

# A study on auditory perception of tense and lax vowels of English as a FL by learners with Spanish as L1

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## ARTICLE INFO

## ABSTRACT

### Article history

Received 10 June 2023

Revised 27 August 2023

Accepted 02 September 2023

### Keywords

Spanish L1

Linguistics

English Vowels

Speech Perception

Different studies in the field of perception of second-language sounds (L2) suggest that English learners with Spanish as their mother tongue language (L1) are influenced by the sounds of their L1 to perceive the sounds in the L2. As a result, learners are not able to perceive speech sounds as they are in English, because they assimilate the sounds of the foreign language (FL) based on their L1 (Best & Tyler, 2007; Gibson & Gibson, 1955). The objective of this research is to explore the capacity of perception of tense and lax vowels of English (Standard British accent) in 8 high school students from two subsidised schools in Chillán and San Carlos, Chile. The age of the participants range from 15 to 18 years old. One auditory perception test was used: *An Identification Test was applied to measure the capacity of the participants to perceive lax and tense vowels: /i:/, /ɪ/, /æ/ and /ʌ/.*



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**How to Cite:** Bustos, J., Vignolo, F., & Vyhmeister, G. (2023). A study on auditory perception of tense and lax vowels of English as a FL by learners with Spanish as L1. *Teaching English as a Foreign Language Journal*, 2(2) 138-145. <https://doi.org/10.12928/tefl.v2i2.498>

## 1. Introduction

For some learners of a foreign language (FL), perceiving the sounds of other languages is usually difficult. Some authors suggest that the phoneme inventory may be different from one language to another (Akahane-Yamada, et al., 1996). The researchers Escudero and Boersma (2004), Flege et al. (1997), Iverson and Evans (2007) and Morrison (2002) proposed that Spanish native speakers (L1), perceive for instance /i:/ and /ɪ/ of English as /i/ of Spanish.

Studies indicate that Spanish speakers tend to assimilate tense-lax English vowels as sounds of their L1 (Flege et al., 1997, Fox et al., 1995; Iverson & Evans, 2007; Morrison, 2008). According to Pereira's hypothesis (2013), Chilean-Spanish speakers who learn English, struggle to perceive distinctions of vowels, such as the English /i:/-/ɪ/ contrast would be assimilated to Chilean-Spanish /i/, and the English /æ/-/ʌ/ would be assimilated to the Chilean-Spanish /a/.

Throughout the years there have been authors that had dedicated their academic lives to search for information to explain the perception of sounds of an L2. For instance, the Perceptual Assimilation Model (PAM) was proposed as an explanation of how monolingual older learners perceive sounds of an L2 (Best, 1993). Whereas, the Speech Learning Model (SLM) contrasts PAM as SLM explains the stages of sound perceptions (Flege, 1995).

PAM suggested that the assimilation process of an L2 is adjusted to the perception of nonnative phonemes of their L1, which can be different or similar to the L1 phonemes. This model is derived from the direct-realistic approach to perception which states that speech gestures are the central focus

attended by perceivers (Gibson & Gibson, 1955). The authors Best and Tyler (2007) made an update of PAM which consisted on finding evidence of processes related to speech perception of nonnative speakers considering late-learner speakers. Consequently, they extended PAM to L2 speech. Afterwards, the authors concluded that all the predictions of the assimilation categories can only be applied to monolingual and L2 learners immersed in the L2 culture. The researchers observed learners of an L2 learning the second language in the classroom knowing that outside of that educational context is not a chance to be exposed to the L2. This group of learners take the name of EFL learners (English as a foreign language). Therefore, after the inquiry of the importance of a learner with an L1 learning an L2 being immersed in a place of the L2 context when learning EFL, where the usefulness of quantity and quality of input must be provided by the interaction with native speakers of the L2 and in a context where the target language is spoken (Best & Tyler 2007). Soon after, the researchers of PAM clarified their findings of the L2 speech perception with the SLM (Flege, 1995).

The Speech Learning Model proposes (SLM) that L2 learners who had lived in the context of the target language and have had the opportunity to use the L2 present patterns that exist in the perception and production of the L2 (Flege, 1995). SLM suggests that not producing sounds of an L2 accurately would not help to perceive the acoustic characteristic of the L2 phoneme because perception and production are related. There are four statements on this model. The first one introduced by Flege (1995) states that human beings as they grow older never lose the mechanism and processes of the perception and production of the L1. Therefore, this capacity of processing new native sounds can be also used to acquire new sound categories of an L2. In the second statement, Flege (1995) demonstrates that phonetic categories are portrayed in long term memory, containing speech sounds information. The third statement presents that the changes of the phonetic categories, established by the experience of the native speaker, show an influence in both L1 and L2 sound systems. Lastly, the fourth statement portrays that in the cases where the sounds 'phonological space' is shared between an L1 and L2, it is more difficult for bilinguals to differentiate them (Flege, 1995).

PAM and SLM are always in an on-going process of refinement yet the strategy which children and adults use to learn an L2 is always different (Best and Tyler, 2007). There is a disagreement between SLM and PAM on the central idea of category formation sounds. The SLM suggests that speech perception is realized by auditory cues, and in PAM speech perception is realized by extracting invariants of articulatory gestures (Pereira, 2013).

The present study is focused on learners of English as FL in the Chilean context. According to the Bases Curriculares (2015), English classes must provide fundamental skills to respond to the different global changes and new technologies that have been implemented in recent decades and the cultural exchanges that have taken place. To keep up with the global changes, the Chilean Government demands English lessons from the 5th grade on. The Agencia de Calidad de la Educación in Chile (Decree 439) measures reading and listening comprehension skills in order to assess students' competences. Therefore, it could be inferred that having a good capacity to perceive English sounds, especially vowels, could benefit the listening skill (Bustos & Pereira, 2020). According to the Acquisition of a Second Language (ASL) it is required to practice the target language in the classroom to have a better perception of the target phonemes. Iverson and Evans (2009) propose that the auditory training has a positive impact on the identification of phonemes of an L2. Additionally, authors suggest that perceptual training is fundamental to improve the capacity of identification and production of the target language (Iverson & Evans, 2009; Iverson et al., 2012).

How pronunciation is taught has been the target of several researches, because it is believed that this improves the oral communicative skills of the learners (Baker, 2013). Additionally, researches corroborate that explicitly teaching pronunciation shows a positive output in students in the context of the ASL. Consequently, language teachers have been incorporating the teaching of pronunciation of the programs in their practices, based on the Communicative Language Teaching (Gordon, et al., 2013; Baker, 2013).

Research has shown that learners of a second language (L2) who start to learn an L2 at early ages are more advantaged when it comes to perceive and produce L2 speech sounds (Major, 1987; Flege, 1992; Munro, 1993; Jun & Cowie, 1994; Munro et al., 1996). Some authors studied a group of Italians who started to learn English when they emigrated to Canada. Piske, Mackay and Meador (2002) divided the participants of the study into two groups: Italian who started to learn the target language

at early ages and Italians who started to learn English at late ages. At first, the investigation aimed to study the speech production, but they found that the lack of exposure to the auditory input may affect the creation of new L2 categories in the L1 of the learner. In addition, HØjen and Flege (2006) explain that learners of a second language who have learnt the target language at early ages have an advantage over the ones who have learnt the L2 at older ages.

Different studies establish that the age of people exposed to an L2 affect the perception of sounds. For instance, individuals exposed to an L2 from an early age will have a similar perception of the language as a native speaker. However, learners whose first exposure to the L2 is during their adolescence or adulthood will struggle with the target language (Flege et al., 1999; Flege and MacKay, 2004; Yamada, 1995). The main difference between the Spanish and English vowel system is that Spanish only has 5 vowel sounds /a/, /e/, /i/, /o/, /u/, and English has around 20 vowel sounds, depending on the dialect region (Wood, 2019).

Based on these initial findings, we have started studying the speech perception of speech sounds on learners of a foreign language. The present study described the capacity of perception of tense and lax vowels of English as a foreign language (FL) by Chilean learners of English with Spanish as first language (L1).

## 2. Method

This study corresponds to a descriptive quantitative investigation in the area of Applied Linguistics, specifically the learning of the speech sounds of English as a foreign language (FL).

### 2.1. Participants

The participants were students of high school from two educational establishments (privately subsidised) in the Ñuble region. The number of students was 8, from these participants, 6 of them were female and 2 were male. The age of the sample ranges between 15 and 18 years of age.

### 2.2. Data Collection Instruments

To measure whether the participants had knowledge of the concepts used in the Identification Test, a Vocabulary Test was applied to validate the Identification Test. It was taken on paper by the participants in the classroom. To collect information about the capacity of the participants to identify the tense and lax vowels, an auditory Identification Test was applied. The accent used for the Identification Test was Standard British because students at school were exposed to this specific accent in listening activities rather than the American accent. The participants answered the Test by means of a computer program called Testing Perception (TP), this type of program is used to develop research focused on auditory perception. The program was installed in laptops from the researchers of this study. Therefore, each student had a laptop equipped with headphones.

### 2.2. Vocabulary Test

In order to design this test 72 words were used. There were 18 for each tense and lax English vowel. The selection of the concepts was based on minimal pairs between vowels. The vocabulary test was presented on a sheet of paper. The participants had 15 minutes to complete the test.

The participants had to see an image and select the option (a, b, c or d) they identified as correct. There were 12 control items in order to identify if the students were answering correctly. Some studies suggested that it is better to apply these types of tests in order to recognise the use of images and concepts in the design of the Identification Test: Auditory perception (Bustos & Pereira, 2020). **This type of test includes three types of modes (audio, audio-visual and video only) which allowed to measure vowel identification which was presented in the audio-visual mode for the purposes of the study.** In this test the participants did not receive any feedback. The responses of each participant were stored in an Excel file individually. In order to validate the Vocabulary Test, it was applied to a group of high school students with a B English level, information given by the English teacher of one of the schools studied, where the students were previously tested for external purposes.

### Identification test of English vowels

In order to design the Identification Test (ID) 72 words were used based on the results of the Vocabulary Test. There were 18 for each tense and lax English vowel. The selection of the images was based on the results of the Vocabulary Test in order to obtain 36 minimal pairs. There were three items at the beginning that the participants had to answer in order to get familiar with the test. Specifically, how to respond to the ID test. In addition, there were four control items in order to observe if the participants were responding correctly. The words were built based on the C-V-C (Consonant, vowel, consonant) composition. The sounds used in the test were created on the website [www.fromtexttospeech.com](http://www.fromtexttospeech.com). The voices in the audios were set at medium speed with British English accent, and were alternated between male and female voices.

This test was presented in the *TP* program. Before the participants began the ID test they had to write their names and select the option Start Identification Test. Afterwards, they had to select the correct image according to the word they perceived. At the moment they clicked on the selected image, the next stimulus was played. Every two stimulus, the students had to press Ok to move on to the following item. Some studies suggest that the participants could use their knowledge on vocabulary to answer to the ID test (Bustos & Pereira, 2020; Højen & Flege, 2006). At this test the participants did not receive any feedback and they had the opportunity to listen to the stimulus one time. The answers were stored with a participant code in an Excel file given by the *TP* program.

### 3. Finding and Discussion

The general objective of this research was to explore the capacity of the auditory perception of tense and lax vowels (four monophthong vowels) of English that have learners of English as a foreign language with Spanish as their mother tongue language. The means of the group for each tense and lax vowel suggest that the participants of this study have a high capacity to perceive the vowels of English, using the Identification task. Some previous studies suggest that learners only need to know the vocabulary to identify the stimulus (audios) in the Identification Test. In order to measure the capacity of the participants to identify vowels, one Auditory Perception Test was applied (Identification Test). For the analysis of the results the Statistical Package for the Social Sciences (SPSS) was used. The total mean of the group was 68.7% of correct answers, the variability of the results goes from 44% to 94%. Table 1 shows the means (percentage of correct answers) and standard deviation per vowel (four vowels) obtained from the 8 participants of the study. In Table 1, it can be observed that the vowel /æ/ obtained the highest percentage of correct answers and the vowel /i:/ obtained the lowest percentage of correct answers.

Table 1. Result of the Identification Test: Percentage of correct answers per vowel and standard deviation for the 8 participants of the study.

Vowels	Mean (% correct answers)	Standard Deviation
/æ/	72.1	13.4
/^/	70.7	15.6
/i:/	64.5	10.4
/ɪ/	67.5	6.8

It can be observed at the Identification Test there is a group of vowels (/æ/ and /^/) that is easier to perceive using this type of task (Identification) based on the mean of the group (M: 68.7%). Previous studies suggest that learners need to know the concepts to complete the Identification Test (Iverson et al., 2012), the knowledge of the participants on the vocabulary used in the ID Test could benefit the perception of the words. It means if the participants' knowledge is high in concepts, he or she obtains better results. In addition, some research indicates that the reason for the highest scores for the lax

vowel /æ/ (72.1%) could be due to the distance between the English lax vowel /æ/ and the Chilean Spanish vowel /a/ (Hawkins & Midgley, 2005; Sadowsky, 2012).

In Table 2, the results of the contrast of the means (percentage of correct answers) for each pair of vowels are shown, using the Student's t-test based on the means obtained by the 8 participants who completed the Identification Test.

Table 2. Identification Test: contrast between tense and lax vowels.

Vowels	t	gl	P
/æ/ - /ʌ/	0.237	7	0.819
/ɪ/ - /i:/	0.709	7	0.501

On one hand, Bohn (1995) suggests that L2 learners use the features of the vowels (duration) to perceive differences between tense and lax vowels. Although the results for the pair /ɪ/ - /i:/ are not significant, the lax vowel (67.5%) obtained higher scores than the tense vowel (64.5%). The participants of this study could not use the duration strategy to identify the tense vowel for the pair /ɪ/ - /i:/. Even though, Gibson and Gibson (1995) suggest that the English vowel /i:/ could be easily perceived because it shares analogous features with the Chilean Spanish vowel /i/ for this pair of vowels the results suggest the opposite. On the other hand, Best and Tyler (2007) suggest that this process is based on the assimilation of two phonemes of the L2 to one phonemic category of the L1, it means the participants assimilated the lax vowel for the pair /ɪ/ - /i:/ to the Chilean Spanish vowel /i/. Finally, Flege (1993) suggests that the distance between vowels could benefit the identification of the vowel. However, the English lax vowel /ɪ/ (67.5%) is not as close to the Chilean Spanish vowel /i/ as the English tense vowel /i:/ (64.5%) (Hawkins & Midgley, 2005; Sadowsky, 2012).

For the contrast between the vowels /æ/ - /ʌ/, the lax vowel /æ/ was easier to perceive than the lax vowel /ʌ/ at the Identification Task. Some authors compare the formants (F1, F2) of the English vowels and the Spanish vowels (Hawkins & Midgley, 2005; Sadowsky, 2012). Based on what is described for this group of participants, if the English vowel /ʌ/ is close to the Spanish vowel /a/ the learners do not perceive the vowel in the FL.

#### 4. Conclusions

The aim of this study was to explore the capacity of perception of the English vowels by learners of English as FL with Spanish as L1 using one type of task: Identification. The results of the Identification Test show that the capacity of the participants to perceive tense and lax English vowels is high. The results for each vowel are above 50% (percentage of correct answers). The results evidence that the participants did not present a great deal of problems perceiving the vowels /i:/, /ɪ/, /æ/ and /ʌ/. The reason may be that they were already familiarised with the vocabulary words used in the Identification Test. Since the vowels /æ/ & /ʌ/, and /i:/ & /ɪ/ are close in the phonetic-phonological space of the Spanish vowels, it is easier for English learners to perceive those vowels. However, the results of this study for this group of participants differ because they suggest that it is easier for this group of learners to perceive these English vowels when the lax vowel /æ/ and lax vowel /ɪ/ are not close based on the phonetic-phonological space between the FL and L1.

The contribution of this study to the field of the perception of the speech sounds of English as a FL by learners with Spanish as L1 is that researchers could make use of technologies such as the TP programme to measure the capacity of participants to perceive speech sounds and work accordingly. In the educational Chilean context, this study contributes to the job of the English departments in schools. It would be helpful for them to know which vowels students struggle the most with, specifically with Very Young Learners (VYL), so that language teachers could modify teaching strategies (implicit or explicit), the design of classes (Levels) and material selection (ICTs) to teach phonemes according to the auditory perception problems of the learners of English as FL.

Even though, this study attempts to present information to explain the phenomena that occurs in the field of the perception of the speech sounds of English as a FL by learners with Spanish as L1, it is impossible to make general assumptions. The results of this study contribute to explain the phenomena which occur in the field of the speech perception of English speech sounds. It would also be interesting to train teachers in the development of evaluation material for the perception of English sounds as L2 and perceptual training. In this way it could address the problem of perception and production deficits of the sounds of English as L2, of the use of material that respects the individual needs and that supports the acquisition process of sounds of an L2.

#### Acknowledgment

We would like to acknowledge the teachers with whom we had various discussions to help plan and design the inner speech checklist content in this study. We would also like to acknowledge the students who participated in the study and provided opinions about the checklists.

#### Declarations

- Author contribution** : We are responsible for the entire research project, from initiating the ideas to revising the manuscript.
- Funding statement** : No funding is available for this research.
- Conflict of interest** : We declare that we have no competing interests.
- Ethics Declaration** : We as author acknowledge that this work has been written based on ethical research that conforms to the regulations of our university and that we have obtained permission from the relevant institutes when collecting data. We support TEFL Journal in maintaining high standards of personal conduct and practicing honesty in all our professional practices and endeavors.
- Additional information** : No additional information is available for this paper.

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