Christel Gómez Mendoza

English Studies

2016/2017

Analysis of EFL Speech Production:
English Plosives by Native Spanish Speakers

Directora: Maria Luisa García Lecumberri

Department of English and German Philology and Translation and   Interpreting

Index

Abstract

Within language acquisition, speaking in a non-native language accurately is extensively recognized to be the hardest skill confronted by learners. It seems an arduous task as it demands the correct employment of second language phonology, a challenge that usually results in foreign accents. In the light of this problem, the present paper examines the realisation of English plosives by Native Spanish (NS) speakers in an attempt to understand the causes that lead learners to errors. In order to carry out the analysis, L2 (second language) perception models are reviewed as well as a list of the major factors that usually provoke foreign accent. The following investigation is based on a corpus of task-based conversational speech in which 3 pairs of Native Spanish (NS) learners were selected. Data were analysed with PRAAT, a tool that allows to see the spectrograms of speech together with the sentences and the sound. For this analysis, approximately 3 minutes of speech per person were scrutinized in which certain specific words were selected for the examination of stop consonants. Findings demonstrate different types of realisations of English plosives by NS speakers that reveal an evident foreign accent. The study has focused on Flege's Speech Learning Model (SLM) so as to prove its suitability for foreign accent speech. However, results of this investigation show that using Flege's model to understand the causes of foreign accent is not enough. Therefore, it would seem more efficient to examine a wider set of factors that SLM does not include in its predictions.

Keywords: L2, L1, FL, non-native speech, language acquisition

1. Introduction

Overcoming a foreign accent in a second language (L2) poses a serious challenge to language learners. This phenomenon has created an increasing interest among linguists who, as a consequence, have tried to explain the causes that impede learners from mastering the pronunciation of an L2.

Many investigations have analysed the effects of learning age in the production and perception of the L2. The critical period hypothesis tried to determine the age at which an L2 cannot be efficiently acquired. The majority of linguists agreed that there is an

impediment after puberty (Patkowski cited in Flege et al.,1997 and Long cited in Flege, Munro and Mackay, 1995) that stops learners from having a "near native" accent in another language. However, most studies have proved that there is not a cut-off age for language acquisition as it is a progressive phenomenon, i.e. in the case of phonetics, the younger the sounds of an L2 are acquired the more likely they will be pronounced native-like (Flege cited in Piske, 2001; Patkowski cited in Flege, Frieda & Nozawa, 1997; Aoyama, 2008). Therefore, it has been concluded that the age of learning plays a decisive role when perceiving and pronouncing a non-native language.

Furthermore, the phonological system of the learners' native language is also another factor that influences the perception and production of the L2. It has been demonstrated (Flege *et al.*, 1997) that the amount of usage of the L1 affects the success of L2 pronunciation. In this last study, they analysed 5 original English sentences produced by native Italians who arrived at different ages in Canada. These native Italians were grouped according to the amount of first language (L1) they used in their daily life. Thus, linguists classified them in groups of high and low use of L1. They found that those native Italians, who still used their L1 considerably often, had a notably stronger foreign accent in English than those who hardly ever used it. Moreover, they also showed that the high use of Italian derived in a better pronunciation of this L1, so, those who seldom used it had a worse production in their native language and a better performance in the foreign language. On account of this phenomenon, we can conclude that the L1 is a primary factor to explain phonetic acquisition and that, maybe, the more accurate the L2 sounds are the less accurate the ones from the L1 will be. Hence, this leads us to wonder if we cannot master two languages to the same level.

However, we should take into consideration that the L1 is not the only reason for having a foreign accent in an L2, but that there are some other factors -which will be discussed later in this essay- that also affect pronunciation acquisition. For instance, Flege (1995) suggests that having a foreign accent may be the result of different causes, such as, not having an adequate phonetic input for the L2, a lack of satisfactory motivation or the incorrect habits in early ages of L2 learning, amongst others. Consequently, we perceive that a simple explanation towards the question of what causes a foreign accent is, indeed, insufficient. For this reason, it is important to examine and study this linguistic field in order to develop a complete analysis of the factors that cause learners of an L2 to have a non-native-like pronunciation. In this sense, the aim of the present study is to analyse the foreign accent of native Spanish (NS) speakers when speaking in English and

specially, their common errors in the production of English plosive consonants. Data will be analysed following Flege's Speech Learning Model so as to explain the possible causes that lead NS speakers to those errors.

Nevertheless, before fully entering the core of the essay, it is important to clarify certain terminology that will appear throughout this piece of work. As I have been mentioning, there is a difference between L1/NL vs L2. While L1/NL refers to the mother tongue that someone has been exposed to from birth, the L2 is the non-native language used in the geographical setting. Additionally, it is essential to distinguish that Foreign language (FL) is not the same as L2, since an FL is not a language spoken in the area where the speaker lives. A clear example would be Native Spanish speakers whose L2 is Basque, due to the area in which they are living, but they can learn English as an FL. An L2 is more likely to be acquired rather than learned, as it can be acquired by exposure to it in the local area, so it is a subconscious process. On the contrary, an FL must be learned following a conscious process due to the environment in which it occurs.

Having clarified these basic notions, I will dedicate the first part of the essay to examine the different and numerous factors that could cause a perceivable foreign accent. Secondly, I will try to explain the different FL perception models, paying special attention to Flege's Speech Learning Model (SLM). And finally, Native Spanish speakers' errors in English plosives will be considered, and in addition to this, the possible reasons that lead learners to these errors will be outlined.

2. Factors affecting perceived foreign accent

The list of possible factors affecting the acquisition of an L2 can be large and questionable, due to the fact that most of them will depend on the particular circumstances of the individual that is being examined. The following section has been devoted to discuss the most common and relevant ones in the acquisition of L2 sounds.

2.1 AOL and Critical Period Hypothesis

The Critical Period Hypothesis (CPH) has been an abiding debate in linguistics which questions the individual's ability to fully acquire a language as a native after a

certain age. Lenneberg (cited in Flege *et al.,* 1997) and Patkowski (cited in Flege *et al.,* 1997) suggest that after puberty individuals cannot master an L2. However, there is not a solid agreement regarding the latest AOL (age of learning) at which native-like pronunciation of an L2 remains possible, but it seems that phonetic acquisition involves an earlier CPH than other language skills.

In spite of this uncertainty, there seems to be an accord that the earlier an L2 is learned in life, the more possibilities there will be to master it. Indeed, there are many previous studies, such as Aoyama *et al.* (2008) that firmly support this notion. This piece of research makes a comparison between native Japanese (NJ) adults and children learning American English, and observes the age and environment at which they acquired it. At first, as NJ adults had previous English experience, their production of L2 phonemes was more successful than the children's one. However, after 1 year of residence in the country, children's oral production improved, whereas the adults' one did not. This leads them to suggest that the younger the learners are, the easier and the more rapidly they will acquire oral production skills in an L2. Flege (1987) gives the following explanation for this phenomenon:

> It is conceivable that young children are more likely than adults to arrive at the "new category" solution when exposed to L2 phones not found in L1 because they are still in the process of establishing phonetic categories based on the phonetic input they receive in the L1 (p.80).

Nevertheless, if we assume Flege's claim, we are asserting that learners establish categories for L2 phonemes and that consequently, they should be able to pronounce as genuinely and identically as monolinguals. Yet, we find that although these NJ children's production improved more efficiently than adults', they could still sound foreign-accented. So, as Flege *et al.* (1997) concluded "bilinguals may speak their L2 with a slight but detectable accent not matter how early in life they began to learn the L2" (p.182). Therefore, although it is true that after a certain age certain difficulties arise to acquire an L2 in the same way as L1, the CPH is not sufficient to explain this event.

Findings based on native Italians who migrated to Canada as children have also challenged the CPH. This study showed that even those who arrived at the age of 3 and had spoken English for 34 years on average, had a detectable foreign accent (Flege *et al.,* 1997). Thus, it has been demonstrated that the neurological development of L2 learners is not the unique or, ultimately, the most significant reason that explains how accurately

a non-native language will be pronounced, as CPH states. Therefore, early bilingualism does not ensure a monolingual-like pronunciation (Flege *et al.*, 1997).

Moreover, CPH proponents do not agree on questions, such as the latest AOL at which an L2 can be mastered or if the critical period does affect all individuals at the same level. Actually, the CPH does not take into account other factors, such as the length of residence (LOR) in the country of the L2, the motivation towards the L2 or the emotions regarding the L1. Hence, this has led investigators to develop different hypotheses in order to analyse the aspects that cause a foreign accent. One of these hypotheses is the "single system hypothesis" that will be discussed in the following section.

2.2 L1 Influence

It is commonly believed that the interaction between the L1 and L2 phonological systems has a clear effect in the success of L2 acquisition (Guion *et al*, 2000). When learning a second language, there is a certain interference of the L1 system that leads learners to make mistakes. This type of interference has been called *negative transfer*[1] (Zhanming, 2014). Although there are many other linguistic fields (syntax for example) in which the L1 also has an influence when acquiring an L2, this negative transfer has a particularly central role in the acquisition of L2 sounds. Such is the interaction between the two languages, that it has been generally considered that learners substitute an L2 sound for an L1, if the non-native sound is perceived as similar to an L1 sound. Furthermore, contrasts of L2 sounds that are not present in the phonological system of the L1 will not be discriminated. In turn, the sound contrasts that exist in the L1 could be unnecessarily produced in the L2 (Weinreich 1953 and Lehiste 1988 cited in Flege, 1995). As a result, the connexion between the L1 and the L2 influences the perception and production and, ultimately, the success in the pronunciation of the second language.

The "single system hypothesis" was developed in order to examine the influence of the L1 in bilinguals' L2 production. Assuming that bilinguals' use of L1 affects L2

---

[1] The idea of transfer was introduced by Lado (1957) in his *Contrastive Analysis Hypothesis* and states that the characteristics of the L1 are carried to the L2. However, apart from negative transfer, the L1 also may lead to *positive transfer* that is supposed to help in the second language acquisition. Although this idea was already mentioned by Trubetzkoy (1939) who proposed that the phonological system of a language was like a "sieve" (later on explained in this paper).

pronunciation, the hypothesis examines the amount of the L1 that negatively influences the performance of the L2. Instead of just describing the phenomenon as CPH does, this hypothesis predicts that the lesser use of the native language derives in a better pronunciation of the L2 (Flege *et al,.* 1997). According to the single system hypothesis, bilinguals do not have 2 different phonological systems where each of the languages is located but a single one in which both phonetic systems reside. As Flege *et al.* (1997) concluded "bilinguals are unable to fully isolate the L1 and L2 phonetic systems, which necessarily interact with one another" (p.172).

Researchers have accomplished many different investigations that have supported the notions of this hypothesis. For instance, as I previously indicated in the introduction, Flege *et al* (1997) analysed native Italians who were settled in Canada. The participants had similar experience learning English as an L2. They were divided into groups according to the amount of L1 they used and after that, they were asked to repeat sentences in the corresponding L2. Results of this investigation showed that a frequent use of Italian (L1) causes a stronger foreign accent in the L2, in this case in English.

In another investigation by Guion *et al.* (2000), 30 Quichua-Spanish bilinguals were examined on the basis of their "self-reported L1 use". Following the notions of the preceding study, the procedure consisted on the repetition of several Quichua and Spanish sentences that, later on, were recorded. The tests demonstrated that there was a significant jump between the participants that used their L1 on few occasions and the ones that had a high L1 use. Findings showed that the higher use of L1 the stronger the perceived foreign accent was in the production of L2 sentences.

In addition to this, it was also hypothesized that bilinguals who accurately produce L2 sounds will be less efficient in producing L1 phones (Flege *et al*, 1995). However, Guion *et al.* (2000) did not encounter in their investigation that the better pronunciation of the L2 negatively influenced L1 performance. The amount of L1 use modified the pronunciation of the second language, but not the native's one. For this reason, they concluded that "the balance between L1 and L2 use exerts a measurable effect on the extent to which the L1 sound system influences the pronunciation of an L2, whereas it does not affect the extent to which the L2 sound system influences pronunciation of the L1" (Guion *et al.*, 2000, p.10). Due to these contradictory results, it would seem necessary to have more detailed research conducted on the effects of the L2 on L1 production.

However, both studies agree that the amount of L1 use influences speaker's abilities in the L2 production and consequently, they support the single system hypothesis. It

seems that both language systems are constantly activated and that it is impossible for a bilingual to disconnect one while using the other one (Grosjean 1992 cited in Guion *et al*., 2000). Nevertheless, further study on the nature of the influence of the L1 should be carried out since the power of the influence can be dependent on factors such as the topic of the conversation, the recency of use of the L1 or the individual's languages involved in the talk exchange.

Finally, while the phones of the L1 and L2 system influence one another in production, it is questionable whether this influence is also present to the same extent in perception or not. Therefore, the following section examines how perception of non-native languages alters the L2 production.

2.3 Second language perception

The interaction between production and perception in an L2 phonological learning has been investigated by several linguists. The increased interest in the perception of foreign language sounds has led linguists to develop different studies that support contrasting theories among them. Although these theories will be discussed in the third chapter of the essay, this section is meant to introduce the influence of L2 perception on the accuracy of the L2 pronunciation. According to Flege (1995) having a foreign accent derives from the defective perception of the L2 sounds. He suggests that the degree of accuracy in which non-native sounds are perceived limits their authentic pronunciation, although he maintains that not all aspects of perception are involved in production (Flege, 1995). In this sense, it is generally believed that perception leads production in language acquisition (Flege and Eefting,1987).

It is also hypothesized that those L2 phones that actually are not similar acoustically but learners judge them as being part of the same category of L1 phones, will not be pronounced native-like (Flege and Hillenbrand 1984 cited in Flege *et al*., 1987). For instance, English stops are perceived by native Spanish speakers as part of their native stop category and as a result, the production is judged to be foreign accented since it reflects the L1's stop realizations (Flege *et al*., 1987). It seems clear that not only does the L1 phonological system influence the production of L2 sounds but also their perception.

Best *et al.* (2003) propose that "non-native speech perception is influenced not only by the phonological system of the listeners' native language, but also by experience with the fine-grained phonetic details of L1 phonemes". Thus, listeners' equivalence classifications between the L1 and L2 systems are done at a phonemic and allophonic level (Flege, 1995).

All in all, these studies advocate that production depends on perception in an L2 and vice-versa. What is more, it seems that perception precedes production in the learning processes. Therefore, we could conclude that perception is essential in learning L2 sounds due to the fact that it is a prerequisite to achieve a closer native-like pronunciation.

Nevertheless, many other studies that have attempted to make a connexion between the ability to discriminate L2 sounds and the production of them have found contradictory results (Gómez Lacabex, 2009). For example, it is possible to perceive and be aware of the difference of an L2 sound and still produce it inaccurately due to factors such as context, orthography or the received phonetic instruction.

2.4 Other factors

In addition to the previously considered factors, speakers of an L2 may differ in the degree of foreign accent due to other significant causes.

One of these influences could be the Length of Residence (LOR) that stands for the amount of time that speakers of an L2 spend in the L2 community. While Flege *et al* (1995) found certain influence of LOR in the pronunciation of L2, there are also other studies that have not found such evidence (Piske, *et al.* 2001). This has led linguists such as Flege (1995) to conclude that LOR may depend on the phase of L2 learning in which the speaker is. Learners could be facing a stage of fossilization in which there is a loss of progress in the acquisition of second language regardless of any previous exposure to and interaction with the L2. Additionally, the amount of L2 use also interacts with the factor of LOR. Despite the fact of living in a second language country, it is possible to find learners who live in ghettos, segregated and unexposed to the L2. Consequently, although we cannot reject that LOR has certain influence in the perceived foreign accent, it is safer to claim that LOR depends in many other circumstances and it is a less relevant predictor than AOL for example.

Apart from LOR, we could also mention the role that instruction of L2 has in the ultimate production of second language sounds. It is undeniable that usually pronunciation does not receive the same consideration as grammar or vocabulary does in classrooms (Piske *et al*., 2001). Some studies have found that those individuals who obtained specific training in L2 production and perception showed results that were comparable to natives ones (Bangaerts *et al.* cited in Piske *et al*. 2001). Nevertheless, Flege *et al.* (1995) did not discover such attainment. Whilst there is not firm evidence that the instruction on L2 sounds may lead to native-like pronunciation, it is generally believed that it has a positive effect on the L2 pronunciation accuracy (Gómez Lacabex, 2009).

Furthermore, the degree of L2 speakers' motivation has also been examined as a factor that affects second language production. Concern or awareness of the importance of L2 pronunciation accuracy may lead learners to make the effort to sound native-like. However, having a strong motivation or concern for L2 pronunciation does not ensure accent-free L2 speech (Piske *et al.* 2001). Indeed, it is difficult to study an individual's motivation and the way it affects in the production of L2 as it is a factor that could differ within the same person at different times.

Finally, it has been considered that orthography may play a negative role in the amount of foreign accent too. Spelling of L2 words triggers a correspondence between the L2 symbol and the pronunciation of the same symbol in the native language. For example, native Spanish speakers usually pronounce the phoneme /r/ in English words such as in "word" due to the fact that they associate the spelling with the L1 phonemes, not taking into account that most of the times the English sound /r/ is not pronounced.

3. FL Perception Models

As I have recently mentioned, many theoretical models have been developed with the purpose to explain how perception of non-native phonemes is strongly influenced by the L1 phonological system. Taking this into account, this part of the essay will consider the aspects of the different FL perception models that have been proposed.

3.1 Speech Learning Model (Flege)

The SLM (Speech Learning Model) was developed by Flege in an attempt to account for the difficulties in acquiring a native-like pronunciation in an L2. It is addressed to examining the production and perception of L2 speech by L2 learners. According to this model, perception of L2 sounds precedes production.

The SLM suggests that the difficulty of producing an L2 phoneme accurately lies on the degree of its similarity to the nearest native one (Flege, 1995). Therefore, the creation of a new category for L2 phonemes should be easy for new sounds that are different enough from L1, problematic for those that are similar to L1 phonemes and needless for identical ones. If learners create a new category for the L2 sound they will maintain a distance from the closest L1 sound and ultimately, they will correctly produce the non-native sound. On the contrary, if the L2 sound is perceived to be a realization of an L1 sound they will not create a category and consequently, they will fail in its production (category assimilation) (Flege, 1995).

Flege proposed 4 postulates that became central in his model. The first postulate claims that "the mechanisms and processes used in learning the L1 sound system, including category formation, remain intact over the life span, and can be applied to L2 learning" (Flege, 1995, p. 239). The second one holds that the specifications of speech sounds are present in what we have been calling "phonetic categories" which are said to be long-term memory representations. In the third one, he states that L1 phonetic categories can evolve due to L2 influence since it can modify the L1 system. Finally, he postulates that L1 and L2 phonetic categories coexist in the same phonological space and as a result, bilinguals have to strive to keep them apart (Flege, 1995).

In addition to these postulates, Flege derived 7 hypothesis that can be summarized in the following way: the first one proposes that learners perceptually connect L2 allophones to the closest L1 allophones. He also asserts that when a sound is recognized as different from the closest L1 category, a new phonetic category is established (hypothesis 2) and then, the sound is produced as that category specifies (hypothesis 7). The more differences perceived between L2 and L1 sounds the easier it will be to distinguish phonetic differences (hypothesis 3). However, as I have been mentioning throughout the essay, AOL plays a fundamental role since the earlier the L2 learning happens, the smaller differences between L1 and L2 will be needed to create phonetic

categories (Hypothesis 4). If this does not happen and the sounds are identified to be the same, the creation of new categories for L2 sounds will be blocked (Hypothesis 5). Finally, Flege concludes that even if bilinguals are able to establish new phonetic categories, they still may not sound as native speakers due to the realisation of greater differences between L1 and L2, or because of a representation of sounds that differs from the monolingual one (hypothesis 6) (Flege,1995).

All in all, the model proposes that as the age of learning an L2 increases, the ability to detect the differences between L1 and L2 sounds decreases. A small distance between the two sounds provokes new categories for L2 sounds to be blocked, predicting in this way the inaccuracy of L2 pronunciation. However, as Flege (1995) states "as L2 learners gain experience in the L2, they may gradually discern the phonetic difference between certain L2 sounds and the closest L1 sound(s)" (p.263). Nevertheless, this model does not explain how to measure the degree of perceived cross-language distance (Flege, 1995) and therefore, some questions remain unanswered.

3.2 Perceptual Assimilation Model (Best)

Another model that has focused on the perception of non-native speech has been called Perceptual Assimilation Model (PAM). This model takes L1 influence as the principal cause for a non-native-like pronunciation and it is based in a direct realist view. This view suggests that rather than mental articulatory representations, learners' perception is based on the gestural information received in speech, that is, "the acoustic waveform is regarded simply as an energy medium shaped by, and therefore, carrying information about distal vocal tract gestures" (Best *et al*., 2003, p.172). Hence, Best also maintains that perception and production are linked since these gestures are perceived with a communicative goal.

Similarities between non-native phones and native ones are explained by the spatial proximity of gestures and active articulators as well as by the constriction degree and gestural phasing (Best *et al.*, 1995). Due to these similarities, interpretations of L1 phones can be confused and assimilated to the native categories, that is, learners can "perceptually *assimilate* the non-native phone to the most articulatory-similar native phoneme" (Best et al., 2007, p. 22).

Considering this, a non-native sound may be categorized as identical or similar to a native one. However, it could also be an uncategorized sound due to the dissimilarity to any native phoneme or simply, it will not be assimilated because of being recognized as a non-speech sound.

Following these notions, PAM establishes categories for contrasting non-native pairs in order to identify how each phone is perceptually recognized with respect to L1 sounds. In Two Category assimilation (TC) the 2 non-native sounds are perceived as acceptable exemplars of two different native sounds and therefore, discrimination between the two is predicted to be excellent. In the Single Category assimilation (SC) both NN sounds are recognized as "equally good or poor tokens of the same native phoneme" (Best et al., 2007, p.23), thus, the acquisition will not be good. Similarly, in the Category Goodness differences (CG), both NN sounds will be perceived as realizations of a single L1 phoneme; however, they will differ in terms of how similar they are to the native sound. When one sound is perceived as equal to a native one but the other is not, then, we will be talking about an Uncategorized-Categorized assimilation (UC). Moreover if both sounds are Uncategorized (Uncategorized-Uncategorized assimilation) then, the discrimination will depend on the proximity to each other and to native phonemes. Finally, they will be in a Non-Assimilable (NA) relationship to the L1 if they are considered as non-speech sounds and consequently, they will be excellently discriminated.

3.3 Native Language Magnet (Kuhl)

Kuhl has demonstrated that L1 perceptual sound systems effect such influence in the acquisition of L2 sounds, that differences between them may not be perceived. Initially, she developed the Native Language Model (NLM) in order to explain L1 acquisition by arguing that early exposure to language "produces a change in perceived distances in the acoustic space underlying phonetic distinctions, and this subsequently alters both the perception of spoken language and its production" (Kuhl and Iverson, 1995, p. 560).

When expanding this model for the L2 acquisition study, she supports the idea that the L1 phonetic categories are like a "sieve" (Trubetzkoy 1939 cited in Weinberg, 1997)

that filter the new acquired phonetic sounds. In this context, the good exemplars of NL phonetic categories are called "prototypes" and act like magnets, that is, they will attract those L2 sounds that are similar to them making distinctions difficult to perceive. Therefore, sounds of an FL that are close to the native prototypes will pose problems to distinguish them. They can be assimilated to the L1 phonetic category which acts as a prototype that lessens the discrimination of those sounds that are near in acoustic proximity. As Kuhl *et al.* (1995) predict "Listeners exhibit relatively poor discrimination in the region of prototypic exemplars of phonetic categories" (p.560).

However, those sounds that are not similar to the prototypes will not be assimilated to the L1 system. Thus, they will be easier to discriminate from surrounding sounds. When L2 sounds resemble a single prototype the degree of difficulty will depend on the proximity to its "magnetic field". In her analysis of non-native vowels, Best *et al.* (2003) follow the NLM model and reaches the conclusion that "prototypes of two different native vowels will be discriminated better than 2 non-prototypes of a single native vowel, which should in turn be discriminated better on average than a prototype versus a non-prototype of the same native vowel" (p. 2890).

To sum up Kuhl's model, it is possible to say that the L2 acquisition is conditioned by the phonetic system of the native language and that the perception of L2 phones will be strongly influenced by the categories of L1 speech sounds.

3.4 Ontogeny and Philogeny Model (Major)

Following the predictions of the previous models, the Ontogeny and Philogeny Model (OPM) proposes the L1 as the major factor for foreign accent as well. However, it also pays attention to other influences that intervene in the acquisition of a second language.

First of all, it is convenient to define the words ontogeny and philogeny in the linguistic field. As Major (2001) claims "ontogeny refers to the life cycle of an individual's language and philogeny is the life cycle of whole languages and language types including historical change, dialect variation, language loss, and language contact phenomena" (p. 80). Taking this into account, this model holds that the processes of the

L1 are also present in L2 or FL acquisition so it also focuses on some universal and developmental processes.

The OPM explicitly claims that there are 3 factors in L2 acquisition that are interrelated: L1 transfer, L2 influences and certain Universal (U) developmental processes. Moreover, Major states that these factors are influenced by "similarity and markedness" (Major, 2001)

As exposure increases, the transfer from the L1 will decrease. Therefore, depending on the stage of learning, the influence of the above factors will vary. In the first stages, the L1 dominates but as learning of L2 continues, the U developmental factors intervene. Also, constituents from the L2 appear and at the end of the acquisition process the L2 will dominate over the L1. Nevertheless, the more similar the L2 sounds are, the more likely the transfer will be and consequently, this dominance will last longer. On the contrary, if the acquired sounds are less similar to the NL, it is logical to think that the acquisition will be easier and faster achieved. (Major, 2001)

In conclusion, the OPM proposes a definite interaction between the L1 transfer, the L2 and the universal developmental processes. This transfer will decrease over time while the developmental processes increase. However, this interrelationship will be conditioned by similarity, and the ultimate success in an L2 will depend on that.

4. Experimental Work

This section of the essay will explain the analysis of the production of English plosives by Spanish speakers, a subject that has been the object of much study. By doing so, I expect to show the foreign accent of learners and demonstrate some of the factors that have been highlighted in previous sections.

To have an insight into this consonantal analysis, it is important to describe briefly the differences between the English and Spanish consonant systems. Spanish and English share a similar alphabet, but in terms of phonology many differences are revealed. The Spanish alphabet is composed of 22 consonants with only 19 corresponding phonemes /p/ /t/ /k/ /b/ /d/ /g/ /f/ /θ/ /s/ /tʃ/ /x/ /m/ /n/ /ɲ/ /l/ /ʎ/ /ɾ/ /r/ /j/. The consonantal system of English consists of 21 consonants and 24 consonantal phonemes /p/ /t/ /k/ /b/ /d/ /g/ /f/ /v/ /θ/ /ð/ /s/ /z/ /ʃ/ /ʒ/ /tʃ/ /dʒ/ /h/ /l/ /m/ /n/ /ŋ/ /w/ /j/ /ɹ/. Both languages share several consonantal phonemes including the stops analysed here /p/, /t/, /k/, /b/, /d/, /g/.

Despite these common phonetic symbols, it is important to note that English and Spanish plosives differ in many ways. One of these dissimilarities is that Spanish stops are produced with less plosion than in English, i.e. with less air pressure. Spanish voiceless consonants /p/, /t/ and /k/ are frequently confused by English native speakers as their voiced equivalents /b/, /d/ and /g/ due to the fact that they have the same Voice Onset Time (VOT). This last phenomenon makes reference to the start of vocal fold vibration with respect to the release of the plosive. In general, Spanish voiceless stops are produced with shorter VOT than English plosives. Lenition of /p/, /t/ and /k/, i.e. the sound change that makes voiceless stops more sonorous, leads to crucial confusions when distinguishing voiced and voiceless sounds in minimal pairs. Apart from this, by the phonological process of spirantization, Spanish speakers turn English plosives /b/, /d/, and /g/ into fricatives and approximants [β̞] [ð̞] [ɣ̞]. Moreover, we must not forget that while English /t/ and /d/ are alveolar, Spanish /t/ and /d/ are dental phonemes. All these distinctions may confound Spanish learners and make them erroneously transfer L1 features to the L2.

The current analysis will describe the data collected from a corpus of learner speech which was designed for the investigation of L1 and L2 pronunciation. Not only will the analysis focus on phonemic differences but also on allophonic dissimilarities. For example, the aspiration of [pʰ] [tʰ] [kʰ] will be examined since it poses real problems for Spanish speakers who lack this feature in their plosives. Further, the role that the phonotactic constraints of Spanish final plosive clusters have when speaking English will also be studied. Finally, the influence of orthography will be considered too as a factor that potentially intervenes when it comes to pronunciation.

4.1 The DIAPIX-FL corpus

4.1.1 Participants

This experimental work has analysed some of the speakers of the Diapix Foreign Language Corpus (DIAPIX-FL). It is a cross-language corpus based on spontaneous conversations between 10 pairs of English and Spanish native speakers who were recorded speaking both languages as their L1 and L2. This spontaneous speech allows us

to observe speakers in 2 languages for comparison (García Lecumberri and Cooke, in press).

For our analysis 3 pairs of participants have been selected. They are native Spanish/Basque speakers studying English as their FL in the University of The Basque Country. Their level of English has been said to be a B2/C1 according to the Common European Framework of Reference for Languages (CEFR). Speakers are numbered from 1 to 3 and labelled with letters a-b in order to distinguish individuals of each pair. They were remunerated for taking part in the experiment.

4.1.2 Materials and Procedure

The materials of the corpus consist of different pictures involving three different themes: Beach, Street or Farm. Each participant was given a version of the picture that was similar to the one that the other member of the pair received. They had to work in pairs in a "spot the difference" task and they had to describe verbally each version of the image in order to find the 12 differences (García Lecumberri and Cooke, in press). Pictures also had some English texts in order to analyse certain intentional words as well as to prove how spontaneous speech differed from reading (see Figure 1 for an example).

Participants were seated at a table with a divider that made it possible to see each other but not the companion's picture. Before starting the task, each pair could practice using the image of a Park scene in order to familiarise with the task.
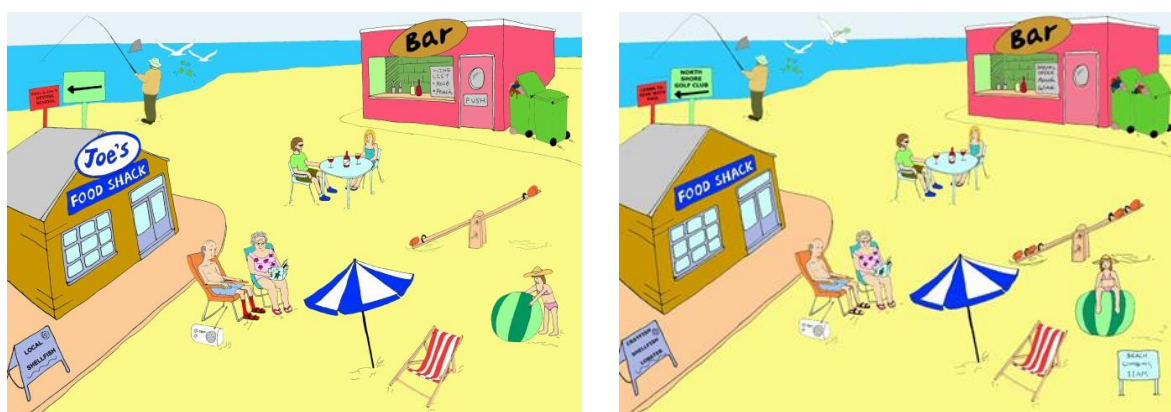

Figure 1: *Images of the DIAPIX Beach scene. English version of the pair 1a and 1b*

4.1.3 Analysis Method

The current analysis of plosives has been developed by following the principles of Flege's Speech Learning Model. First of all, the actual mistakes made by Spanish speakers have been assessed and explained with the hypothesis proposed by Flege. However, not only the mistakes but also the right productions have been investigated. In this sense, I will try to prove whether the expectations of this model are actually fulfilled or not. In case they are not, the downsides of the model will be discussed in the conclusion section.

PRAAT (Boersma & Weenink, 2017) has been the tool used to analyse the pairs' speech due to the fact that it allows to see the spectrograms of speech together with the sentences and the sound (see Figures 2 and 3 as an example). For this analysis, approximately 3 minutes of speech per person have been scrutinized in which certain specific words have been selected for the examination of stop consonants. Table 1 shows the quantity of plosives examined per speaker. In general terms, /d/ was the most frequent phoneme produced by NS speakers whereas /g/ was the least one.

speakers	/p/	/t/	/k/	/b/	/d/	/g/
1a	15	17	11	10	20	10
1b	14	19	10	7	15	6
2a	11	12	10	12	16	9
2b	15	14	11	12	18	7
3a	16	17	13	15	20	9
3b	16	14	15	13	14	10

Table 1: Number of the plosives analysed per speaker

5. Results and Discussion

Although the sounds [p t k] and [b d g] may seem similar in Spanish and English, they actually differ in important aspects. Spanish realisation of plosives may display a complete or incomplete closure without voicing or with voicing and followed or not by a

full burst. Moreover, depending on the context, they generally change the manner of articulation of plosives replacing them with fricatives, and more commonly with approximants (García Lecumberri and Cooke, in press).

Aspiration of English voiceless [p t k] is one of the features that Spanish plosives lack. Therefore, those Spanish speakers that produce these sounds without aspiration sound foreign and inappropriate. Unsurprisingly, the majority of speakers that have been examined in this analysis, pronounced words such as "carrot" "peach" "push" or "painting" among others, without aspiration in the first plosive sound. For example, speaker 3a -who used code-switching in many occasions- pronounced the word "paper" without an audible burst and with such lack of aspiration that she seemed to be replacing [p] with [b]. This could be a common misunderstanding since [b] at the beginning of word is a devoiced sound in English. Thus, the lack of aspiration may affect the intelligibility of words and make native English speakers understand the wrong word. Speaker 3a was the only one who got closer to the target language and produced "pear", "t-shirt" or "pink" among other words with aspiration in the initial plosives. Nevertheless, she produced [pʰ] [tʰ] [kʰ] with shorter VOT values than the ones of NE speakers.

On account of this, the study confirms our prediction that Spanish learners of English produce /p t k/ without aspiration or with shorter VOT values than NE. As Flege (1987) stated, this could be the result of identifying [pʰ] [tʰ] [kʰ] with L1 sounds [p] [t] [k] and therefore, a new category for these L2 sounds is not created despite them being different. It may be the case that learners have not perceived differences between L2 and L1 sounds and thus, they have not established a new L2 category. However, as previously mentioned, there was one speaker who was aware about the differences between Spanish and English /p t k/ and she still did not have a native-like pronunciation. She could be on the way to acquire full aspiration. This may support Flege's hypothesis 6 which says that the category established for L2 sounds may be different from a monolingual's one. But at the same time, this reality could challenge his hypothesis 7 since although the perception may have been accurate, the production may not have corresponded as well to the perceptual category created. If this claim is maintained, his assumption about accurate perception leading to accurate production would be problematic. Nonetheless, this allophonic analysis would endorse Flege's supposition that L1 and L2 are related at an allophonic level.

In addition, auditory analysis suggested that words like "table" or "advertisement" were realised with the Spanish dental phoneme /t/ instead of English alveolar /t/. Acoustic

similarities between these two sounds may have prevented Spanish learners to judge the L2 sound as a totally new sound due to the L1 influence. Therefore, a new category is not created but the L2 sound is replaced with the nearest L1 phoneme. Moreover, it was also common among the 3 pairs of speakers that have been analysed to confuse the sound of aspiration in words such as "too" and "two" with another similar Spanish phoneme like /tʃ/ (also shared by the English phonetic system). The reason for this phenomenon may have been that as all these sounds share an occlusion, the succeeding aspiration could have been mistaken by the friction that characterises this last phoneme. As Flege predicts in his model, the VOT values of the plosives could be perceived as comparable to friction and therefore, classified in terms of L1 categories and replaced by an L1 resembling sound. Similarly, sequences of /tr/ and /tl/ or /pl/ in words such as "trousers" "bottle" and "apple" for example, were also inaccurately produced. NS speakers may have judged /tr/ sequence to be pronounced as 2 independent sounds instead of one articulated sound with an affricate allophone [tɹ]. In /tl/ clusters, participants included a vowel /e/ due to the fact that Spanish /t/ and /p/ do not usually precede a lateral sound in word final position. These sequences may sound strange for NS learners due to their phonotactic constraints and consequently, the L1 characteristics are negatively transferred to the L2.

Another analysed phenomenon among these speakers was the inconsistent pronunciation of /p t k/ in word final position. NS learners did not produce the final /t/ plosives in the context of "left side". However, this cannot be considered a mistake since in English the elision of /t/ at the end of a word is permitted when it is preceded by a voiceless sound and followed by a consonant other than /h/ (Estebas, 2012). Nevertheless, they also omitted final /t/ in isolated words such as "right" or "advertisement". Therefore, we could conclude that the elision of final /p t k/ was not done by following certain rules but by the influence of the lack of final /p t k/ in Spanish due to its phonotactic system. The findings for this phenomenon were unpredictable since speakers sporadically had a correct pronunciation. This inconsistency is part of a developmental stage of acquisition in which speakers are. Thus, further research on this field should be carried out to determine the rules that lead NS speakers to these errors.

Additionally, voiced plosives /b d g/ seem to pose problems for Spanish speakers too. Many different inaccuracies were found among the analysed learners. Initial /b/ and /g/ sounded quite similar to native speakers in words such as "behind", "boy", and "because", "golf" and "guess". However, if one objection should be raised it would be that they were fully voiced instead of devoiced. This allophonic difference may have been

motivated by the influence of the L1 in which these sounds are produced with vocal fold vibration throughout closure. Figure 2 shows how there was only one speaker who produced the word "beans" with a devoiced [b̥]. Therefore, the importance of the previously mentioned aspiration plays a significant role that helps native English speakers to distinguish minimal pairs such as "pin" and "bin". All these results support Flege's presumption of both systems being constantly engaged.
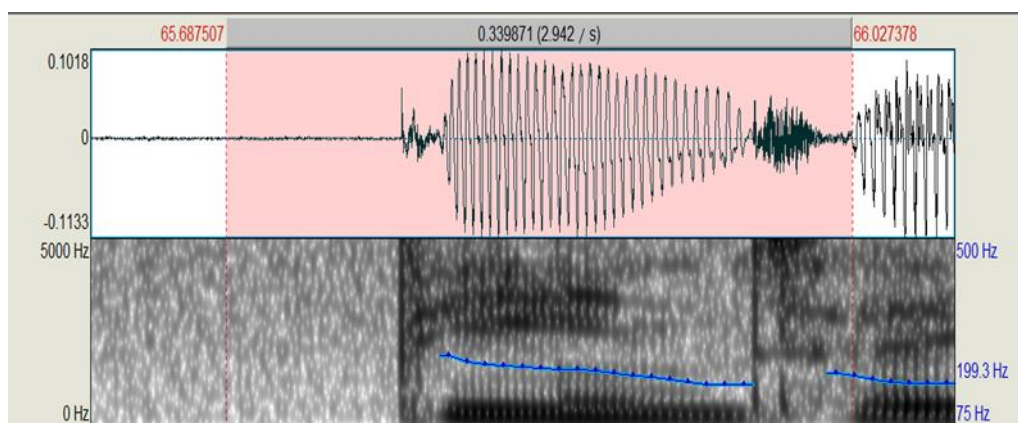

Figure 2: Spectogram of the word "beans" produced by speaker 3b.

Moreover, there were few occasions in which some of the Spanish speakers replaced the alveolar /d/ of English with the Spanish dental /d/ in isolated words like "day" "difference" or "down". Thus, as previously observed in the pronunciation of /t/, similarities between Spanish and English /d/ prevent learners from creating a new category for alveolar /d/. It is true that the greater the phonetic differences the more likely they will be perceived by learners but, factors such as orthography may also stop Spanish speakers from perceiving them.

However, this last error was not the most common one made by the analysed speakers. All of the learners exhibited a strong foreign accent due to the fact that they performed /b/ /d/ in "rubbish" "maybe" "window" or "sandals" with the inappropriate allophones, i.e. they used Spanish approximants [β̞] [ð̞]. Not only in medial position of a word but also at the beginning of words preceded by voiced sounds like in sequences "charity bring" or "and buy", /b/ was realised as an approximant [β̞]. Flege explains this phenomenon as a consequence derived from the introduction of L1 sound differences into the L2. That is, we could say that the differences between Spanish [b d g] in absolute

position and [β̞] [ð̞] [ɣ̞] between two voiced sounds are overgeneralized and consequently produced in English. In this way, the possible weakening of Spanish stops made learners produce English burstless plosives as approximants.

Considering these sounds at the end of a word, we could only discover results for /d/ and /g/. As in the pronunciation of /p t k/, we couldn't find consistent productions either. There were certain words such as "hand" or "behind" in which the final /d/ was not pronounced due to the cluster. But there were also other times in which speakers pronounced final /d/ like in "red" or "blood". The tendency to produce it varied even within the same speaker. When these sounds were produced, some participants replaced the final /d/ with /θ/ or /ð/. Similarly, speakers devoiced final /g/ and replaced it with the voiceless phoneme /x/ in words like "bag". This phenomenon is also present in the Spanish language due to the fact that the final position is very vulnerable and what is more, native Spanish speakers do not usually encounter other consonants but *n*, *s, l* or *r* at the end of a word. Therefore, it seems that it costs less effort to get rid of the voicing feature and produce a friction at the end of a word.

Not only was [β̞] pronunciation transferred in words with /b/ in initial and medial position but also it was employed in those words where the /v/ phoneme should be present. The majority of participants used the Spanish approximant [β̞] in words where [v] should be used, for example "available", "diving" or "seven". Speaker number 2a was the only one who produced words like "seven" or "pullover" with the corresponding [v] sound. However, collected data showed that this sound was well utilized if these words appeared isolated (maybe because of the degree of awareness) whereas if the phoneme /v/ appeared in a sequence of spontaneous speech it was mispronounced. Additionally, it was also confused at the beginning of words such as "very" where speakers instead of using [v] they substituted it for the plosive [β̞]. Paradoxically, at first sight it could be predicted that it would be easier to use the /v/ phoneme for the letter "v" as we tend to associate sounds with the spelling of words. However, as Spanish phonetic system lacks this sound, L1 orthography makes learners identify "v" with the pronunciation of the letter "b". Taking these examples into account, Flege's (1995) following assumption is strengthened: "contrasts between L2 sounds not present in L1 will not be discriminated" (p. 235). At the end of words like "have" "dive" or "five", /v/ was generally devoiced and realised as /f/ (see Figure 3 as an example).
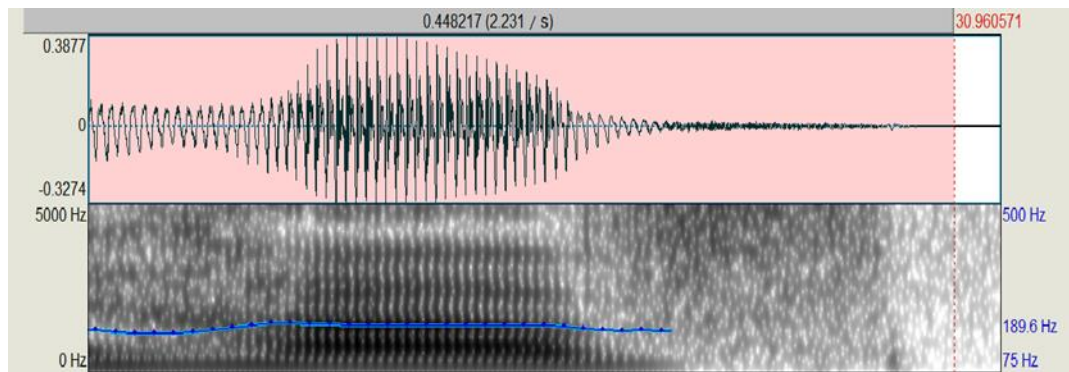
Figure 3: Spectogram of the word "have" produced by speaker 3a

Similarly, comparable mistakes in the contrast between /ð/ and /d/ were discovered. The phoneme /ð/ was generally mistaken by every single participant that took place in this analysis. Our results proved that Spanish speakers replace initial /ð/ with the plosive /d/ in function words such as "the", "there" or "that". We can conclude that /ð/ is not well produced due to the fact that it does not exist as a Spanish phoneme at the beginning of words but as an allophone between two sounds. Therefore, in support of SLM, we could say that NS speakers replace the L2 sound with the most similar L1 sound not creating a new category but assimilating in this case the phoneme /ð/ to the L1 /d/ category. Nevertheless, it is also arguable that learners may be aware of the differences between these two sounds but the degree of awareness that the sound implies in spontaneous speech is usually lacking among NS. It was found as well that /ð/ was confused with [ð̞] in medial position of words such as "other" or "another". Finally, the study found the mispronunciation of the word "with" where the final /ð/ is also fully devoiced and pronounced as /θ/, although we must not forget that this sound is possible in some English accents.

6. Conclusion

The analysis has focused on the examination of English plosives produced by native Spanish speakers in order to show how well Flege's Speech Learning Model explains the reasons for foreign accent.

On the one hand, it has been proved that auditory detectable differences between L1 and L2 sounds play an essential role for the following accurate production. Discerning

the differences between them is the basic premise for the formation of new categories for L2 sounds. As we have demonstrated, when speakers do not perceive the differences between [p] and [pʰ] the formation of a new category for [pʰ] is prevented and therefore, it is assimilated to the native category. As a result, the pronunciation remains foreign-accented and may cause native English speakers to misunderstand several words. In this sense, this study would support Flege's idea that the production of a sound corresponds to the one specified in the perceptual categories and as a consequence, it endorses that the perception precedes and leads to production.

This theory, thus, is based on the factor of perceived cross-language phonetic distance and maintains that the greater distance of an L2 sound from an L1 sound, the more likely the learner will be to create a new category and therefore, the more native-like will sound. However, the model does not explain how to measure the degree of perceived cross-language distance. It does not clarify the acoustic distance between Spanish [β̞] and English [v] that leads NS speakers to inaccurately produce the L2 sound [v]. For example, Best's model would explain this in terms of spatial proximity of constriction locations and active articulators and by similarities in constriction degree and gestural phasing (Best *et al,* 2007).

Moreover, the data analysed in this investigation has also shown that even though speakers perceived differences between L1 and L2 sounds, the created categories for these last ones do not guarantee that an L2 sound will be accurately produced. Some of the analysed speakers have noticed acoustic differences between [t] and [tʰ] but the production of [tʰ] was incorrectly replaced with the phoneme /ʧ/. Therefore the previous assumption of perception leading to production could be challenged. Furthermore, the model does not explain the degree of acoustic distance between the phoneme /ʧ/ and [tʰ] that has led speakers to mispronounce it. Taking these phenomena into account, we believe that this model is not enough to explain the reasons for foreign accent. It doubtlessly presents certain interesting hypotheses that may account for foreign accent but it does not consider other factors that have a central role in pronunciation.

The interference of spelling is a great influence in the acquisition of L2 pronunciation. Speakers of an L2 recognize the orthography of words and associate letters, in this case consonants, to the corresponding L1 phonemes. As we have demonstrated, it would be easier to associate the "v" spelling to the corresponding /v/ phoneme. However, the Spanish phonetic system lacks this sound since it is produced as a /b/. Therefore, learners identify English "v" spelling with Spanish "b" and consequently,

they substitute it with Spanish /b/ phoneme. Hence, L1 orthography acts like a "blinding" factor that prevents L2 speakers from discerning the phonetic differences between L1 and L2 sounds. Furthermore, we should also take into account the L2 phonetic instruction that learners have received, since as we have mentioned in previous sections, it is another factor that positively influences on the L2 pronunciation accuracy. Consequently, further study should be developed for intra- and inter- speaker variation.

In conclusion, this paper has tried to explain the causes of foreign accent by analysing the pronunciation of English plosive consonants by Spanish speakers. In this analysis, Flege's Speech Learning Model's suitability for a possible explanation has been investigated. However, as it has been observed, there are still many questions that remain unanswered so, it would be interesting to develop further research. To support future studies, it is important to notice that the DIAPIX-FL corpus offers the possibility to examine a broader set of phonetic features alongside other phenomena. This corpus can be found at http://datashare.is.ed.ac.uk/handle/10283/346.

References

Aoyama, K., Guion, S., Flege, J. E., Yamada, T., Akahane-Yamada, R. (2008). The first years in an L2 speaking environment: A comparison of Japanese children and adults learning American English. *International Journal of Applied Linguistics,* 46, 61-90.

Best, C. T. (1995). A direct realist view of cross-language speech perception. In W. Strange (ed.), *Speech Perception and Linguistic Experience: Theoretical and Methodological Issues in Cross-Language Speech Research*, 171–203. Timonium, MD: York Press.

Best, C. T. (2003). Cross-language perception of nonnative vowels: phonological and phonetic effects of listeners' native languages. En M. J. Sole, D. Recansens & J. Romero (eds.), P*roceedings of the 15 International Congress of Phonetic Sciences,* 2889-2892. Barcelona: Causal Productions.

Best, C.T., & Tyler, M.D. (2007). Nonnative and second language speech perception: Commonalities and complementarities. In M.J. Munro & O.-S. Bohn (eds.), *Second Language Speech Learning: The Role of Language Experience in Speech Perception and Production.* 13-34. Amsterdam: John Benjamins.

Boersma, P. & Weenink, D. (2017*). PRAAT: doing phonetics by computer* [Computer program]. Version 6.0.29, retrieved 28 April 2017 from http://www.praat.org/

Estebas,E.(2012). *Teach Yourself English Pronunciation.* La Coruña: netbiblo.

Flege, J. E. (1995b). Second-language speech learning: theory, findings and problems. In W. Strange (ed.), *Speech Perception and Linguistic Experience: Issues in Cross-Language Research.* 233-277. Timonium, MD: York Press.

Flege, J. E. & Eefting, W. (1987). The production and perception of English stops by Spanish speakers of English. *Journal of Phonetics,* 15, 67-83.

Flege, J. E., Frieda, E.M. & Nozawa, T. (1997). Amount of native-language (L1) use affects degree of perceived foreign accent. *Journal of Phonetics*, 25, 169-186.

Flege, J. E., Munro, M., & MacKay, I. (1995a). Factors affecting strength of perceived foreign accent in a second language. *Journal of the Acoustical Society of America*, 97, 3125–3134.

García Lecumberri, M.L & Cooke, M. (in press). *A Bi-directional Task-based Corpus of Learners' Conversational Speech.*

Gómez Lacabex, E. (2009). *Perception and Production of Vowel reduction in Second Language Acquisition.* Leioa, Spain. University of the Basque Country/Euskal Herriko Unibetsitatea

Guion, S., Flege, J. & Loftin, J. (2000). The effect of L1 use on pronunciation in Quichua-Spanish bilinguals. *Journal of Phonetics,* 28, 27-42.

Iverson, P. & Kuhl, P.K. (1995). Mapping the perceptual magnet effect for speech using signal detection theory and multidimensional scaling. Journal of the Acoustic Society of America, 99, 553-562.

Kuhl, PK; Iverson, P; (1995) Linguistic experience and the "perceptual magnet effect.". In: Strange, W, (ed.) *Speech Perception and Linguistic Experience: Issues in Cross-Language Research.* 121-154. York Press: Baltimore.

Major, R. C. (2001). Foreign Accent: *The Ontogeny and Philogeny of Second Language Phonology*. 81-156. New Jersey: Lawrence Erlbaum.

Piske, T., MacKay, I.R.A. & Flege, J.E. (2001). Factors affecting degree of foreign accent in an L2: A review. J*ournal of Phonetics* 29, 191-215.
rg, S. H. (1997). Minimal segments in second language phonology. In A. James & J. Leather (eds.), *Second Language Speech: Structure and Process.* 264-351. Mouton de Gruyter: Berlin.

Zhanming,W. (2014). Review of the Influence of L1 in L2 Acquisition. *CsCanada* 9, 57-60.