Raising awareness of L2 phonology: explicit instruction and the acquisition of aspirated /p/ by Brazilian Portuguese speakers

Tomada de consciência da fonologia em L2: instrução explícita e a aquisição do aspirado /p/ por falantes de português brasileiro

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Abstract: Currently, there has been a large number of studies involving pronunciation and pronunciation teaching. However, the role of explicit instruction has received very little attention in this field. This research study aims to investigate the effects of explicit instruction on the production of the voiceless plosive /p/ in word-initial position in English. We have carried out quantitative analyses involving 12 Brazilian native speakers who have been studying English as a second language. Participants were divided in 2 groups: (a) an Experimental Group, which received contextualized pronunciation classes on aspiration; and (b) a Control Group, which did not receive any kind of instruction. Prior to classes, participants took a production test both in English and in Portuguese, which allowed us to measure their Voice Onset Time (VOT) values in milliseconds (ms). Following the instruction classes, participants took the same test again, so that their progress could be assessed. The tests consisted of a list of words with word-initial /p/ as well as distracters. Our data show that explicit instruction contributed to an increase in the averages of VOT produced by the participants in the Experimental Group. On the other hand, the Control Group did not produce the aspirated /p/ in a target-like manner. Overall, explicit instruction with contextualization has proved to have a positive effect on the acquisition of aspirated /p/ by Brazilian speakers.

Keywords: Aspiration; Explicit instruction; Pronunciation teaching; Voiceless bilabial plosive

Resumo: No contexto atual de pesquisas sobre aquisição do inglês (L2) por brasileiros, encontramos um grande número de investigações acerca do aspecto fonético-fonológico. Entretanto, a questão do papel da instrução explícita tem recebido pouca atenção nos estudos da área. A partir desse quadro, o presente trabalho visa a investigar os efeitos da instrução explícita acerca da produção da plosiva surda /p/, em posição inicial de palavra no inglês. Participaram do estudo doze aprendizes brasileiros de inglês, que foram divididos em dois grupos: (a) um Grupo Experimental, que recebeu aulas de pronúncia de caráter contextualizado acerca do fenômeno de aspiração; e (b) um Grupo de Controle, que não recebeu nenhuma forma de instrução. Anteriormente à etapa instrucional, os participantes de ambos os grupos realizaram testes de produção em português e em inglês, a partir dos quais foram coletados dados para que fossem verificados os índices de Voice Onset Time (VOT) das plosivas produzidas por estes aprendizes. Os testes consistiam em listas de palavras iniciadas por /p/, além de palavras distratoras. Após a instrução, os participantes realizaram novamente o teste em língua inglesa, de modo que seu progresso pudesse ser analisado. Os dados mostram que a instrução explícita contribuiu para um aumento nas médias de VOT das plosivas produzidas pelos aprendizes pertencentes ao Grupo Experimental. Por sua vez, o Grupo de Controle não produziu a plosiva labial com aspiração. Verificamos, assim, que a instrução explícita contextualizada exerce efeitos positivos na aquisição, por parte de aprendizes brasileiros, da aspiração da plosiva /p/ em posição inicial de palavra.

Palavras-chave: Aspiração; Instrução explícita; Ensino de pronúncia; Plosiva bilabial desvozeada

Introduction

Pronunciation corresponds to one of the key elements that influence the mastery of a language. On the one hand, there are sounds commonly produced both in the L1 and in the L2, such as word-initial /f/ (occurring both in English and in Brazilian Portuguese), which do not represent major difficulties for Brazilian learners of English as a second language[1]. On the other hand, a sound can occur in the L2 but not in the L1. This fact leads to pronunciation difficulties for L2 learners. A good example is the interdental fricative /θ/ in English, which does not have any equivalent in the Brazilian Portuguese phonological system. As a result, this segment is produced as either [f], [t] or [s] by Brazilian learners of English. Moreover, the great majority of English as a foreign language classes are focused only on the four broader skills of reading, writing, listening and speaking. Pronunciation, which plays a significant role in intelligibility, is therefore generally forgotten. This may happen because teachers might think pronunciation teaching is time-consuming (specially for class preparation), as it demands a great command of the sounds as well as the terminology used for this kind of teaching, besides the fact that pronunciation also takes time to be taught and learned. When it is taught, pronunciation usually corresponds to a part of the lesson which is detached from the rest of the English class, being completely isolated and decontextualized. In this sense, Barreto and Alves (2009) claim that pronunciation should be seen as a means through which students will be able to improve the expression of their communicative content, and not as a mere repetition of sounds. The authors also state that the same procedures adopted to approach the four essential skills in a foreign communicative language class should be taken into consideration when dealing with pronunciation.

This research study investigates the role of explicit instruction on the acquisition of the aspirated voiceless bilabial plosive[2] /p/. The decision to investigate the bilabial plosive /p/ in this research study is based on the fact that most Brazilian Portuguese learners of English do not aspirate it in word-initial position. Consequently, the use of their L1 phonological system is employed to produce this segment, as language transfer takes place (ZIMMER et al., 2009). Yavas and Wildermuth (2006, p. 251) define the phenomenon of aspiration as "a period between a plosive release and the start of the following voiced segment, whereby the voicing of the second segment is delayed for a period of 30 milliseconds or more". The aspiration of initial voiceless stops /p/, /t/, and /k/ can be located in word-initial or syllable-initial position, provided that the syllable initiated by the word-mid plosive is stressed and the voiceless consonant is followed by a vowel (ZIMMER et al., 2009). This length of time in milliseconds, between the release of a stop and the beginning of vocal fold vibration, is known as Voice Onset Time (VOT). In other words, the term VOT refers to the period of voicelessness which follows the plosive and characterizes the audible sensation of aspiration (REIS et al., 2007). Aspirated /p, t, k/ have long VOT values in English, corresponding to an average of 55 ms, 70 ms, and 80 ms, respectively (KENT and READ, 1992; TORIBIO et al., 2005). On the other hand, Brazilian Portuguese speakers do not aspirate plosive segments; thus, their VOT values are never long. Klein (1999) points out the typical VOT values for Brazilian Portuguese: 12 ms for /p/, 18 ms for /t/, and 38 ms for /k/.

Acquiring aspiration, therefore, means acquiring new VOT patterns. According to Reis et al. (2007, p. 1), this length of time is "decisive for accurate perception of the voiceless and voiced stops /p, t, k/ and /b, d, g/, respectively, which characterize the aspirated and unaspirated distinction". Lisker and Abramson (1964) describe three major VOT phonation types in the literature: (1) negative VOT, in which the beginning of the vocal fold vibration precedes the release of the plosive (time ranges from -125 ms to -75 ms); (2) zero VOT, in which the beginning of vocal fold vibration is simultaneous with the plosive release (time ranges from 0 to +35 ms); and (3) positive VOT, in which the plosive is released and there is a delay in the beginning of vocal fold vibration (time ranges from +35 ms to +100 ms). English and Brazilian Portuguese, therefore, have different Voice Onset Time patterns. When attempting to produce /p/, /t/, and /k/, native Brazilian Portuguese speakers tend to produce them with zero VOT, whereas Native English speakers tend to produce a positive VOT value, which is longer (REIS et al., 2007).

Aspiration is an important part of the processes of perception and production of the differences between voiceless and voiced sounds among native speakers of English. Most Brazilian learners of English, whether beginners or more advanced, do not produce aspiration when they pronounce word-initial bilabial plosives (ZIMMER, 2004; ZIMMER et al., 2009). For that matter,

[1] In this paper, we do not distinguish between the terms 'second language' (L2) and 'foreign language' (FL). According to R. Ellis (1994, p. 12), these terms have been used interchangeably in the literature. 'L2' has been considered a neutral term which refers to the two types of learning. Moreover, no distinction between the terms 'learning' and 'acquisition' will be made in this article.

[2] A stop or a plosive consonant involves a complete closure of the articulators and thus total blockage of airflow. Taking the manner of articulation into account, the stops found in English are /p, b, t, d, k, g/. On the other hand, taking the place of articulation into account, a bilabial sound involves the use of the two lips coming together. The initial consonants of the words "pay, bay, and may" exemplify the English bilabials /p, b, m/. (YAVAS, 2006)

we believe that explicit instruction plays a significant role in the acquisition of aspiration. Instruction may help learners notice the pronunciation differences between aspirated /p/ in English and unaspirated /p/ in Brazilian Portuguese.

Thus, this research study intends to investigate the effects of explicit instruction on the acquisition of aspiration in word-initial [p^h] in English by Brazilian Portuguese speakers. The main hypothesis guiding this investigation is that contextualized instruction may lead learners to a more effective production of the aspirated bilabial plosive /p/. In the present study, participants were divided in two different groups of students. An Experimental Group received contextualized instruction in a communicative setting. On the other hand, a Control Group did not receive instruction on word-initial /p/. We hypothesized that there would not be significant differences between the two groups both in the English and the Portuguese production pre-tests of the voiceless plosive /p/ in word-initial position, as neither of the groups would produce the voiceless plosive /p/ with aspiration before the provision of explicit instruction. We also hypothesized that, following the instructional period, the Experimental Group would produce the target VOT pattern for /p/ in word-initial position, with learners in this group showing a significant difference between the VOT values obtained from the pre- and the post-test. The Control Group, however, would not produce the voiceless plosive /p/ in a target-like in the post-test. Consequently, there would be a significant difference between both groups in the post-test.

As we believe this research study proves to be relevant to the field of pronunciation teaching, which characterizes an area that has been problematic and forgotten in most English classrooms, the present investigation can contribute to pronunciation instruction and teaching, as well as open new avenues to the development of more research studies in the fields of Second Language Phonological Acquisition and Focus on Form.

Literature review

L2 Acquisition

The way languages are learned has been a quite intriguing matter to this day. There is a wide variety of theories, approaches and studies that shed some light on what is already known by researchers. Some theories will defend a psychological idea of language learning. Other theories will contemplate a more sociological path and discuss the way we master languages. Cognitive theorists are interested in how learners access linguistic knowledge, that is, in the strategies applied to learning.

Cognitivists are divided into two main groups. In Group One, we find theorists such as Pienemann (1998) and Hawkins (2001), who have studied processing theories, i.e., language is considered to be something special, to complement property theories like the Universal Grammar Theory, in which language is seen as a separate module in the mind (MITCHELL and MYLES, 2004, p. 95). The researchers from Group One assert that all the linguistic knowledge we have is somehow particular. Competence, which refers to the speaker's abstract knowledge of language, and performance, which refers to the speaker's actual utterances, are different constructs. As a result, their investigation relies upon how second language learners process linguistic information. The second group of Cognitivists, on the other hand, is composed of researchers such as N. C. Ellis (1998, 2001, 2003), MacWhinney (1999) and Tomasello (2003), who state that not only are processing and property theories completely distinct from one another, but also that no distinction between competence and performance should be made. For them, domain-general cognitive principles can explain the way linguistic knowledge is processed (MITCHELL and MYLES, 2004, p. 95-6). This group includes approaches known as constructivism, emergentism or connectionism.

Emergentists believe that human beings are born without any innate language acquisition mechanisms and language learning takes place through associations. N. C. Ellis (2003) states that Emergentism "emphasizes the linguistic sign as a set of mappings between phonological forms and conceptual meanings or communicative intentions". For emergentist theorists, learning is the analysis of patterns in associations which are made when one is using the language (MITCHELL and MYLES, 2004, p. 98). As learners are more and more exposed to language use, regularities emerge from the input. This allows for comparison and analysis to take place, and more regularities are extracted by the learner. Eventually, these regularities are put into practice.

Zimmer et al. (2009, p. 3) explain that emergentists see the L1 and L2 learning processes under the same cognitive mechanisms, as both forms of learning are seen as "the result of the capacity to observe simultaneously multiple probabilistic constraints, so that aspects which would not be relevant when considered in isolation become relevant when they are processed along with other probabilistic aspects also present in the input". Emergentist researchers believe that the learning process of a second language can be better understood if we firstly understand how the human brain processes and learns new pieces of information. Thus, the learner becomes the focus of all investigations connected to Second Language Learning (SLL). An emergentist approach is interested in how learners access linguistic knowledge, the strategies

students use to learn, and the reasons why there are better language learners than others, that is, why some students are much more successful in mastering a language and others are not. This considered, the present study follows the emergentist approach to language learning.

L2 Phonological Acquisition and Teaching: Raising Awareness of L2 phonology

Acquiring new L2 sounds is a complex process. In this paper, we conceive that the acquisition of a new sound system can be explained under an emergentist approach. However, for acquisition to occur, the L2 aspects must be noticed by learners; this might prove difficult as far as second language phonology is concerned, as the L2 sounds tend not to be easily perceived by learners. In this sense, explicit instruction might be of great use. Silveira (2004) asserts that pronunciation teaching is a means of helping learners to improve the mastery of the target language as well as to improve communication. Teaching students how to pronounce the sounds of another language may contribute to better levels of production and perception of these sounds. According to Zimmer et al. (2009), learners tend to acquire the L2 based on the L1 patterns, as they interpret the L2 sounds as if they were the ones found in their L1. This mere transfer of sound patterns from the L1 to the L2 should be explored by teachers to avoid mispronunciation. In pronunciation instruction settings, according to Silveira (2004, p. 37), the L1 system should always be taken into account, "since it is one of the major sources of difficulty in trying to acquire the L2 phonological system". In order to attenuate the effects caused by the L1 transfer on the acquisition of the L2 phonological system, the author suggests that pronunciation problems, which may appear due to L1-L2 transfer, should be both predicted and identified by the teacher, and that students' awareness should be raised towards the differences between the native as well as the target language phonological systems. Offering learners opportunities to produce and perceive is a relevant goal in the pronunciation teaching field, as Silveira concludes (2004, p. 37). However, a negative point surrounding pronunciation teaching, discussed by Silveira (2004), is the fact that the material concerning this aspect in textbooks is far from being communicative. Whenever taught, pronunciation, in many cases, tends to become a simple repetition of words with similar sounds in a totally mechanical manner.

One of the ways to solve this serious lack of contextualized material and/or meaningful classroom activities in teaching pronunciation could be the proper use of contextualized instruction in phonetic English classes. As a consequence, explicit instruction plays a very important role in teaching pronunciation. Following the definitions presented in Zimmer et al. (2009) and Alves (2009), the term "explicit instruction" should be understood in a broader sense. It includes not only the linguistic explicitation of the target item itself, but also all the pedagogic steps which lead students to better opportunities to use the linguistic aspects that are being explored (ALVES, 2009). Zimmer et al. (2009, p. 15) complement the definition given by Alves saying that "explicit instruction surpasses the teacher's task of formalizing the L2 system, since it also includes the composite of other teaching procedures aiming to highlight, review or draw the students' attention to specific aspects of the target language (…)". These specific aspects mentioned by the authors are the ones that would probably remain unnoticed by the language learner and that might become fossilized. Baptista (1995) points out that explicit instruction avoids fossilization, which occurs due to L1 transfer at the phonological level. Therefore, in this research study, we regard 'explicit instruction' as a term that encompasses all the pedagogic procedures adopted to provide students with more effective learning opportunities in a communicative context.

Drawing students' attention to what may differ from the native to the target language is one of the purposes of adopting explicit instruction in pronunciation classes, since the acquisition of new L2 patterns requires a certain degree of awareness by learners, according to Schmidt (1990). If the learner neither pays attention to the linguistic aspect to be acquired nor shows at least some degree of awareness about it, there will be no acquisition. As claimed by N. Ellis (2005), these linguistic aspects which end up not being processed by the language learner are the ones that are not perceptually salient. In the case of the present study, we may regard these non-salient aspects as those sounds that are perceptually very similar in the L1 and the target language.

The aspiration phenomenon of the plosives /p, t, k/ illustrates what has been said, as aspirated stops are not perceptually salient to learners. Brazilian learners tend not to distinguish the plosive sounds of English from the sounds of their L1 and are not likely to produce the L2 plosives with any degree of aspiration. Studies developed by Zimmer (2004) and Alves (2007) have proved that even Brazilian students at their most advanced levels of L2 proficiency do not aspirate plosive sounds. Explicit instruction, therefore, may be the way to direct students' attention to what would otherwise remain unnoticed.

Implicit and Explicit Forms of L2 knowledge

L1 acquisition is an implicit process, i.e., L1 learners have no conscious intention to find out regularities

and patterns in the language. To a greater extent, L2 acquisition is acquired implicitly, that is, with no formal instruction. This considered, if people acquire both the L1 and the L2 in the same way, what would the role of explicit instruction be? The intriguing solution to this question is not so easily answered; however, the interaction between explicit and implicit knowledge can be one of the answers. This interaction has been discussed under three distinctive perspectives, which give more or less importance to the role of explicit instruction in the classroom. Following N. Ellis (2005), the three perspectives are: the Non-Interface Hypothesis, the Strong Interface Hypothesis, and the Weak Interface Hypothesis.

For the Non-Interface Hypothesis, discussed by authors such as Krashen (1981, 1994) and Schwartz (1993), implicit and explicit knowledge are completely distinct because they handle different acquisition mechanisms. Implicit learning is fundamental to the acquisition process, whereas explicit knowledge does not contribute to the spontaneous use of language. Only what one learns implicitly can be used in spontaneous production. Thus, explicit learning only plays a role when learners monitor their production. On the other hand, the Strong Interface Hypothesis, studied by Sharwood-Smith (1981) and DeKeyser (1997, 1998), claims that explicit knowledge contributes to spontaneous language use, as long as a large number of practice activities are provided. Finally, the Weak Interface Hypothesis, defended by N. Ellis (1994) and R. Ellis (1993, 1994), states that linguistic aspects might end up becoming automatic in non-controlled language situations, i.e., the construction of explicit knowledge may direct students' attention to such linguistic details in the input; these L2 aspects, in turn, may become automatic in the long term. According to this view, explicit knowledge has an indirect contribution, as it allows linguistic aspects to be noticed by students, besides the fact that it can be applied in controlled uses of the language. Explicit knowledge, therefore, allows for noticing, which is a necessary condition for input to become intake, and, consequently, for the acquistion process to take place (SCHMIDT, 1990). The present study conforms to the Weak Interface Hypothesis, as we believe that instruction may help learners to start processing the target L2 items, which might eventually lead learners to a spontaneous use of the target forms, provided that enough exposure and practice of the second language are guaranteed.

The relevance of these three perspectives to phonological acquisition lies in the fact that some phonetic-phonological aspects of the L2 are processed as if they were similar to the L1 sound pattern (FLEGE, 2002, 2003; BEST et al., 2001; BEST and TYLER, 2007). Since some of these aspects are difficult to be perceived, they should be systematized in class both in controlled and in spontaneous language use situations. R. Ellis (2005) concludes that explicit instruction may contribute to linguistic productions regardless of the role played by explicit knowledge in the acquisition of implicit knowledge, that is, regardless of whether explicit knowledge assumes a more or less immediate role in the spontaneous use of a target form. In other words, even if explicit knowledge is not successful enough to allow for the formation of implicit knowledge, it may be considered to be relevant, since it might at least help learners monitor their controlled use of the language. As a result, the need to systematize the linguistic aspect becomes relevant to the learning process.

In Brazil, Silveira (2004), Alves (2004), Nobre-Oliveira (2005), Alves (2007), and Dresch and Alves (2009) carried out studies on explicit pronunciation instruction. All of these studies have highlighted the benefits of explicit instruction in the area of L2 phonological acquisition. As we can see, explicit instruction contributes positively to both the production and perception of L2 sounds. Even though the results of these studies suggest the efficiency of explicit instruction, Silveira (2004, p.36) states that the explicit teaching of pronunciation cannot be expected to generate immediate improvement in learners' performance. It may be true that, if teachers do not continue reinforcing the target phonological aspect in a contextualized way, learners will not incorporate it as something natural to their L2 new phonological system. In other words, Silveira's statement conforms with the Weak Interface Hypothesis. We agree that the construction of explicit knowledge may allow linguistic aspects to be noticed, and, consequently, applied in controlled uses of the language. This may allow linguistic target items to become automatic in non-controlled language situations, in the long term.

Methodology

Participants

In order to conduct this study, learners who had been studying English for more than 2 years, in a private English school in the city of Porto Alegre, were invited to participate. After being told about the importance of their participation in the study, 12 learners took part in the experiment (6 in the Experimental Group and 6 in the Control Group, with a balanced number of male and female learners). Both groups were taught by the second author of this study. Before the pre-tests, all the participants took the *Oxford Placement*

Test[3] (ALLAN, 2004) to check their levels of proficiency. A written informed consent was obtained from all participants prior to the tests.

Production pre- and post-tests

The production test consisted of a list of words, shown on a PowerPoint slide presentation. Learners were asked to read the words aloud. There were two different kinds of production tests. The first test was in Portuguese, aiming to verify the VOT values found in the learners' mother tongue. This test proved necessary as there are very few research studies on Brazilian Portuguese VOT values. Moreover, there are no studies aiming to verify the VOT values produced by speakers in the city of Porto Alegre. In the Portuguese test, there were eight words with /p/ in initial position[4] and five distracters. Each word was repeated five times, totalizing sixty-five tokens. The L1 test took around three minutes.

The second production test was in English. There were twelve target words with /p/ in word-initial position and twelve distracters[5]. Each word was repeated four times, totaling 96 tokens. The English production test was applied both in the pre-test and the post-test, and took around four minutes to complete each. In selecting the target words, we controlled for vowel height, as we made sure that the total number of target plosives were followed by the same number of high and low vowels, since vowel height seems to have an influence on VOT values (YAVAS and WILDERMUTH, 2006).

Both the Portuguese production test and the English production pre-test were recorded on the same day. In order to record the participants' oral productions individually, we used *Audacity 1.3 Beta.* This software, which is available online, stores the participants' voice in *.wav* files. One week after the completion of the period of instruction with the Experimental Group, all participants were invited to take part in the production post-test.

The contextualized instruction classes

The contextualized instruction classes were taught right after the production pre-tests were conducted. Two distinct classes were planned to teach the aspiration of the plosive /p/: The two classes provided to the Experimental Group were planned based on Celce-Murcia et al.'s (1996) suggestive steps for a more meaningful and effective pronunciation class. The authors divide a communicative pronunciation class in five steps: (1) description and analysis, (2) listening discrimination, (3) controlled practice and feedback, (4) guided practice and feedback, and finally, (5) communicative practice and feedback. According to the authors, steps 1 and 2 focus mostly on perception. They occur when the learner's awareness of the target item is raised. Steps 3, 4, and 5 focus on production. At these three instructional stages, learners create contextualized language involving the target item. Alves (2007), based on Zimmer and Alves (2006), claims that such steps are all necessary and dependent on each other for more efficient results in a pronunciation class, as pronunciation teaching should consist of much more than "listen and repeat" activities.

Transcription and analysis of the data

All the oral production data collected from the Portuguese test, as well as from the English pre- and post-tests, were analyzed acoustically by the researchers. After the acoustic analyses, the data were sent to a statistician to run paired T-tests. The results of the tests will be discussed in the following section.

Data analysis

In order to analyze the data, four hypotheses were suggested for this research study, based on Silveira (2004):

H1. There are no significant differences between the Experimental and Control groups in both the English and the Portuguese production pre-tests.

H2. In the pre-test, neither the Experimental nor the Control Group produces the English voiceless plosive /p/ in word-initial position in a native-like manner.

H3. The Experimental Group produces the English VOT pattern in the post-test, differing significantly from the VOT values found in the pre-test.

H4. The students in the Control Group will not produce the voiceless plosive /p/ in a target-like manner in the post-test. Therefore, there will be a significant difference between the Experimental and the Control Groups in the post-test.

Tables 1 and 2 present the pre-test VOT values obtained from the Experimental Group and the Control

[3] This test consists of multiple choice questions of listening comprehension as well as English grammar. According to Allan (2004), the Oxford Placement Test has been validated since its application, for over 5 years, with learners of more than 40 nationalities. Although students were classified at different proficiency levels, the results found in the pre-test show that their VOT patterns are the same, regardless of their experience with the L2. For delimitation purposes, we have not run statistical tests investigating the role of proficiency level on the effects of instruction (post-test). We leave this issue for further investigation.

[4] Pus, pio, paz, pés, pipa, puxa, pata, para

[5] Pick, put, pill, pack, pass, pet, Peter, people, pushing, package, party, parents. The different number of words in the Portuguese and English tests is justified by the fact that English presents a larger set of vowel consonants.

Group, respectively. These results show the comparison between the VOT values in Portuguese and in English through paired sample T-tests. All the tests used a 95% confidence interval difference.

Table 1 shows the VOT values for the Experimental Group in English and in Portuguese:

Table 1. *Experimental Group* – English pre-test x Portuguese test

	Factor	N*	Mean	SD
VOT	Experimental Group – English	72	9,0690	1,55609
	Experimental Group – Portuguese	48	9,2090	1,21266

* For delimitation purposes, we have used only part of the data collected ("72" represents 12 English words multiplied by 6, which is the total number of participants in each group. "48" represents 8 Brazilian Portuguese words multiplied by 6 participants in each one of the three groups).
SD = Standard Deviation.[6]

The results above show that there was no significant difference (*P*=0,582) between the two tests applied to the Experimental Group before explicit instruction. The VOT mean was 9, 06 ms in the English pre-test (*SD*=1, 55) and 9, 20 ms (*SD*=1, 21) in Portuguese. As mentioned in the Introduction of this article, word-initial /p/ has a VOT value of approximately 55 ms in English (KENT and READ, 1992; TORIBIO et al., 2005). On the other hand, the Brazilian Portuguese VOT value for /p/ is much shorter. Klein (1999) points out that the typical VOT value for Brazilian Portuguese is approximately 12 ms for /p/. Our data show that participants from the Experimental Group produced the same VOT pattern in both the English pre-test and the Portuguese test. In other words, learners process the L2 plosives as if they were the same ones found in their first language (FLEGE, 2002, 2003; BEST et al., 2001; BEST and TYLER, 2007), as they might not notice (SCHMIDT, 1990) the difference between the first and the second language systems. This confirms that explicit pronunciation instruction is, therefore, necessary.

Table 2 shows the VOT values obtained from the Control Group in the pre-test:

Table 2. *Control Group* – English pre-test x Portuguese pre-test

	Factor	N	Mean	SD
VOT	Control Group – English	72	9,8660	1,61342
	Control Group – Portuguese	48	9,6209	2,08328

SD = Standard Deviation.

The results in Table 2 show that there was no significant difference (*P*=0,493) between the two tests applied to the Control Group before explicit instruction. The VOT mean was 9, 86 ms in the English pre-test (*SD*=1, 61) and the VOT mean in the Portuguese test was 9, 62 ms (*SD*=2, 08).

As can be noted, Tables 1 and 2 indicate that there were no significant differences concerning VOT values between the two groups in the English and the Portuguese pre-tests. In both tests, participants from these 2 groups produced VOT values which are similar to the values produced by native speakers of Brazilian Portuguese. Our data indicate that, without awareness-raising tasks, learners tend to reproduce the same L1 pattern in the production of the English bilabial plosive /p/ in word-initial position, i.e., without aspiration. Therefore, Hypothesis 1 has been fully confirmed for both groups. This suggests that, in neither of the groups, the target item is noticed by learners. The results shown above highlight the importance of pronunciation instruction, as learners do not seem to differentiate between the L1 and L2 sounds (FLEGE, 2002, 2003; BEST et al., 2001; BEST and TYLER, 2007).

Table 3 summarizes Tables 1 and 2 by presenting the results found in the comparison between the Experimental and the Control Groups, as we verify their VOT values in the English pre-test.

Table 3. *English pre-test* – Experimental x Control Group

	Factor	N	Mean	SD
VOT	Experimental Group	72	9,069	1,5561
	Control Group	72	9,866	1,6134

SD = Standard Deviation.

Both groups present VOT means which are closely related to the Brazilian Portuguese average VOT value (12 ms), and far from the English VOT average for the bilabial plosive /p/, which is 55 ms. We also have to consider that the group that had a slightly higher VOT value was the Control Group, not the Experimental Group. However, one must consider the fact that such a difference is very small (shorter than 1 ms). In other words, both groups produce word-initial /p/ under the Brazilian Portuguese VOT pattern.

After analyzing the information from Tables 1 to 3, it is relevant to note that neither of the groups produced the L2 VOT patterns for the voiceless plosive /p/ in word-initial position without explicit instruction. In fact, there were no significant differences between the two groups in the English pre-test either. Thus, Hypothesis 2 has also been confirmed by the results mentioned above.

After explicit instruction, the English post-tests were run in order to verify the expected effects generated by the instructional period. Table 4 shows the results obtained

[6] According to the 6th edition of *Oxford Advanced Learner's Dictionary* (2000, p. 1314), Standard Deviation is the amount by which measurements in a set vary from the average for the set.

after the pronunciation classes, by comparing both groups in the English post-test.

Table 4. *English post-test* – Experimental x Control Group

	Factor	N	Mean	SD
VOT	Experimental Group	72	36,809	22,2964
	Control Group	72	9,375	1,7860

SD = Standard Deviation.

Independent-sample T-Tests showed a significant difference (*P*= 0) between the Experimental Group and Control Group in the English post-test. The VOT mean was 36, 80 ms for the Experimental Group (*SD*=22, 29) and 9, 37 ms (*SD*=1, 78) for the Control Group. The results obtained from the Experimental Group match our expectations. After the instruction period, the VOT values increased (from 9,069 to 36,809) and the Control Group results indicate no difference concerning VOT values in the post-test, whose mean was 9,375. In the pre-test, the average VOT produced by the Control Group was 9,866. This group continued to produce the same pattern found in their L1, since the participants were not made aware of the aspiration phenomenon. This confirms our hypothesis that learners will not produce an aspirated /p/ unless they are provided with explicit instruction, as students tend not to notice the target item by themselves.

In summary, the data suggest that, after explicit instruction, participants from the Experimental Group started to notice (cf. SCHMIDT, 1990) the target form, as instruction led to a more native-like production of the target item, as shown in Table 4. As expected, the Control Group did not produce the target form in a more target-like fashion. Therefore, Hypotheses 3 and 4 have been confirmed.

Although there was a considerable increase in the VOT values for the participants of the Experimental Group, it is important to mention that a VOT average of 36,80 ms is not considered to be similar to the VOT values produced by native speakers of English, which are around 55 ms. Although one must take this fact into account, it is, however, quite clear that the values found in the post-test for the Experimental Group are higher than the ones commonly produced by Brazilian Portuguese speakers. This indicates that learners are getting closer to the target language in terms of VOT values. This change may be possible because they might have already started to notice (cf. SCHMIDT, 1990) the L2 aspects that differ from the L1, in relation to the production of /p/. We believe that, as students have more opportunities of exposure and practice the target language, their noticing of the L2 forms will be boosted, which will allow them to reach the target VOT values in the long term. The data produced by learners on the Experimental Group indicate, thus, that their phonological acquistion process of the target item is in progress.

Conclusion

This article intended to present the results obtained from a research study which investigated the effects of explicit instruction on the acquisition, by Brazilian Portuguese speakers, of the aspiration of the bilabial plosive /p/ in word-initial position.

One of the limitations of this research study was that only oral production, but no perception, could be investigated. Another limitation lies in the fact that, due to time constraints, a delayed post-test was not carried out to verify the lasting effects of the explicit instruction classes. Last but not least, future studies, with a larger number of participants, must also be carried out.

Despite all the aforementioned limitations, our data suggest that there were changes in the VOT patterns of the voiceless plosive /p/. Such changes could be obtained through the contextualized instruction applied to the Experimental Group, whose VOT values changed from 9,06 ms in the pre-test to 36,80 ms in the post-test, which was run a week after the contextualized classes had been taught. The Control Group did not show changes in their VOT values from the pre- to the post-test. This confirms our assumptions that explicit instruction has a positive effect on the acquisition of aspiration in word-initial [p^h] in English as a second language by Brazilian Portuguese speakers. This considered, despite the limitations of the present study, we believe that our results have proved relevant both to the fields of L2 Phonological Acquisition and Applied Linguistics, as they indicate the benefits of pronunciation instruction in the English classroom.

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