lead to better perception of individual sounds and an overall improvement in listening comprehension. This assumption seems logical, given that we know that the processes of perception and production are related within the phonological system, and current models— such as Flege's (1995) Speech Learning Model (SLM)— suggest that both processes depend on the same phonetic categories. There have, however, been few empirical studies investigating whether teaching pronunciation can in fact improve listening comprehension. Furthermore, many in the field of L2 phonology believe that the development of perception precedes production, meaning that learners must be able to accurately perceive an L2 sound or contrast before they will be able to produce it accurately (Rochet, 1995, p. 395).

It has been well established in the field of L2 phonology that training in perception (Bradlow, Akahane-Yamada, Pisoni & Tohkura, 1999; Hardison, 2005; Lively, Logan & Pisoni, 1993) and production (Elliot, 1995; Lord, 2005; Saito, 2012, Yule & Macdonald, 1995) can improve abilities in each respective process. However, only a handful of studies have examined whether instruction in one process can have a positive effect on the other. In this case, we are interested in examining whether

pronunciation instruction, or training in production, can positively affect listening comprehension, which at its most basic level involves the perception of individual L2 sounds and/or contrasts which may not exist in the learners' L1.

The only current model of L2 phonological acquisition that considers both the processes of perception and production, as well as their relationship with each other, is Flege's (1995) Speech Learning Model. The SLM proposes that learners have phonetic categories at the allophonic level for both L1 and L2. When a learner hears a new sound in the L2, one of two things can happen. If the L2 sound is noticeably dissimilar to any L1 category that already exists, the learner will establish a new L2 category within the phonological system. However, if the L2 sound is similar to an L1 category that already exists, through a process called *equivalence classification*, the learner will assume that the L2 sound he heard pertains to the L1 category (Flege, 1995). It is through experience that a learner may eventually begin to distinguish between the L1 and L2 sounds that have been classified as being the same L1 sound, and with enough experience, a new L2 category may be established.

One of the hypotheses of the SLM reflects what has long been the consensus in the field: that perception precedes production in L2 phonological acquisition. In other words, productive accuracy is limited by the accuracy of perceptual categories as it relies on these categories for articulatory instructions. Given this relationship one might argue that perception training has the potential for increasing production because it would improve the perceptual categories on which production depends. Our interest in this study is the reverse: training in production to increase perceptual abilities. In order for improved listening comprehension to be a theoretically possible result of pronunciation instruction, there must be a positive correlation between the two processes within the L2 phonological system. There is little debate in the field about whether or not a positive relationship exists between the processes of perception and production. Many studies have shown positive correlations of varying strengths (Akahane-Yamada, Tohkura, Bradlow & Pisoni, 1996; Flege, 1995; Flege, Bohn & Jang, 1997; Flege, MacKay & Meador, 1999; Hattori & Iverson, 2010) and others have argued that a deep relationship exists between two processes (Kusmoto, 2012; Listerri, 1995; Peperkamp & Bouchon, 2011). As correlations do not indicate causality, the agreement that a correlation exists between perception and production leaves room for the possibility that the improvement in either process can improve the other.

Some studies have shown improvement in students' L2 perception and listening comprehension after pronunciation instruction or phonetics training (Aliaga-García & Mora, 2008; Aminaei & Jahandar, 2015; Ghorbani, Neissari & Kargozari, 2016; Khanghaninejad & Maleki, 2015; Rasmussen & Zampini, 2010). However, the instruction given to the students included either listening comprehension activities or perceptual training which highlighted the sound contrasts being taught. It is difficult to draw clear conclusions on the effect of pronunciation instruction in these studies as listening and perceptual activities can clearly positively affect listening comprehension.

A few studies, however, have better isolated the effects of pronunciation instruction on listening comprehension. Catford and Pisoni (1970) compared articulatory training to auditory training with regard to native English speakers' abilities to produce and perceive "exotic sounds" from languages to which they had not been

exposed. Participants in the articulatory group received only instructions on the articulatory postures required to produce the sounds. They outperformed the auditory group, which only heard the exotic sounds as compared with familiar sounds, in both production and perception tasks. There was a statistically significant difference in the perception of exotic vowels, but the difference in exotic consonants was not significant. Ahangari, Rahabar and Maleki (2015) used listen-and-repeat activities in the instruction of English pronunciation to Iranian learners and found that after two months of regular pronunciation instruction, listening comprehension increased significantly as compared to the control group.

While Catford and Pisoni (1970) were able to completely avoid influencing the perception of participants in the articulatory group, it is very difficult to avoid providing some type of perceptual information to learners in a language class setting because listen-and-repeat type activities allow students to hear the L2 sounds that are being modeled. Although students may gain some amount of perceptual information from hearing L2 sounds, it is important to avoid explicit contrastive perception training which compares two sounds and raises awareness of the contrasts being tested. As we have seen previously, training in perception has been shown to improve perceptual abilities and this type of training would therefore compromise the results if we are seeking to test the effect of pronunciation instruction on learners' perceptual abilities.

With regards to how pronunciation can be taught without offering contrastive analysis or additional listening comprehension activities, a study by Yule and MacDonald (1995) offers us a comparison of three methods. Two experimental groups participated in listen-and-repeat activities, one in a classroom setting and the other in a laboratory setting. The participants in the classroom setting received feedback from the instructor during instruction, while the participants in the laboratory setting completed the activities on their own. A third group received no instruction but was asked the question "what?" by the instructor during a presentation in order to elicit clearer pronunciation. Surprisingly, the group that showed the most improvement and best maintained that improvement over time was the laboratory group.

Based on these previous studies, we can conclude that there has been some success in improving students listening comprehension after articulatory and auditory pronunciation instruction, but that other types of activities that focus on perception rather than production may have an unintended positive effect on the results. Two aims of the current study are to control for the positive effect that contrastive perception training can have on listening comprehension and to compare the effects of two methods of teaching pronunciation.

Aspiration of /s/

In our study we have chosen to focus solely on the case of /s/ aspiration in Spanish because at the beginner-level, it is likely that many students have not been exposed to it. This can be a particularly difficult sound to perceive for native English speakers as it does not have strong articulatory features and it occurs in different positions in Spanish and English. Schmidt (2011) tested the perception of /s/ aspiration by providing several options of words for participants to choose from while listening to recordings and the findings suggested that while beginners had great

difficulties in perception, such abilities became more native-like at very advanced levels or after exposure through study abroad. George (2014) also tested the perception of /s/ aspiration and found that native English-speaking learners of Spanish at all levels exhibited perception difficulties, especially when asked to write the word that they heard. Rasmussen and Zampini (2010) tested the effect of phonetics training on the perception of /s/ aspiration and found that their results were affected by many external factors, including the types of words that can exhibit /s/ aspiration in native Spanish speech, as well as the location of the aspiration within the word. These studies show that while perceiving /s/ aspiration can be especially difficult for learners at the lower levels, testing the perception of /s/ aspiration can also present challenges to researchers.

The aspiration of /s/ in Spanish occurs in coda position, or after the vowel within a syllable.[1] Therefore, it may occur in word-internal or word-final position. For example, plural articles, adjectives, and nouns in Spanish often end in /s/ or /es/. Testing the perception of /s/ in the word-final position is difficult because listeners can often understand or guess the plural meaning based on context. To avoid context, the perception of /s/ aspiration can be tested in word-internal position when words are pronounced in isolation, but it makes perception much more difficult for native English speakers. The phoneme /h/ does not exist in coda position in English so when a word such as *gasto* [expense] is pronounced with aspiration [ˈgah.to], it contains [h] in coda position. Without context, native English speakers may perceive [ˈga.to], or *gato* [cat], as [h] does not occur in that position in English nor does it have strong articulatory features. While /s/ aspiration may be difficult for native English speakers to perceive and for researchers to test, using near minimal pairs such as *gasto-gato* [expense-cat] and avoiding context allows the best possible chance to test what students do perceive.

Methodology

Research Questions

This study examined two research questions, the first regarding the relationship between pronunciation instruction and listening comprehension and the second regarding the type of pronunciation instruction.

1. Does teaching pronunciation of /s/ aspiration positively affect the perception of the allophone [h] in word-internal position by native English speakers learning Spanish?
2. Will teacher-lead (classroom) instruction or self-guided (laboratory) instruction have a greater effect on the improvement of the perception of [h] produced by /s/ aspiration?

Participants

Participants in this study were 43 students of intensive beginner Spanish courses. Although these students were enrolled at the beginner level, all of them had been exposed to Spanish previously, at community colleges or in high school, and were therefore not true beginners. The participants were split by class section into three groups. The control group consisted of 19 students, the classroom experimental group consisted of nine students, and the laboratory experimental group had a total of 15 students.

Through a questionnaire, background data were gathered about all of the participants. The questionnaire included basic personal information such as age, gender, native language, number of years of second language study, age at beginning of second language study, as well as information about any previous exposure to Spanish through family, travel, or study abroad; and finally motivations for studying Spanish. This background data allowed us to control to the degree possible for previous exposure to /s/ aspiration. Any student who had been exposed to a dialect that exhibits /s/ aspiration, through Spanish-speaking family, travel abroad, or study abroad, was excluded. The data also allowed us to compare the groups to confirm that there was no statistically significant difference on any other important factor that could potentially affect the results.

A one-way ANOVA showed that there was no difference in the mean age of the participants across the three groups, $F(2,40) = 1.379$, p = .263 and a Chi-square test revealed no differences in gender distribution between the groups, $X^2(2, N = 43)$ = .185, p = .912. A one-way ANOVA to compare the beginning age of acquisition of Spanish of the participants also revealed no difference, $F(2,40) = 1.858$, p = .169. Similarly, there was no difference between the total number of years of study of Spanish between the three groups, $F(2,40) = 2.154$, p = .129. Since this intensive beginner course counts towards the language requirement within the institution, motivational factors were also compared across the groups. The questionnaire included twelve motivational factors, or potential reasons for taking the course, including options such as a program requirement or having Spanish-speaking friends. A Chi-square test showed that although there were a few students in two of the sections who were not taking the course to fulfill the language requirement, there was no difference in motivational factors selected between the groups, $X^2(2, N = 43) = 3.325$, p = .190. Finally, in a comparison of pretest scores, a one-way ANOVA confirmed that there was no difference between the pretest scores of all three groups, $F(2,40) = .331$, p = .720. Given all of these factors, we can conclude that all groups had similar makeups and perceptual abilities at the beginning of the study.

Materials Design

The materials in this study included recordings and an answer sheet used in the perception tests, as well as a PowerPoint presentation used in the instructional sessions. During the perception test, which lasted approximately 10 minutes, students listened to the recordings of 40 pairs of words and they were asked to indicate on an answer sheet whether the words were the same or different by circling one of the two options. The recordings were played for all participants in each group at the same time and the same recordings were used in the pretest, immediate posttest, and posttest, but items were played in a random order for each test.

Given the complexity of the phonological process of /s/ aspiration, we tried to eliminate the two issues that offer perceptual clues: context and word-final position of /s/. In order to accomplish this, each item contained only a pair of words generated from a list of near minimal pairs. Unlike minimal pairs, a near minimal pair contains one word that has one more segment than the other which distinguishes the two words. An example is the previously discussed pair *gasto-gato* [expense-cat], where the presence, absence or aspiration of the coda position /s/ is what distin-

guishes the meaning of the two words. Every near minimal pair that was chosen contained an /s/ in word-internal coda position (see Appendix A for a complete list of near minimal pairs). As we have seen previously, /s/ in this position may undergo aspiration in some dialects, and this is the same position in which it is difficult for a native speaker of English to perceive the pronunciation of [h]. With aspiration the minimal pair *gasto-gato* [expense-cat] is pronounced ['gah.t̪o]-['ga.t̪o]. However, without explicit instruction on this process, a native English speaker learning Spanish may not perceive this near minimal pair as being different, as both words may be perceived as *gato* [cat]. It should be noted that in some dialects /s/ may be deleted in this position, but all near minimal pairs with /s/ aspiration contained one token with the allophone [h].

While some of the items were near minimal pairs with /s/ aspiration, other types of pairs were generated as distractors and as controls. A second type of pair contained the same word with [s], for example *gasto-gasto* [expense-expense] pronounced ['gas.t̪o]-['gas.t̪o]. A third type contained a near minimal pair with the pronunciation of [s] such as gasto-gato [expense-cat] pronounced ['gas.t̪o]-['ga.t̪o]. The final type was a distractor pair which contained any two tokens within the list of near minimal pairs such as *gato-mosca* [cat-fly] pronounced ['ga.t̪o]-['mos.ka]. Table 1 includes examples of each type of item used in the perception tests. Ten pairs of each type were included in the perception tests for a total of 40 items.

Table 1

Examples of Items Used in Perception Tests and Correct Answers

Item Type	Example	Correct Answer
Same Words	['gas.t̪o]-['gas.t̪o]	same
Different Words	['ga.t̪o]-['mos.ka]	different
Near Minimal Pairs [s]	['gas.t̪o]-['ga.t̪o]	different
Near Minimal Pairs [h]	['gah.t̪o]-['ga.t̪o]	different

Instructional materials for both experimental groups consisted of a PowerPoint presentation which was designed to guide a 15-minute lesson with activities on /s/ aspiration. The lesson began with slides explaining which dialects of Spanish include aspiration, how the phonological process of aspiration works, and where aspiration typically occurs within a word. This explanation included interactive questions to check for students' comprehension of the key concepts. The animation feature was utilized to allow for immediate feedback to students about their own comprehension by revealing the answers directly after the questions. Following the explanation of /s/ aspiration, the presentation guided students through a pronunciation activity to practice pronouncing words with aspiration in word-internal, coda position. Recordings of words with aspiration were linked to the presentation and after listening to the recordings, students were asked to repeat the words aloud. As the goal of instruction was to avoid contrastive perception training, the pronunciation activity was a listen-and-repeat type of activity but it did not contrast near minimal pairs nor did it provide further input in the form of additional listening activities.

Tasks and Procedures

This study took place over a five-week period in which the researcher conducted sessions once every other week during each participant group's regularly scheduled class time. In the case of both experimental groups, the researcher was also the students' regular instructor. During week one, all groups were asked to fill out the background questionnaire and then they completed the pretest. During week three the experimental groups participated in an instructional session. The classroom experimental group progressed through the lesson detailed above with the help and explanations of the instructor. Students in this group were allowed to ask questions during the lesson and the instructor was able to monitor their comprehension and pronunciation. The laboratory group attended the instructional session in a computer lab. All students were able to progress through the same lesson at their own pace and they used headphones to complete the listen-and-repeat pronunciation activity. Due to the fact that the laboratory group's lesson was modeled on a traditional language lab activity, the instructor did not answer questions or monitor students' comprehension or pronunciation. Directly following the instructional sessions of both experimental groups, students took an immediate posttest. In the final week of the study, all groups completed a posttest.

Results

The average overall pretest score for all three groups was 80.9%. As reported in the section on participants, a one-way ANOVA revealed no statistically significant difference between the pretest scores of all three groups, $F(2,40) = .33$, p = .720. Participants in all groups had high rates of accuracy with near minimal pairs with [s] and when both words were the same or completely different; however, the average score on near minimal pairs with [h] was only 30.7% for all groups. Given the difficulty that native English speakers have in perceiving /s/ aspiration, the low scores on the near minimal pairs with [h] were expected prior to instruction.

When we compare the scores of the two experimental groups on the pretest and the immediate posttest, paired-sample t-tests revealed a statistically significant difference between the two tests for the classroom group, $t(8) = 3.29$, $p = .011$, and for the laboratory group, $t(14) = 3.09$, $p = .008$. These results indicate that there was a change in overall perception test scores directly after instruction, but examination of the values reveals that accuracy scores in both groups declined after instruction. Table 2 shows the overall scores and scores on individual sets of items on the pretest and immediate posttest for both experimental groups.

Table 2

Pretest and Immediate Posttest Scores for Experimental Groups

	Classroom Group				**Laboratory Group**			
	Pretest		Im-Posttest		Pretest		Im-Posttest	
	M	SD	M	SD	M	SD	M	SD
Overall	80.83	4.84	65.56	15.30	87.17	5.58	69.83	14.71
Same Words	97.78	6.67	98.89	3.33	94.00	11.83	98.67	3.52

Different Words	100.0	0.00	98.89	3.33	100.0	0.00	100.0	0.00
Near Min. Pairs [s]	100.0	0.00	45.56	46.40	98.67	5.16	57.33	45.27
Near Min. Pairs [h]	25.56	21.28	18.89	18.33	32.00	20.77	23.33	23.50

Note. Mean scores presented in percentages.

Paired-sample t-tests were conducted to see if either of the experimental groups experienced improvement on specific item types between the pretest and the immediate posttest. Table 3 shows the results for the classroom group and Table 4 shows the results for the laboratory group. No significant difference was found in the scores for minimal pairs with [h] for the classroom group, $t(8) = 1.16$, p = .282, or the laboratory group, $t(14) = 1.44$, p = .171, which indicates that the posttest changes were not due to change in the scores for near minimal pairs with aspiration. Similar tests were conducted for the other types of pairs, revealing no significant differences for items with pairs of the same word or with pairs containing two different words. In items containing near minimal pairs with [s], a significant difference was found for both the classroom group, $t(8) = 3.52$, $p = .008$, and the laboratory group, $t(14) = 3.46$, $p = .004$. Therefore, the participants' performance on these items seems to account for the decline in overall scores for both experimental groups.

Table 3

Paired Sample T-Tests on Pretest and Immediate Posttest for Classroom Group

	M	*SD*	*t*	*df*	*p*
Overall	15.28	13.94	3.29	8	**.011**
Same Words	6.67	17.32	-0.43	8	.282
Different Words	1.11	3.33	1.00	8	.347
Near Min. Pairs [s]	54.44	46.40	3.52	8	**.008**
Near Min. Pairs [h]	6.67	17.32	1.16	8	.282

Note. Mean represents mean change (pretest score-immediate posttest score). Statistically significant differences of p < .05 appear in bold.

Table 4

Paired Sample T-Tests on Pretest and Immediate Posttest for Laboratory Group

	M	*SD*	*t*	*df*	*p*
Overall	11.33	14.20	3.09	14	**.008**
Same Words	-4.67	11.87	-1.52	14	.150
Different Words	n/a, scores equal on pretest and immediate posttest				
Near Min. Pairs [s]	41.33	46.27	3.46	14	**.004**
Near Min. Pairs [h]	8.67	23.26	1.44	14	.171

Note. Mean represents mean change (pretest score-immediate posttest score). Statistically significant differences of p < .05 appear in bold.

A closer examination of the posttest scores reveals some interesting findings. When comparing the overall posttest scores for the classroom group (M = 68.06, SD = 11.91) to the immediate posttest scores, a paired sample t-test did not reveal statistically significant difference, $t(8)$ = -.85, p = .421. Similarly, no significant difference was revealed for the laboratory group when comparing the posttest scores (M = 73.00, SD = 14.05) to the immediate posttest scores, $t(15)$ = -1.57, p = .139. We can therefore conclude that changes to participants' phonological systems were maintained two weeks after instruction. When examining overall scores for control group we find a statistically significant difference, $t(18)$ = -2.51, p = .022 between the the posttest score (M = 82.89, SD = 4.19) and pretest score (M = 80.79, SD = 46.44), although the changes is very slight.

Discussion

Consideration of the Findings

The results of the study did not reveal improvement in the perception of /s/ aspiration for either of the experimental groups, and therefore do not allow us to answer the second research question, which asked if a particular instructional style would lead to more improvement in students' perception. We can, however, draw some conclusions regarding the first research question, which considered whether pronunciation instruction could improve the perception of /s/ aspiration in Spanish by native English speaking participants. While there was a statistically significant difference in the pretest and immediate posttest scores for both experimental groups, the scores revealed a decline in accuracy even though the scores on minimal pairs with [h] such as *gasto-gato* [expense-cat] pronounced ['gah.t̪o]-['ga.t̪o] remained unchanged after instruction.

As noted earlier, aspiration has proven to be difficult to perceive by native English speakers (George, 2014; Rasmussen & Zampini, 2010; Schmidt, 2011). The aspiration of /s/ produces an allophone [h] which is very similar to the faithful allophone of the phoneme /h/ in English. The SLM predicts that L2 sounds that are similar to L1 sounds are more difficult to differentiate due to equivalence classification and therefore similar sounds require more input to differentiate them from already established L1 categories (Flege 1995). The finding that perception in minimal pairs with [h] did not improve suggests to us that perhaps more input was needed for participants to establish a new L2 category [h], which would allow them to perceive the sound in word-internal position.

Of the four item types included in the perception tests, the only statistically significant difference that was found after instruction was for items containing near minimal pairs with [s], such as *gasto-gato* [expense-cat] pronounced ['gas.t̪o]-['ga.t̪o], which declined after instruction (see Tables 2-4). Had instruction positively affected the perception of /s/ aspiration, we would have expected the accurate perception of minimal pairs with [s] to stay the same after instruction, while expecting the inaccurate perception of minimal pairs with [h] to to improve after instruction. On the immediate posttest, participants in the experimental groups began to mark pairs such as *gasto-gato* [expense-cat] pronounced ['gas.t̪o]-['ga.t̪o] as being the same rather than different, which contributed to an overall decline in their scores after

instruction. [2] It seems that the awareness of /s/ aspiration and the position in which it can occur that was gained through pronunciation instruction led students to assume that the second token in minimal pairs with [s] actually contained aspiration, such as [ˈgas.to]-[ˈgah.to] meaning *gasto-gasto* [expense-expense]. Their awareness of this process may have allowed them to come to the conclusion that this type of pair included the same word pronounced two ways: without /s/ aspiration and with /s/ aspiration. This finding demonstrates that even though participants' perception of pairs with aspiration did not show improvement, they developed an understanding of the process and were able to generalize it to positions in which it could actually occur.

It is interesting to note that although production was not explicitly tested in this study, participants in the classroom group were observed accurately pronouncing the aspiration of /s/ during instruction. As the laboratory group worked independently, the researcher was not able to observe the participants' production collectively. This observation cannot be explained by the SLM as it assumes that productive accuracy cannot exceed perceptual accuracy, but it does seem to mimic the findings of a handful of other studies which have found that learners are more accurate in their production than their perception of particular sound contrasts (Gass, 1984; Goto, 1971; Kluge, Rauber, Reis & Hoffman, 2007; Sheldon & Strange, 1982; Tsukada et al., 2005; Zampini, 1998).

Unlike with the experimental groups, our examination of the control group revealed a very slight improvement in the overall posttest scores. This improvement may reflect an increased familiarity with the testing procedure. The pauses between items were designed to be short in order to foster quick decisions rather than analysis. Due to the relatively rapid succession of items, participants had to adjust to recording their decisions quickly on the pretest. When it came time for the posttest, participants' previous experience likely allowed them to be more prepared to answer quickly on the first few items.

Based solely on the results of this study, we are unable to support the hypothesis that pronunciation instruction has a positive effect on discriminatory listening comprehension, at least in the case of /s/ aspiration. The results do suggest, however, that learning about a phonological process can occur and can even be applied to environments within a word where it naturally occurs in native speech.

Limitations and Future Studies

One limitation of the study seems to be that more instructional time was needed in order to provide a sufficient amount of input. This is an obviously tricky obstacle as certain types of input would be categorized as contrastive perceptual training, which would compromise the methodological design of the study. The number of activities that a researcher has to choose from that both provide input and avoid explicit perception training is relatively limited, as is the potential attention span of students asked to participate in a lesson consisting only of listen-and-repeat activities. Increasing instructional time by providing more sessions over several classes could help to resolve this problem.

In addition to the need for more input, some improvements could have been made to the materials. An examination of the recordings made for the perception

tests revealed that some pairs of words exhibited different intonations, which could offer clues to students that particular pairs of words were different. One of the near minimal pairs with [h] also included additional noise in the first word of the pair which led some participants to mark the pair as being different in the pretest, even though they likely would have marked the pair as being the same given that their perceptual accuracy of /s/ aspiration was low for all other similar items. Rather than recording each pair of words separately, recording only one token of each word and splicing the recordings together to create the pairs would have avoided the potential effect of intonational information on the students' perception.

Very few studies to date have investigated the isolated effect of pronunciation instruction on learners' listening comprehension, while limiting the effects of contrastive perception training. Clearly, our understanding of the effect of instruction on learners' developing L2 phonological systems would benefit from further study. It seems that some sound contrasts, like /s/ aspiration for native speakers of English, may be harder to affect through pronunciation instruction than others. Previous studies have focused on the effects of broader instruction on overall listening comprehension, while this study focused on the perception of a single L2 contrast. It would be beneficial to combine these methodologies in order to compare overall listening comprehension to the perception of particular L2 contrasts that were taught. A combined methodology will help us gain insight into which types of L2 sound contrasts are most positively affected by pronunciation instruction and which contrasts are the most important to teach in order to improve students' listening comprehension.

Implications for Teaching Pronunciation

There are some obvious benefits of teaching pronunciation in the beginner language classroom (Arteaga, 2000). As observed incidentally within this study, participants in the classroom group were readily able to produce /s/ aspiration. While retention of pronunciation was not tested, this observation indicates it is possible that teaching pronunciation for the sake of more native-like pronunciation may be successful within a short instructional session. A review of studies on the perception of non-native Spanish by native speakers found that pronunciation plays a major role in learners' intelligibility (Agostinelli, 2012) as it can cause more comprehension difficulties on the part of native-speakers than grammatical errors (Gynan, 1985), and at the beginner-level, students make more pronunciation errors than other types of errors (Galloway, 1980). As one overarching goal of L2 instruction is to prepare learners to interact with native speakers outside the classroom, we can conclude that devoting time to pronunciation instruction is indeed worthwhile, as it has the potential to increase learners' intelligibility.

While we are not necessarily advocating teaching the process of /s/ aspiration with the intention of having students regularly reproduce it within their own speech, a major benefit to students is that it raises dialectal awareness. Such awareness can aid in successful communication outside of the classroom. Knowing that a process, such as aspiration, exists and how it affects the pronunciation of a word can allow a student to be aware of these differences when interacting with native speakers. Schmidt (2009) found that dialect familiarity gained through a three-week study

abroad trip significantly improved students' listening comprehension of that dialect. Students' generalization of the aspiration to minimal pairs containing [s] on the perception tests clearly indicate the development of an awareness of /s/ aspiration after one relatively short instructional period, which suggests that we may be able to offer the same type of benefit through pronunciation instruction.

Conclusion

Studies such as this one highlight the need for sound empirical research to guide teaching methodologies used in the L2 classroom. While this study showed that pronunciation instruction can help learners develop an awareness of a /s/ aspiration, it may be too early to conclude that articulatory pronunciation instruction always offers significant benefits to discriminatory listening comprehension. This should not, however, detract from the many ways in which pronunciation instruction has been shown to benefit learners, such as improving their intelligibility and raising their awareness of dialectal variation. Further study will help us to better understand the complex effects that pronunciation instruction has on the L2 phonological system and may reveal additional ways in which we can enhance its benefits for learners.

Endnotes

[1] It is worth noting that in some dialects there is free variation between deletion and aspiration of /s/. As this variability was not introduced to participants through instruction, such variability did not play a role in the methodological design of the study.

[2] For items such as ['gas.t̪o]-['ga.t̪o], a native speaker could possibly identify these as being two pronunciations of the same word given the free variation of deletion and aspiration of /s/ that exists in some dialects.

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Appendix A

Near Minimal Pairs

Spanish Pair	Phonetic Transcription	English Translation
basta-bata	['bas.t̪a]/['bah.t̪a]-['ba.t̪a]	that's enough!-coat/gown
gasto-gato	['gas.t̪o]/['gah.t̪o]-['ga.t̪o]	expense-cat
hasta-ata	['as.t̪a]/['ah.t̪a]-['a.t̪a]	until-he/she/you (formal) ties
mismo-mimo	['mis.mo]/['mih.mo]-['mi.mo]	same-mime
mosca-moca	['mos.ka]/['moh.ka]-['mo.ka]	fly-mocha
muslo-mulo	['mus.lo]/['muh.lo]-['mu.lo]	thigh-mule
pisco-pico	['pis.ko]/['pih.ko]-['pi.ko]	grape liquor-beak
pista-pita	['pis.t̪a]/['pih.t̪a]-['pi.t̪a]	clue-agave
resto-reto	['res.t̪o]/['reh.to]-['re.t̪o]	remainder-challenge
risco-rico	['ris.ko]/['rih.ko]-['ri.ko]	cliff-rich