L3 ACQUISITION: DOES IT FOLLOW LANGUAGE ORDER OR LANGUAGE PROXIMITY?

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ABSTRACT

There is still a lot we do not know about L3 acquisition of sounds. Assuming what the L2LP model (van Leussen and Escudero, 2015) teaches, L3 learners will fully transfer the perceptual space of one of their languages and shape it to the new L3. While different factors could contribute to the choice of transferring the L1 or L2 percepcutal space, there are two which seem particularly central: language proximity and language order. This study aims to learn what factor does the L3 learner consider more influential. Thirty advanced bilinguals (15 L1 English, L2 Spanish; 15 L1 Spanish, L2 English) who were early learners of Korean completed a discrimination task and a reading aloud task so to learn what perceptual space were they fully transfering when restructuring it into their new language.

Keywords: L3 acquisition, phonetics, vowels, language proximity, language order

1. INTRODUCTION

Speech is one of the unique features of human beings. In fact, before the 28th week of gestation, human babies hearing system is already operational [1]. As soon as we are born, we count with the ability to discriminate phonetic contrasts of all languages: universal speech perception [2]. Through sensory language and statistical learning, among others, they acquire language-specific speech perception by the age of six months, and are able to produce language-specific speech sounds by the age of ten months [2].

However, there is a countless amount of factors that modify the canonical timeline of acquisition and production of sounds. In the case of bilinguals, early learners of two languages need to detect language-specific patterns so to properly produces the sounds of each language. On the other side, late bilinguals, sometimes described as those who learn their second language by the age of 7, the acquisition of sounds seems to work differently. Here, we will follow what the Second Language Linguistic Perception Model (L2LP) assumes: late learners fully copy their L1 perceptual system and adjust it when necessary so to fit the L2 sounds [3].

Similarly, the picture can get more complex when diving into the polyglots context. In 2022, one-quarter (24.7%) of working-age adults (defined here as people aged 25-64 years) in the EU reported that they knew 2 foreign languages, but also 12.3% stated knowing 3 or more [4]. Regardless of these numbers, the theoretical background of L3 acquisition of sounds is still behind [5]. This study aims to expand the L2LP to L3 learners by analyzing two of the most prominent factors that seem to favor the fully transfer of the L1/L2 perceptual systems into the new L3 system so to modify it with the new L3 categories. The factors this paper considers are language proximity and language acquisition order. Lastly, given that most of the L3 research includes only Indo-European languages [5], this study includes a Koreanic language: Korean.

2. LITERATURE REVIEW

2.1. L2 Acquisition of Sounds

L2 acquisition of sounds is a widely researched field, including multiple models that diverse from each other in both their conclusions. In this study, the model adopted is the L2LP [3]), which states that the acquisition of sounds is perceptually driven, and deals with the contrasts of the sounds in the languages. The L2LP assumes that L2 learners create a L2 perceptual system by fully copying the L1 system. During the initial stages of learning the L2 phonological system, the learners can encounter three learning scenarios:

- Similar Scenario: the L2 categories match those of the L1, and the learner only needs to briefly adjust the boundaries of the sounds. This is seen as a relatively easy scenario for the learner.
- New Scenario: the L2 categories do not match

those of the L1, and the learner needs to form new phonetic categories. This is seen as a hard scenario for the learner.
- Substet Scenario: the L2 categories are mapped to multiple L1 categories. This is seen as a hard scenario for the learner.

As a result, the L2LP assumes that the phonological systems of both languages are separated and only activated when selected. The learners moves from the initial to the developmental and to the end state through L2 learning experience [5].

2.2. L3 Acquisition of Sounds

Although the L2LP does not predict how do the L3 learners develop a third perceptual system, or if they do so, researchers have adjusted their assumptions and investigated L3 acquisition of sounds adapting them [5]. Regardless of not having a great amount of models to understand this phenomena, what remains clear is that L3 acquisition is more complex than L2 acquisition, for the significant factors considered when talking about bilinguals are more tangled in the case of multilinguals. Wang and Nance [5] reviewed the L3 phonological acquisition experimental and theoretical studies published up to date, identifying the following factors that contribute to the transfer from the L1 and/or L2 into the L3 in terms of perception and production:

- Language proximity
- Proficiency
- L2 status
- L3 experience

In the case of language proximity, here it is understood as the degree up to which two or more languages are similar in terms of typology, sounds and grammar, among others. For instance, two languages belonging to the same linguistic family might be closer, such as Spanish and French, both being Romance languages. However, Spanish and English might be less close, for English is a Germanic language. Ringbom and Jarvis [6] indicate that L3 learners tend to elicit more cross-linguistic transfer between languages when those are more similar. For instance, Liu et al. [7] studied the acquisition of voiced/voiceless stops in CH-EN bilinguals who were learning different L3s (Japanese, Russian, and Spanish). In a discrimination task, they found that the difficulty in perceiving L3 voiceless stops was related to the similarity in the phonemic range of the learner's L1 and L2.

Regarding proficiency, research needs to specify if it is L1, L2 or L3 proficiency that is taken into account. Here, the level of proficiency considered is that of the three languages. Others have already focused on reviewing the impact of the proficiency in L3 learning. Cal and Sypianska [8] measured the interaction between the level of proficiency of the L2 and L3 in PO-EN bilinguals learning Spanish. In a word reading task, the participants produced all Spanish vowels /a, e, i, o, u/. The results indicated that the role of the L2 and L3 proficiency interacts with how each vowel is produced.

2.3. Vowel Sounds

While language proximity and proficiency are the factors analyzed in this study, it is important to remark what linguistic trait the article reviews. In this case, we have chosen vowel sounds. Language acquisition of vowels is relevant for infants, who extract and generalize repetition-based structures through the vocalic tier [9], but also for those who need to learn foreign vowels, more specifically distinguishing the contrast between their L1 and the learning languages.

When considering the common classification of vowels (tongue height, backness and lip rounding; [10]), along with the number of vowel sounds, there are significant differences between Spanish, English and Korean. While Spanish is a small system with 5 vowel sounds, English counts on a dense vowel space (12 vowel sounds). Korean, however, sits somewhere in the middle, closer to English in terms of numbers, for it is usually described as having 8 vowel sounds.

More specifically, all vowel sounds overlap across Spanish, English, and Korean. For instance, the sounds /e/ and /u/, as shown in tables 1 and 2. All of them are relatively high-frequent, although /e/ might show slight differences, for it tends to appear as the diphthong /eɪ/. On the contrary, English and Korean share some sounds that Spanish does not.

Language	Word	Meaning (English)	IPA
Spanish	mesa	table	/mesa/
English	bait	bait	/beɪt/
Korean	bae	pear/boat	/pɛ/

Table 1: Examples of words containing the vowel /e/ in Spanish, English, and Korean (romanized).

The sounds /ɛ/ and /ʊ/ are absent in Spanish but present in English and Korean. This distribution can be seen in table 3. As such, these four vowels can be used to learn about the L3 acquisition factors that influences the choice of what language to transfer the sounds from, an L1 or L2. In this case, Spanish-English bilinguals learners of Korean would need to

Language	Word	Meaning (English)	IPA
Spanish	luna	moon	/luna/
English	boot	boot	/but/
Korean	mu	radish	/mu/

Table 2: Examples of words containing the vowel /u/ in Spanish, English, and Korean (romanized).

create a new sound category for the Korean vowel if they are fully coping the Spanish system, but it would not be needed if they were to copy the English system. Here, the factors considered earlier, such as language proximity and proficiency might shape this process.

Vowel	Language	Word	IPA
/ɛ/	Spanish	—	—
/ɛ/	English	bet	/bɛt/
/ɛ/	Korean	sae (bird)	/sɛ/
/ʊ/	Spanish	—	—
/ʊ/	English	cut	/kʊt/
/ʊ/	Korean	eo (interjection "uh")	/ʊ/

Table 3: Examples of the vowels /ɛ/ and /ʊ/ in Spanish, English, and Korean (romanized).

3. THIS STUDY

This study reviews L3 acquisition of sounds and asks what perception system does the L3 learner fully copy, that of the L1 or the L2, and what factor plays a stronger role in this transfer. For this, the research question is (RQ1) what weights more in L3 sounds acquisition: language order or language proximity? It is hypothesized that (H1) bilinguals learning a new L3 fully transfer the perceptual space of the most similar language, regardless of the acquisition order of the L1 and L2. It is predicted that (P1) in terms of perception, participants will identify the sounds as belonging to the most similar language, regardless of the order of acquisition, and that (P2) in terms of production, participants will produce vowel sounds closer to the most similar language, again, regardless of the order of acquisition.

4. METHODS

4.1. Participants

30 advanced late bilinguals participated in the study. There was a first group of 15 L1 English, L2 Spanish participants (mean age = 20.3 years) and a second one of 15 L1 Spanish, L2 English participants (mean age = 21.7 years). All participants had acquired their L2 in a foreign language classroom setting (mean AoA = 19 years), and reported having lived in a L2-speaking country for at least two years. Participants were undergraduate students at Rutgers University at the moment of completing the study, and received course credit after participation.

Given that previous research shows that beginner L3 learners are more prompt to notice the acoustic contrasts between their languages [11], participants were early learners of the L3. Aside of their main two languages, all participants were enrolled in a Introduction to Korean II course as third language. Participants were at the end of the second semester taking the course. No participants reported knowing another language.

4.2. Materials

4.2.1. Screening Tests

To determine eligibility for the study, participants completed a brief online survey before conducting the experiment. To assess their bilingual profile, participants completed an adaptation of the Language and Social Background Questionnaire (LSBQ, [12]) and the LexTALE, ([13]).

The LSBQ [12] is a self-reporting tool that assesses language use across various contexts, language proficiency in multiple skills, age of acquisition, and language switching and mixing. Its full version contains 62 items. Participants completed the adaptation of the LSBQ in their L1. Its completion should take around 15 minutes.

The LexTALE [13] is a proficiency test containing 60 items. Generally designed to screen bilinguals, participants have to decide whether the word they see is a real word or not (Yes/No decision). It is a reliable and valid test, created for English and adapted into other languages [13]. Participants completed the LexTALE in their L2 and Korean. The test should take approximately 10 minutes per language to complete.

4.2.2. Discrimination Task

Participants completed a discrimination task so to evaluate their vowels perception. Materials included 30 pseudo-artificial Korean words containing the vowel sound /ɛ/, 30 pseudo-artificial Korean words containing the vowel sound /ʊ/, and 30 pseudo-artificial Korean words containing the vowel sound /e/. The words containing /ɛ/ and /ʊ/ were target words, for they included vowel sounds shared with

English and Korean. The words with the /e/ sound were used as distractors, for that sound appears in the three languages. Distractors were not considered in the statistical analysis. Words were divided into two different blocks, each containing 20 words from each vowel sound. Words were recorded by a professor from the department of Korean at Rutgers University.

4.2.3. Reading Aloud Task

Participants completed a reading aloud task so to evaluate their vowels production. Materials included 20 Korean words containing the vowel sound /u/, which were embedded into carrier phrases, such as example, and 20 Korean words containing the vowel sound /u/, which were also embedded into carrier phrases with the same structured. Words were matched for length, frequency, and controlled for difficulty. Four professors from the department of Korean at Rutgers University graded the words' difficulty on a scale from 1 to 5. Those words which received a score of 3 or higher were discarded and new ones were included, which were also graded for difficulty. Sentences were divided into two different blocks, each containing 10 sentences from each vowel sound.

4.2.4. Procedure

Before conducting the experiment, participants were tested for eligibility into the study. Participants completed online the LSBQ and LexTALE in their L2 and Korean. Once eligibility was confirmed, participants signed the consent form and were accepted into the study.

First, they were welcomed into the RAP lab at Rutgers University. Then, they were instructed to sit comfortably in a chair and completed the Discrimination Task. While giving instructions, the person conducting the experiment used both English and Spanish to favor a bilingual mode environment. The participants were told that they would listen to Korean monosyllables and, as soon as hearing them, would need to decide if the words sounded more English-like or Spanish-like. Words were presented in a Apple monitor with a white background and on black Arial 11 font. Participants then completed three practice trials, which were not included in the experimental trials. Then, the task started. After finishing the two blocks, participants were invited to take a brief rest.

After resting for a few minutes, participants completed the Reading Aloud Task. This time, participants went to a sound-attenuated booth where they could seat comfortably in front of a screen. They also had a table-mounted microphone to record their speech. Participants were instructed to read as naturally as possible each phrase. Following [14], participants were asked to male a pause at the word boundary so to reduce as much as possible the effects of the surrounding phonological context.

4.2.5. Acoustic Analysis

The Korean words produced in the Reading Aloud Task were manually segmented in Praat. Praat scripts were used to divide each participant's recording into individual files for each target item, creating a text grid for each token, and normalizing the peak intensity. Then, each vowel type was added manually into the text grid. Finally, another Praat script was used to extract formant values at the vowel midpoint for each token and written into a .csv file.

4.2.6. Statistic Analysis

In the case of the Discrimination Task, a perception model was fit. The response type was taken as a sound sensitivity measurement. Using R [15], responses were categorized by vowel type and then divided between true positives (participant is able to recognize the sound as belonging to their similar language), or false negative (participant is not able to recognize the sound as belonging to the most similar language). The sensitivity measure was calculated then with the following formula [16]:

$$Sensitivity = \frac{TruePositives}{TruePositives + FalseNegatives}. \quad (1)$$

For the Reading Aloud Task, a production model was fit. Formant values were compared within-subjects and identified as more L1- or L2-like. Although proficiency was controlled, an extra model for both perception and production was fit includingn it so to measure its effect.

4.3. References

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