

Speakers' Intuitions about L2 Syllable Structure: Diphthong vs. Hiatus Resolution in Spanish by English-Speaking Learners

Germán Zárate-SándeZ
Georgetown University

1. Introduction¹

Research on L2 syllable structure goes back to Tarone (1980, and elsewhere). Her work and subsequent studies focused mainly on the acquisition of consonantal segments in onsets and codas. Much less is known, however, about syllabic nuclei in second language (L2) phonology. The goal of this paper falls within this area; specifically, it deals with L2 learners' intuitions about the resolution of vocalic sequences as diphthongs or hiatuses in Spanish. A relatively large body of literature has looked at this process but only within the area of Spanish as a first language (L1), while second language acquisition research has paid little attention to parallel processes. The present study draws from these two research areas in an attempt to advance our understanding of interlanguage forces that shape L2 phonology.

2. Review of the Literature

2.1. Diphthongs in Spanish

One major challenge for general phonological theory has been to describe the nature of diphthongs. Syllabicity—that is, tautosyllabicity—is crucial in the identification of a diphthong as such. However, the question is whether these sequences constitute one or two phonological units. In fact, languages and their native speakers seem to disagree as to how they perceive what phonetically clearly constitutes two vocalic targets. For instance, most English speakers would claim to hear—and to produce—one vowel sound in words like *day* /deɪ/ while Spanish speakers would probably identify two sounds in a phonetically similar sequence, such as *seis* /seis/ 'six'. In short, from a phonetic perspective, diphthongs contain two vocalic targets, but this does not always map on the phonological status of these targets (for a thorough review of these and related issues, see Sánchez Miret, 1998).

As will become evident in the description that follows, Spanish does not escape the complexity, variation, and exceptionality of diphthongs. Its phonological system contains five pure vowel sounds: high vowels /i/ and /u/, mid vowels /e/ and /o/, and a low vowel /a/. Spanish phonotactics predicts that these vowels can be combined in at least two ways: 1) a diphthong (two consecutive vowels in the same syllable) when one of the vocoids is an unstressed [+high] vowel: /i/ as in *avión* [a.βjón] 'airplane' or /u/ as in *agua* [á.ɣwa];² or 2) a hiatus (two consecutive vowels in different syllables) when neither vowel is /i/ or /u/, for example *ae* in *traer* [tra.ér], 'to bring'. If the [+high] vowel is stressed, the vowel sequence automatically results in a hiatus as well: compare *diablo* [djá.βlo] 'devil' vs. *día* [dí.a] 'day', and *baile* [bái.le] 'dance' vs. *país* [pa.ís] 'country'. The obligatory written accent actually signals the absence of the otherwise expected diphthong. In short, the rule for

¹ I would like to thank Ronald Leow, Alfonso Morales-Front, Lee M. Penyak, Cristina Sanz, and the audience at SLRF 2009 for their comments on previous versions of this paper. The suggestions from two anonymous reviewers have greatly improved this paper as well. All remaining weaknesses and errors are mine.

² Transcriptions only have basic allophonic detail and they represent a more or less standard articulation, though not necessarily associated with a particular dialect. An acute accent has been placed on the stress-bearing syllabic nucleus. Also, I will follow the more traditional differentiation between [+high] vowels as the first and as the second element of the diphthong, and transcribe them as [j], [w] and [i̯], [u̯], respectively.

diphthong formation in Spanish can be synthesized in what Hualde (2005) calls the ‘gliding rule’ (p. 80):

(1) Gliding rule:

/i/, /u/ → [i̯], [u̯] if adjacent to a different V and not stress-bearing

This rule applies both when the high vowel is the first vocoid in the diphthong (henceforth V1), forming a sequence of rising sonority, and when it is the second vocoid in the diphthong (henceforth V2), resulting in a sequence of falling sonority.³ The list in (2) presents all possible configurations of rising and falling diphthongs in Spanish:⁴

(2) Rising Sonority

| | | | |
|------|-----------------|--------------|------------|
| /ia/ | <i>viaje</i> | [bja̯.xe] | ‘trip’ |
| /ie/ | <i>diente</i> | [dje̯.nte] | ‘tooth’ |
| /io/ | <i>pasión</i> | [pa.sjo̯n] | ‘passion’ |
| /ua/ | <i>suáve</i> | [swá.βe] | ‘soft’ |
| /ue/ | <i>bueno</i> | [bwé.no] | ‘good’ |
| /uo/ | <i>virtuoso</i> | [bir.twó.so] | ‘virtuous’ |

Falling Sonority

| | | | |
|------|--------------|-----------|------------------------------|
| /ai/ | <i>naípe</i> | [ná.i.pe] | ‘card’ |
| /ei/ | <i>reino</i> | [ré.i.no] | ‘kingdom’ |
| /oi/ | <i>boina</i> | [bó.i.na] | ‘beret’ |
| /au/ | <i>causa</i> | [ká.u.sa] | ‘cause’ |
| /eu/ | <i>deuda</i> | [dé.u.ða] | ‘debt’ |
| /ou/ | <i>bou</i> | [bou] | type of fishing ⁵ |

There are, however, exceptions to this rule. First, we often find diphthongs when we should expect a hiatus. For example, some Spanish dialects, especially in Latin America, tend to reduce the sequence of two non-high vowels to a diphthong, as in *golpear* [gol.pe.ár] > [gol.peár] ‘to knock, to hit’ or *toalla* [to.á.ja] > [toá.ja] ‘towel.’ Actually, speakers of these dialects can also go a step further and raise the unstressed mid vowel to articulate the glides [j] and [w]: [gol.peár] > [gol.pjár], [toá.ja] > [twá.ja]. Second, we also encounter the opposite situation, that is, the presence of a hiatus where the rule would predict a diphthong. These instances are commonly referred to as ‘exceptional’ hiatuses since the hiatus occurs even though the [+high] vowel is not stressed (Hualde & Prieto, 2002; Navarro Tomás, 1968; among others). As in the case of unexpected diphthong formation, there seems to be a good amount of dialectal and even idiolectal variation in the behavior of exceptional hiatuses. For example, Spanish speakers uniformly produce a diphthong in the sequence *ie* and *ue* when they correspond to the so-called historical diphthongs, derived from vulgar Latin mid-open front /e/ and back /o/ vowels in stressed position, as in [bjé.xo] and [pwér.ta], respectively. The same sequence, however, may alternate between a hiatus and a diphthong when it does not correspond to the historical diphthong, as shown in (3).

| | | |
|-------------------|-------------------------|-------------------|
| (3) <i>riendo</i> | [ri.én.do] or [rjén.do] | ‘laughing’ |
| <i>bienio</i> | [bi.é.njo] or [bjé.njo] | ‘two-year period’ |
| <i>actué</i> | [ak.tu.é] or [ak.twé] | ‘I acted’ |

In cases like *riendo* and *actué*, the exceptional hiatus is believed to result from a paradigmatic influence, that is, the same vocoid is accented in a related word: compare *riendo* and *rien* [ri.en] ‘they

³ This gliding rule also allows for diphthongs of equal sonority: /ui/ and /iu/ as in *cuidar* [kwi.ðár] ‘to take care’ and *triumfo* [tɾjúm.fo] ‘triumph.’

⁴ Only diphthongs in stressed syllables are listed, but actually, diphthongs in Spanish can appear both in a stress-bearing or unstressed position within the word.

⁵ This sequence is rare and only appears in a handful of words, most of which are loans from other languages (particularly Catalan). It is quite common, however, as a result of resyllabification in word boundaries, e.g.: *tengo un amigo* [tén.gou.na.mí.yo] ‘I have a friend.’

laugh', or *actué* and *actúo* [ak.tú.o] 'I act'. As for cases like *bienio*, the hiatus arises since it coincides with a morphological boundary. Similar cases are *ant*[i.á]cido 'antacid' or *us*[u.á]l 'usual'.

The field of Spanish linguistics enjoys a long line of research into diphthongs and diphthongization. In the phonetic realm, Borzone de Manrique (1976) has been one of the pioneer studies to examine Spanish diphthongs from an acoustic perspective. Her spectrographic analysis of /i/ and /u/ in diphthongs showed that when they appear in absolute initial position they are articulated with greater closure and lower intensity than when they appear in other positions. Also, Borzone de Manrique (1976) and Aguilar (1999) found acoustic evidence that hiatuses in Spanish are longer and have a more pronounced curvature in the F2 trajectory than diphthongs. More recent studies have introduced acoustic analysis also when looking at the effect of social variables such as register (level of formality) on the preference for diphthong formation (Garrido, 2007).

As for the phonological arena, research has shown that for the most part issues of syllabification and exceptional hiatuses seem to be resolved straightforwardly in the native phonology; that is, native speakers of the same dialect tend to have clear intuitions as to what constitutes a diphthong (e.g., Hualde, 1991), though idiolectal variation is always at play. Cabré and Prieto (2006), for example, examined how native speakers of Spanish, coming from four different regions of Spain, syllabified Spanish words containing vocoid sequences of rising sonority. The authors found that, compared to previous studies, more speakers have generalized the presence of a diphthong even in contexts previously described as unfavorable for diphthong formation, as word-initial syllables (e.g., 'piano,' pronounced as [pja.no]). However, they also found that morphological boundaries (adjectival, as in *soc*[i.á]l 'social', and verbal, when the [+high] vowel receives stress somewhere else in the paradigm, as in *act*[u.á]r 'to act') still tend to block glide formation among these speakers. The work by Hualde and Prieto (2002) constitutes a good example of how speakers' intuitions about syllabification coincide—or not—with acoustic measures of their production. They looked at the sequence /ia/ and found that participants, all speakers from Madrid, tended to syllabify this sequence following certain lexical contrasts predicted by the authors (e.g. *los vac*[i.á]mos 'we empty them' vs. *los sac*[já]mos 'we sate them'). Furthermore, they found acoustic correlates (longer duration) for intuitions favoring hiatuses.

To conclude, it seems that, despite the increasing amount of research in the field, the degree of dialectal variation makes it difficult to draw generalizations for the behavior of Spanish diphthongs within the language as a unit, particularly when it comes to exceptional hiatuses. On the one hand, some recent research seems to suggest that Spanish speakers are increasingly producing diphthongs in dialects and phonetic environments previously described as rather impervious to diphthong formation, which implies that some exceptional hiatuses are becoming diphthongs and thus conforming to the expected norm (e.g., Cabré & Prieto, 2006; Hualde, Simonet, & Torreira, 2008). On the other hand, we still find studies showing the persistent effects of dialectal variation and other linguistic constraints in shaping the direction of diphthong versus hiatus resolution in Spanish (e.g., Beritognolo, 2008; Garrido, 2007).

2.2. *Transfer and the Study of Interlanguage Phonology*

The notion that L1 phonological features can affect L2 acquisition was probably first formalized in the influential work by Lado (1957). His Contrastive Analysis Hypothesis (CAH) stated that L2 errors (phonological and others) would be expected—or 'predicted'—in those areas where the systems differ, due to negative transfer from the L2, while shared features would positively transfer directly to the L2. In subsequent years, however, scholars such as Eckman (1977) challenged the tenants of the CAH, and claimed that they were flawed because the mere attempt to measure the level of difficulty between the L1 and L2 overlooked the fact that there are linguistic universals that run across languages. Based on this observation, Eckman proposed his Markedness Differential Hypothesis (MDH, Eckman, 1977, and elsewhere), which predicts that more marked features in the L2 will be acquired later than the less marked version. Approaches like the MDH made a big leap in the understanding of interlanguage phonology in the sense that they attributed phonological development not only to L1 and L2 differences (causing *interference errors* due to the L1) but also to universal patterns of acquisition (causing *developmental errors*, similar to those made by native speakers when acquiring their L1).

2.3. *The Acquisition of L2 Syllable Structure*

One of the motivations for this study is that, to the best of my knowledge, there are very few publications where the acquisition and use of diphthongs by L2 learners is the main research objective. This topic has only been treated peripherally in the literature dealing with the acquisition of segments or syllables (see Lord, 2005, for an example of L2 Spanish). Most of these studies concentrated on how pronunciation errors in the L2 output could be attributed to processes such as epenthesis, deletion, and feature change. Therefore, with the goal of better understanding and predicting the behavior of participants in this study, I present a brief overview of the SLA work done in this area.

Syllable structure acquisition has been quite a productive area of inquiry within SLA and one of the first fields to provide empirical support for the existence of an interlanguage, as is the case of Tarone's seminal work (1980). She studied the syllable structure in the production of English learners from three different L1s. Tarone observed that some errors in the L2 syllable structure were the result of simplifications in favor of open syllables, which could not be attributed to transfer. She accounted for this fact by proposing a tendency among L2 learners to produce CV syllables regardless of the L1. This explanation was indeed appealing and timely in the sense that it fit in well with the shift towards understanding L2 errors as driven by universal principles and also supported by approaches that viewed interlanguage development as parallel to development in primary languages (e.g., Eckman, 1991). However, subsequent studies did not find support for Tarone's claim that CV is the universally preferred syllable in interlanguage phonology. The work by Sato (1984) and Hodne (1985) looked at various L1-L2 combinations and their findings suggested that transfer from the L1 was a more prominent factor in determining the structure of L2 syllable than a hypothesized preference for CV syllables.

Later research also yielded support for the role of transfer. For instance, Benson (1988) found that only 11 out of 92 errors in English syllables made by two Vietnamese speakers were due to a preference for CV syllables, while 80 errors were attributed to transfer. Carlisle (1991) also found support for transfer effects when investigating the well-known case of the epenthetic vowel before an onset consonant cluster of the type sC(C) in the interlanguage of Spanish speakers learning English (e.g., [es.ku:l] for 'school'). In this respect, Carlisle (2001) reflects on the prevailing influence of transfer and concludes that studies have shown that, in general, "transfer is the primary process involved in modifying the syllable structure of the interlanguage" (p. 6).

In sum, transfer (or 'cross-linguistic influence,' as it is more commonly referred to now) seems to be one of the few topics that appeared long ago, almost with the inception of SLA as a field, and still continues to be debated (Ellis, 2008; Major, 2008; Odlin, 2003). Major's observations summarize this point:

Even though most L2 phonologists do not necessarily claim or admit that transfer is the focus of their work, transfer is implicated in almost every instance. [...] It [the history of transfer in SLA] continues to unfold because it is well known that the past affects one's present and future behaviors. (Major, 2008, p. 83)

2.4. *Cognate Effects*

As a continuation of the discussion on cross-linguistic influence, the last part of this section will deal with cognate effects in L2 phonology. To begin, I assume a non-selective approach to lexical access (e.g., Kroll & Sunderman, 2003): the L1 and the L2 lexicons are both active during storage, processing, and retrieval of lexical items. As becomes evident, this significantly bears upon processes of cross-linguistic influence between the L1 and the L2. The *Revised Hierarchical Model* (Kroll & Stewart, 1994), for example, proposes that the access to L2 items will be mediated by the L1 lexicon. In the field of L2 phonology, previous studies have yielded some evidence supporting a non-selective approach to lexical processing at the segmental level (e.g., Jacobs, 2007). At the prosodic level, a few studies have shown, for example, that stress placement in the L2 is subject to transfer and interference from the L1 (Archibald, 1993).

In this framework, it could be claimed that cognate effects reported in SLA literature could be partly due to the fact that both lexicons are active. Most of the literature on cognate effects in L2 acquisition has focused on language perception, particularly during reading comprehension. However, fewer studies have examined the role of cognates in L2 phonological production and perception. The

results of these studies suggest that, at least in L2 perception, cognates seem to have a facilitative role, which supports the predictions of a non-selective approach to lexical access. Few studies exist on cognate production. They have looked particularly at the levels of homographic and homophonic similarity for the same word in both languages in order to predict its pronunciation (Dijkstra, Grainger, & Van Heuven, 1999; Jared & Kroll, 2001; Schwartz, Kroll, & Diaz, 2007). Schwartz et al. (2007), for example, concluded that “the high degree of orthographic overlap will lead to activation of the phonological codes of both language versions of the cognate and thereby increase competition” (p. 121).

3. Research questions

Based on the previous discussion, the main interest of the study was formulated in the following three research questions:

- 1) Do Spanish learners have the same intuitions as native speakers do about diphthong/hiatus resolution when syllabifying Spanish words?
- 2) If differences between Spanish learners and native speakers are found, can cross-linguistic influence in the form of cognate effects account for these differences?
- 3) Do these intuitions vary among different levels of proficiency in Spanish (beginning, intermediate, and advanced)?

4. Methodology

4.1. Participants

Participants in the Spanish learners group (henceforth, SLG) were undergraduate students at a U.S. university, enrolled in elementary, intermediate or advanced Spanish, which correspond to the first, second, or third year of instruction, respectively. Course enrollment was used as the criterion to divide the sample into three proficiency levels: elementary (EL), intermediate (IN), and advanced (AD). Initially, 167 students completed all the study components, but 67 had to be eliminated for various reasons, some of the most important being the following: participants declared they had explicitly learned syllabification rules in Spanish at some point,⁶ or their L1 was not American English.⁷ Table 1 shows the main demographic information for the SLG group.

Table 1. *Demographic Information for SLG*

| Group | N | Age | | Gender | |
|-------|-----|-------|-------|-------------|-----------|
| | | M | Range | Females (n) | Males (n) |
| SLG | 100 | 18.97 | 18–22 | 58 | 42 |
| EL | 35 | 18.97 | 18–22 | 18 | 17 |
| IN | 32 | 19.25 | 18–21 | 19 | 13 |
| AD | 33 | 18.70 | 18–20 | 21 | 12 |

The control group (henceforth, CG) consisted of 22 native speakers of Spanish. Seven were speakers of Peninsular Spanish (various regions) while the rest, 15, were speakers of American Spanish (various regions). They completed the same test components as SLG participants, under comparable circumstances. Also, as in the case of SLG, the CG was comprised exclusively of participants who declared not to know any rules of syllabification in Spanish.⁸

⁶ This was the main reason for elimination. This study is about learners’ intuitions about syllable structure in Spanish. Therefore, answers which can be potentially influenced by explicit learning cannot be considered intuitions any more, at least not for the purposes of this study.

⁷ Students who identified themselves as bilingual were also excluded.

⁸ Out of the 22 speakers, seven were graduate students of Spanish literature. Even though they all declared not remembering syllabification rules, the seven graduate students did achieve overall higher scores. However, these scores were not statistically different ($p > .05$) from scores obtained by the other 15 native speakers. The behavior for the sub-classes of items (cognates and non-cognates) was also statistically the same. That being said, it is probably the case that at least some of these speakers were actually exposed to formal instruction on syllabification back in their home countries, but they had forgotten these rules. I am aware that this is not the ideal

4.2. Target forms

A total of 36 items were tested. All items contained a vowel sequence which undergoes the gliding rule described in (1) above, that is, native speakers will treat them as diphthongs under normal circumstances. They represented 9 of the 12 rising and falling diphthongs in Spanish, as shown in (2) above, with four items for each of the nine diphthongs. The diphthongs [wo], [ou], and [oi] were not included since the first two are the least frequent in Spanish, while the last one is also infrequent at least when it corresponds to the spelling *oi*.

Out of the 36 items, 17 were cognates and 19 were non-cognates. The term *cognate* is operationally defined in this study as an L2 word that presents a partial (or total) resemblance with an L1 word at the orthographic, phonetic, and semantic levels. The level of orthographic resemblance was controlled using Van Orden's algorithm (1987) and only pairs of cognates with an orthographic similarity (OS) index above 0.70 were used.⁹ Out of the 17 cognate items, 6 contained a vowel sequence that resulted in a hiatus in English (to be referred as [+L1hiatus] items). Extreme care was taken in the selection of items to guarantee that participants were familiar with the words. Non-cognate items were high-frequency words in Spanish and most of them appear in elementary Spanish textbooks. Word frequency was controlled using the database *Corpus del Español* (Davies, 2009).¹⁰ Appendix A contains the 36 target items organized according to the criteria mentioned above.

In addition, some other factors were controlled for all 36 items: all diphthongs appeared in syllables with a simple coda (one consonant), items were between 2 and 4 syllables long (assuming diphthong formation), and stress fell on the diphthong-bearing syllable in approximately half of the items.¹¹

4.3. Materials

Two questionnaires were used in the study: I) Syllabification Task (see Appendix B), containing 52 words for participants to syllabify: 36 target items and 16 distracters (words without vowel sequences). A list of instructions accompanied the 52 items. II) Background and debriefing questionnaire (see Appendix C), containing questions aimed at collecting participants' demographic information and previous Spanish learning experience, as well as some questions on reactions to the syllabification task (level of difficulty, use of syllabification rules, etc.). All test materials were piloted with a group of intermediate learners before the actual data collection, and materials were then adjusted accordingly.

4.4. Procedure

The methodology of this study followed a survey design. The data collection process for each participant took approximately 20 minutes. First, the researcher explained the goals and major parts of the study, as required by protocols on research with human subjects. Second, participants completed the syllabification task (around 8 minutes). The researcher went over the printed instructions and then syllabified 3 words along with the participants, for practicing purposes, dividing the word with written slashes. The task was performed in silence for the most part, though some participants would softly tap

situation for purposes of comparability with the experimental group, but this compromise was deemed necessary since finding and using completely "uneducated" native speakers would have rendered the possibility of comparison between both groups highly problematic.

⁹ The formula looks at the pair of cognates (e.g., Sp. *historia*, Eng. *history*) and incorporates factors like word length, first and last letters, number of letters shared by the word pair, etc., and produces an OS index ranging between 0 and 1, 1 being complete orthographic correspondence (e.g., Sp. *individual*, Eng. *individual*).

¹⁰ The items *aislar* 'to isolate' and *reinar* 'to reign' are the only two words that could be considered significantly less frequent than the others. Unfortunately, it was not possible to find any frequent words for these diphthongs, at least not any words comparable to the other items in the set.

¹¹ A preliminary statistical analysis of the test items revealed that stress bears no effect on participants' intuitions about diphthong formation (cf. Cabré & Prieto, 2006).

a pencil or finger. As stated in the instructions, such techniques were actually encouraged. Finally, students answered the background and debriefing questionnaire (around 5 minutes).

In the case of the SLG, the data were collected in their classrooms, during their regular Spanish class. As for the CG, participants completed the same tests in a silent place (library or researcher's office).

4.5. Data analysis

The data coding consisted of assigning a 1 for every vocalic sequence syllabified as a diphthong and a 0 for every hiatus. The criterion to assign a 1 was that no slashes should intervene in the vowel sequence, regardless of where the exact syllable boundary was placed. For example, syllabifications like 'pue/rta,' 'puer/ta,' or 'puert/a' received a 1, while 'pu/e/rta,' 'pu/er/ta,' or 'pu/ert/a' received a 0.¹² All the data were entered into SPSS and percentages were calculated by set of items (e.g., percentage of diphthongs for cognate items).

5. Results

5.1. Overall results

Table 2 shows the descriptive statistics for the overall performance (of all 36 items), divided into the four groups of participants. The table reveals a clear pattern: the mean percentages of diphthong formation by the three SLG groups seem close to one another, and as a block they separate themselves from the percentage of diphthongs produced by the CG.

Table 2. *Descriptive Statistics for Overall Performance, Expressed as Percentage of Diphthong Formation*

| Group | <i>n</i> | Mean | SD | Min | Max |
|-------|----------|-------|-------|-------|--------|
| EL | 35 | 56.59 | 13.86 | 22.22 | 83.33 |
| IN | 32 | 59.55 | 17.83 | 30.56 | 94.44 |
| AD | 33 | 56.48 | 18.64 | 11.11 | 94.44 |
| CG | 22 | 90.40 | 13.55 | 52.78 | 100.00 |

These tendencies were statistically confirmed by a one-way Analysis of Variance (ANOVA). That is, at least one difference within the variable Group proved to be statistically significant: $F(3, 118) = 24.73, p < .01$. A post-hoc analysis (Scheffé) revealed that the mean difference between the CG and the SLG is statistically significant ($p < .01$) while all differences within proficiency levels in the SLG are not ($p > .05$). The results of all pair-wise comparisons are presented in Table 3.

Table 3. *Results of Post-hoc Analysis: Differences in Overall Performance*

| Groups | Dif. (% points) | <i>p</i> |
|--------|-----------------|----------|
| EL-IN | 2.96 | .98 |
| EL-AD | .11 | 1.00 |
| IN-AD | 3.07 | .90 |
| EL-CG | 33.82 | .00* |
| IN-CG | 30.86 | .00* |
| AD-CG | 33.92 | .00* |

* $p < .01$.

¹² That is, I expected participants to show that a word like *puerta* has either 2 or 3 syllables, depending on whether they believed there is a diphthong or not. There were a few participants who did not syllabify the word at all, implying that they consider the word has one syllable. Also, a few participants wrote one slash for words like *autógrafo*, which most participants syllabified as having either 4 or 5 syllables. If participants had more than three instances of such unexpected cases of syllabification, they were eliminated from the group altogether, as they probably did not understand the instructions, were not doing the task carefully, or simply did not have the necessary intuitions to divide words into syllables. Five participants were eliminated for this reason.

This first level of analysis suggests that there is no difference among the three proficiency levels in their intuitions about diphthong versus hiatus resolution for the target items. Also, it seems that Spanish learners' intuitions tend to favor hiatuses significantly more than native speakers' intuitions.

The behavior of the control group merits analysis at this point. As previously stated, dialectal variation makes it difficult—if not impossible or irrelevant—to characterize one homogeneous behavior for hiatus/diphthong resolution in the Spanish-speaking world. Even though some instances are almost consistently pronounced as a diphthong, there are others with a great deal of variability among native speakers.

This fact was reflected in the results for the control group. As Table 2 shows, there is a 47-point difference between the lowest and highest percentages among native speakers, and the standard deviation for this group is practically as high as that of elementary level participants (13.55 and 13.86, respectively). As described in the literature, this type of variation is predictable among native speakers, especially for potentially exceptional hiatuses, such as the item *dueto* 'duet'. The downside of this variation is that it might seriously hamper the possibility of comparison with the SLG. Probably little could have been done to overcome this shortcoming, however. That is, restricting the CG to one dialectal group would not have done justice to other dialects, and to the fact that our students are actually exposed to a variety of dialects inside and outside of the classroom. Therefore, results where the control group behaved uniformly will be useful in comparisons with the experimental data, while the almost unavoidable dialectal and idiolectal variation in the results of some diphthongs will not facilitate comparison. The latter cases will be specifically marked in the presentation of results.

5.2. Cognates

The next step in the analysis, and the one that will occupy a major portion of this section, was to find the reasons why the SLG's intuitions about diphthong/hiatus resolution in Spanish behave differently from those of native speakers. One of the research questions partially predicted that any differences could be attributed to cross-linguistic influences and, particularly, cognate effects. Therefore, the 36 items were divided into cognates ($n = 17$) and non-cognates ($n = 19$), and the statistical variable that contrasts them received the ad hoc name 'L1/L2 Item Similarity.' The items were submitted to a repeated measure ANOVA, with four values for the variable 'Group' (EL, IN, AD, & CG) and two for the variable 'L1/L2 Item Similarity.' The results appear on Table 4.

Table 4. *Repeated Measure ANOVA for Group and L1/L2 Item Similarity*

| Source | <i>Df</i> | <i>F</i> | <i>p</i> | Power |
|-------------------------------|-----------|----------|----------|-------|
| Group | 3 | 24.88 | .00* | 1.00 |
| L1/L2 Item Similarity | 1 | 93.74 | .00* | 1.00 |
| Group x L1/L2 Item Similarity | 3 | 4.26 | .00* | .85 |
| Residual | 118 | | | |

* $p < .01$.

The ANOVA yielded significant results for both variables (Group: $F(3, 118) = 24.88, p < .01$; Item Similarity: $F(1, 118) = 93.74, p < .01$) as well as for the interaction between both: $F(3, 118) = 4.26, p < .01$. In principle, these results speak in favor of a cognate effect on diphthong intuitions. A post hoc analysis was conducted in order to determine where the differences really lay. As for the variable Group, the only statistically significant difference was between the CG and the three proficiency groups in the SLG, which is exactly the same result obtained before for overall performance. This result implies that any cognate effects on diphthong/hiatus intuitions behaved in an identical manner across the SLG group, regardless of proficiency level. As for the variable L1/L2 Item Similarity, the difference between cognate items and non-cognate items was statistically significant only for the three levels in the SLG, while it did not reach significance for the group of native speakers, which is not surprising as we do not expect a cognate effect among native speakers.¹³ The

¹³ Two cognate items could have jeopardized this claim: *dieta* and *dueto*. As shown in Appendix D, native speakers syllabified these items with a diphthong 68.2% and 72.7% of the time, respectively. This is not surprising since these words can potentially be produced with an exceptional hiatus. Notice that the item *individual* could yield an exceptional hiatus as well, but the high level of diphthong formation (90.9%) suggests that this was not

means for cognates vs. non-cognates and the differences between each are presented in Table 5, organized by groups.

Table 5. *Mean Percentages and Differences between Cognate and Non-cognate Items*

| Group | Mean C | SD | Mean NC | SD | Diff. C/NC | F | p |
|-------|--------|-------|---------|-------|------------|--------|------|
| SLG | 51.82 | 18.50 | 62.58 | 16.57 | 10.76 | 107.77 | .00* |
| EL | 51.93 | 15.98 | 60.75 | 13.35 | 8.82 | 30.00 | .00* |
| IN | 53.49 | 20.83 | 64.97 | 17.15 | 11.48 | 24.95 | .00* |
| AD | 50.09 | 19.01 | 62.20 | 19.13 | 12.11 | 73.83 | .00* |
| CG | 88.77 | 15.07 | 91.87 | 13.17 | 3.10 | 3.45 | .08 |

Note. C = Cognate; NC = Non-cognate; Diff. = Difference

* $p < .01$.

Interestingly, these results seem to suggest that the cognate effect was negative or ‘inhibitory,’ following the commonly used terminology. Put differently, participants created more hiatuses—and thus more non-target-like structures—in cognate items than in non-cognate ones. Given these findings, I decided to tease apart the results for the 17 cognate items in order to gain a better understanding of why they produced a negative effect on learners’ intuitions. The first line of inquiry consisted of analyzing the two sub-divisions of the 17 cognate items: 1) [+L1hiatus] cognates containing a diphthong in Spanish and a hiatus in the English counterpart (e.g., Sp. *mater*[ja]l vs. Eng. *mater*[i.ə]l) and 2) [-L1hiatus] cognates with a diphthong in Spanish and absence of hiatus in the English counterpart (e.g., Sp. *Jam*[aj]ca vs. Eng. *Jam*[er]ca). The statistical variable that contrasts them received the ad hoc name “L1 Hiatus Effect” with the values [+L1hiatus] and [-L1hiatus].

Table 6. *Repeated Measure ANOVA for Group and L1 Hiatus Effect*

| Source | df | F | p | Power |
|--------------------------|-----|--------|------|-------|
| Group | 3 | 32.25 | .00* | 1.00 |
| L1 Hiatus Effect | 1 | 406.05 | .00* | 1.00 |
| Group x L1 Hiatus Effect | 3 | 26.54 | .00* | 1.00 |
| Residual | 118 | | | |

* $p < .01$.

Table 7. *Mean Percentages and Differences between [+L1hiatus] and [-L1hiatus] Items*

| Group | n | Mean % | | Mean % | | Difference | F | p |
|-------|-----|--------------|-------|--------------|-------|------------|--------|------|
| | | [+L1 hiatus] | SD | [-L1 hiatus] | SD | | | |
| SLG | 100 | 23.50 | 22.98 | 67.40 | 18.94 | 43.90 | 526.39 | .00* |
| EL | 35 | 21.90 | 22.06 | 68.00 | 16.05 | 46.10 | 196.01 | .00* |
| IN | 32 | 28.13 | 26.56 | 68.13 | 20.70 | 40.00 | 120.65 | .00* |
| AD | 33 | 20.71 | 20.00 | 66.06 | 20.45 | 45.35 | 229.48 | .00* |
| CG | 22 | 84.85 | 17.75 | 90.45 | 17.03 | 5.60 | 3.06 | .10 |

* $p < .01$.

As shown in Table 6, the repeated measure ANOVA yielded significant results for both main effects (Group: $F(3, 118) = 32.25, p < .01$; L1 Hiatus Effect: $F(1, 118) = 406.05, p < .01$) as well as for their interaction: $F(3, 118) = 26.54, p < .01$. Post hoc analyses showed the same trends observed before: differences among proficiency levels do not reach significance, while the SLG as a whole does differ statistically from the CG. As for differences between [+L1hiatus] cognates and [-L1hiatus] cognates, they were significant for the three proficiency levels in the SLG, whereas no significant difference was observed for the CG. These results, again, are not unexpected. Table 7 below presents the mean scores for both [+L1hiatus] and [-L1hiatus] as well as the difference between them. A close comparison between the ‘difference’ columns in Tables 5 and 7 shows how the difference in diphthong

the case for the native speakers in this study. As for L2 learners’ performance on these three items, the scores were not any different from other items in the same set (that is, [+L1hiatus] cognates), which may indicate that the potential exceptionality of these items was not present in the group of L2 learners.

formation for cognate items becomes much more pronounced when the variable L1 Hiatus Effect is factored in.

Results from Tables 6 and 7 suggest that the reason for the inhibitory effect of cognates may, at least in part, be due to the fact that participants transferred the syllabic structure from English when syllabifying in Spanish. In other words, they produced a hiatus in Spanish cognate words because the English counterpart contains a hiatus. For example, Spanish cognate items such as *puntual*, *violento*, and *dieta*, all with a hiatus in English, achieved very low instances of diphthong formation: 13%, 15%, and 4%, respectively, while items like *historia*, *fauna*, and *frecuente*, all [-L1hiatus] cognates, yielded significantly higher levels of diphthong formation: 39%, 72%, and 95%, respectively. Therefore, it is plausible to conclude that it is not the status of being a cognate per se that produced the inhibitory effect, but, rather, the presence of a hiatus in the corresponding English word. These differences become apparent in Figure 1, which also presents graphically most of the results presented thus far.

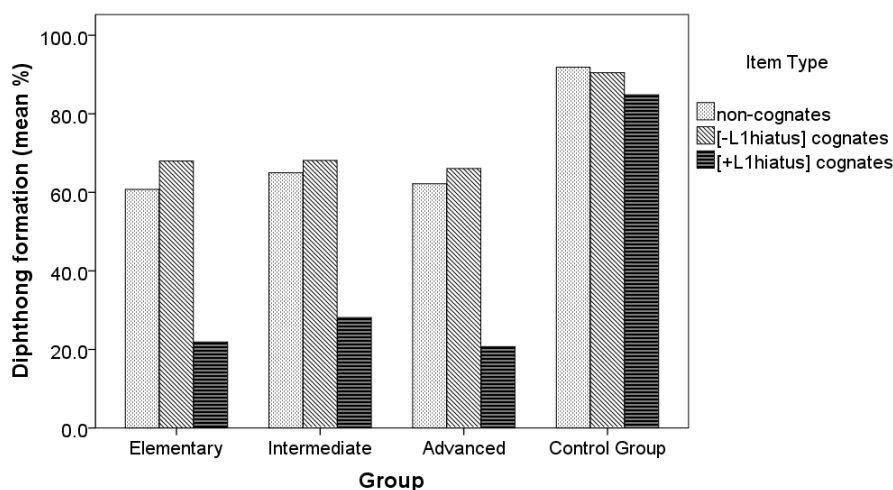


Figure 1. Results for non-cognate and cognate items (by group)

5.3. Non-cognates

Despite the relatively clear tendencies and statistically robust results obtained above, the data analysis also revealed that there is a good amount of variation in the non-cognate items. For example, non-cognates like *sueño* ‘dream’ and *veinte* ‘twenty’ yielded percentages of diphthong preference of 94% and 79%, respectively, among SLG participants, while items like *viaje* ‘trip’ and *canCIÓN* ‘song’ were judged as containing a diphthong only by 16% and 27% of participants in the same group, respectively. With the goal of finding a pattern and explanations for these discrepancies, I decided to take the analysis beyond the initial research questions and conduct a post hoc examination of these data.

I reorganized the non-cognate data as in Table 8, which contains rows with all Spanish diphthongs being analyzed, along with their corresponding non-cognates. Individual items include the percentage of participants in the SLG who syllabified the item as containing a diphthong. The SLG is treated as one group, without discriminating proficiency levels.

Table 8 shows a clear and interesting pattern in the diphthong intuitions for non-cognate items. Two sets seem to emerge in the data (the horizontal line in the table marks the division). On the one hand, items with the diphthongs [wa], [ai], [we], [au], and [ei] have averages of diphthong formation between 71.3% and 98% while on the other hand, items containing [jo], [eɥ], [ja], and [je] have averages in the 15.5%–35.5% range. The difference between both groups was also supported statistically: $t(17) = 9.99$, $p < .01$. My explanation for these differences is based on a comparison between Spanish and English vowel sequences. Table 9 presents the diphthong correspondences and

mismatches between Spanish and English. I base my description of American English vowels on Roca and Johnson (1999).

Table 8. *Percentage of Diphthong Formation for all Non-cognate Items, Organized by Spanish diphthong*

| Spanish diphthong | Item | % | Item | % | Item | % | Item | % | Aver. |
|-------------------|-----------------|----|-----------------|----|---------------|----|---------------|----|-------|
| [wa] | <i>guapo</i> | 98 | <i>cuaderno</i> | 98 | | | | | 98 |
| [ai] | <i>baile</i> | 93 | <i>aislar</i> | 91 | | | | | 92 |
| [we] | <i>sueño</i> | 94 | <i>almuerzo</i> | 83 | | | | | 88.5 |
| [au] | <i>bautismo</i> | 93 | <i>aula</i> | 69 | | | | | 81 |
| [ei] | <i>veinte</i> | 79 | <i>peinar</i> | 71 | <i>aceite</i> | 69 | <i>reinar</i> | 66 | 71.3 |
| [jo] | <i>despacio</i> | 44 | <i>canción</i> | 27 | | | | | 35.5 |
| [eu] | <i>deuda</i> | 29 | | | | | | | 29 |
| [ja] | <i>iglesia</i> | 38 | <i>viaje</i> | 16 | | | | | 27 |
| [je] | <i>nieto</i> | 16 | <i>caliente</i> | 15 | | | | | 15.5 |

Note. Diphthongs are listed according to average obtained, in decreasing order.

Table 9. *Diphthong Correspondences and Mismatches between Spanish and English*

| | Spanish | Example | English | Example |
|----------------|---------|-----------------|---------|--------------|
| Correspondence | [wa] | <i>guapo</i> | ! | |
| | [ai] | <i>baile</i> | [aɪ] | <i>right</i> |
| | [we] | <i>sueño</i> | ! | |
| | [au] | <i>bautismo</i> | [aʊ] | <i>round</i> |
| | [ei] | <i>veinte</i> | [eɪ] | <i>late</i> |
| Mismatch | [jo] | <i>despacio</i> | -- | -- |
| | [eu] | <i>deuda</i> | -- | -- |
| | [ja] | <i>iglesia</i> | -- | -- |
| | [je] | <i>nieto</i> | -- | -- |

Note. Exclamation marks indicate absence of expected correspondences.

My analysis to account for the striking discrepancies observed in Tables 8 and 9 is that participants are more willing to accept diphthongs in the first set of items because they contain vowel sequences reminiscent of tautosyllabic vocoid sequences in English, their L1, while this does not seem to be the case in the second set. Needless to say, I am not suggesting that there is a total correspondence between L1 and L2 segments ([ɪ] is articulatorily different from [i], for example), but it is well known that L2 learners' vowel perception (and production) can be affected by a perceived phonetic similarity between L1 and L2 vowels (e.g., Flege, Bohn, & Jang, 1997). In this case, vowel sequences in the correspondence set are perceived as similar to a tautosyllabic sequence in English, at least sufficiently similar to allow diphthong formation in the L2.

Participants tended to judge as hiatuses all diphthongs of rising sonority containing the glide [j], since there are no similar diphthongs in English.¹⁴ Likewise, the falling diphthong [eu] was not perceived as a diphthong either. Nonetheless, this proposal has some potential limitations: rising diphthongs with the glide [w] are accepted as diphthongs even though they do not have English diphthongs as counterparts. One solution might be to propose that the combination [w] + [-cons] in English, as in 'one' [wʌn] or 'well' [weɪ], may license the parallel combination in Spanish if perceived as similar. In any case, I do not presently have a convincing solution for this problem. Despite its shortcomings, one appealing element of this proposal is that cross-linguistic influence seems to be at its core. As suggested in the review of the literature and in the cognate effects detected in this study, it is not unexpected that transfer (either positive or negative) play a role in L2 phonology.

¹⁴ English has the consonant [j], as in 'music' or 'beautiful,' but it occurs in very restricted contexts, as discussed by Davis and Hammond (1995): in complex onsets, preceded by a non-homorganic sonorant or obstruent (that is, not a coronal sound), and followed exclusively by the vowel [u]. This restricted environment makes it hard to argue that English [j] is comparable to Spanish [j], since the phonetic occurrence of the latter is not constricted by the environment.

5.4. *Intuitions*

Finally, the analysis tried to determine the real ‘intuitive’ nature of the data used in this study. It is worth underscoring that, with five exceptions, the syllabification task posed no problems for the 164 participants. Regardless of whether they had received explicit instruction or not on Spanish syllabification, the vast majority of participants completed the task as expected, after receiving only minimal instructions (including the three-word practice phase). In fact, it has been proven that native speakers in a number of languages have very clear intuitions about the number of syllables in a word and, in some cases, where the breaks occur (Blevins, 1996). Therefore, it was anticipated that participants would complete the task effortlessly, irrespective of accuracy in the answers they provided. Indeed, one item in the debriefing questionnaire (see Appendix C) targeted the participants’ perceived difficulty, and 95% of them expressed that they found the task easy. Following the suggestion made by one anonymous reviewer, I examined the data from the participants that were excluded because they reported having been taught Spanish syllabification rules and, therefore, were not using intuition but explicit knowledge to complete the task. A total of 35 cases were analyzed from the intermediate and advanced levels (only one elementary level participant declared having explicit instruction) and the same criteria regarding L2 experience were used to select the cases. As expected, the mean scores for these participants are significantly higher than those from participants that seemed to have used intuition only to carry out the task, both in cognates and non-cognates. In fact, their scores are, as a whole, slightly over the means achieved by the group of native speakers, though the difference in this case is not statistically significant. These results seem to suggest that their conscious knowledge of Spanish syllabification rules indeed aided these students in identifying the vocalic sequences as tautosyllabic. An interesting question for future research is whether explicit instruction in English syllabification rules affects the L2 performance on syllabic structuring. Unfortunately, this study did not produce the required data to answer this question.

5.5. *Summary of results*

To conclude, the statistical analyses supporting the findings appear to be robust: statistically significant results yielded p values below .01 and the observed power for all statistics consistently reached 1.00. Based on these results, I propose some tentative answers for the research questions. First, Spanish learners’ intuitions do differ from those of native speakers. Specifically, Spanish learners tend to prefer a hiatus for vowel sequences that native speakers treat as a diphthong. Second, this difference between Spanish learners and native speakers seems to be, at least in part, due to the inhibitory effect produced by cognates, particularly when the vowel sequence corresponds to a hiatus in English. Third, Spanish learners’ intuitions for diphthong resolution are statistically the same among the three proficiency levels examined. Furthermore, a post hoc stage of analysis demonstrated that L2 vowel sequences are judged as diphthongs or hiatuses depending on the syllabic composition of similar segments in the L1, which constitutes yet another instance of cross-linguistic influence.

6. Discussion and Conclusions

A better understanding of the syllable nucleus in interlanguage phonology is arguably the main contribution of this paper. As reviewed above, there is a significant amount of literature on processes affecting consonants in onsets or codas, but considerably less about vowels in the syllabic nucleus. In any case, L2 phonologists have recognized that the syllable is “a particularly viable domain for L2 research” since, among other reasons, it is a universal construct (Eckman, 2004, p. 527). This study has demonstrated that transfer from the L1 seems to be a strong factor shaping learners’ intuitions about the syllabic status of vocalic sequences in Spanish. The only areas where participants approached target-like structures were those facilitated by transfer: either cognates without a hiatus in English or Spanish diphthongs potentially perceived as equivalent to diphthongs in English. Low performance, in turn, seemed to be the result of negative transfer to a large extent. The results from this study are consistent with recent research that identifies the syllable in L2 phonology as a domain that is often more susceptible to L1 transfer than units at other phonological levels, especially the segmental one

(Chen, 2006; Deteý & Nespoulous, 2008; Kabak & Idsardi, 2007). In sum, these findings provide an example of how cross-linguistic influence may operate on a special type of syllabic nucleus, namely, a vocalic sequence that forms a diphthong.

As noted in the review of the literature, not all processes in interlanguage phonology can be explained by transfer. A more sound approach should take acquisition universals into account (Eckman, 1977, 1991; and others). In this study, an example of a universal process may come from the non-cognate data discussed above. The analysis I proposed attributed differences in diphthong preference to the presence of a tautosyllabic sequence in English perceived as similar to the Spanish sequence. As previously stated, however, most of the sequences with very low diphthong-formation percentages (three out of four) correspond to rising diphthongs with the glide [j] as V1. From the perspective of linguistic universals, rising diphthongs are less common than falling ones. Sánchez-Miret (1998) discusses at length the place of diphthongs in world's languages, based on information synthesized from various phonetic databases. He concludes that "falling diphthongs are more prototypical and this is confirmed by their frequency in the inventories" (p. 47). The author also supports this observation with a thorough discussion on diphthongization processes in various languages and acoustic differences between falling and rising diphthongs. The fact that participants in this study tended to prefer falling diphthongs might be attributed to a preference for the unmarked forms in interlanguage phonology. This process has been called the *emergence of the unmarked* (McCarthy & Prince, 1994) within Optimality Theory (OT, McCarthy & Prince, 1993; Prince & Smolensky, 1993), since low-ranking markedness constraints emerge over faithfulness constraints under certain circumstances, the result being more reminiscent of the universal configuration of OT grammar in its initial stages, where markedness dominates faithfulness. Instances of the emergence of the unmarked have been attested in L2 phonology as well (Broselow, Chen, & Wang, 1998). In the case of the present study, future research might profit from looking into the role of the markedness constraint *DIPH ('No diphthongs') following, for example, Rosenthal's work (1994). In short, this study provided results that could be analyzed from the perspective of universal paths of L2 development.

When it comes to the role of cognates, the data seem to support the initial assumptions that cognate effects would result from the simultaneous activation of both L1 and L2 lexicons when processing a cognate item. These results are in line with non-selective approaches to lexical access (Kroll & Stewart, 1994; Kroll & Sunderman, 2003). More importantly, findings from this study may shed new light on our understanding of cognate effects on L2 acquisition. Most of the existing literature in this area has focused on the facilitative role of cognates, especially in the realm of language comprehension. Negative effects in comprehension are usually thought to result from the so-called 'false cognates' at the semantic level. This study, however, has provided empirical evidence that cognates may have an inhibitory effect at the phonological level. It seems reasonable to assume that when L2 learners identify an L2 item as a cognate they activate the L1 phonological representation for this item. The result will be either an L2-like output if both representations coincide or a non-target form if both representations do not match. In either case, it is the L1 lexicon that seems to prevail in resolving the phonological configuration for the L2 item, at least for the data in this study. Therefore, it seems that the effect of cognates cannot be classified in black or white terms, and that some cognates might actually be a double-edged sword: facilitative at the semantic level, yet inhibitory at the phonological one.¹⁵ Future research needs to take this interplay into account.

One final question is still unanswered: why do cross-linguistic influence and cognate effects on diphthong resolution remain constant across proficiency levels? One possible answer may be related to the type of knowledge that was being tested, namely, intuitions. Intuitions, at least for the purposes of this study, cannot have an explicit knowledge component. One assumption in this study was that participants were relying on their implicit knowledge, accurate or not, of vocalic sequences in Spanish. Two other questions arise from the first one. First, how is this implicit knowledge acquired, considering that the presence or absence of a diphthong is certainly not among the most salient features in learners' input? My current hypothesis is that the implicit knowledge for this particular target form is probably rudimentary, if present at all for some learners. Therefore, in the absence of the necessary knowledge (explicit or implicit), participants fall back on their L1, and probably on universal processes of acquisition as well, in order to resolve the structure of vocalic sequences. Second, how would the

¹⁵ Or vice versa, as in the case of a 'false' semantic cognate with a facilitative phonology.

results have differed if students had learned this particular L2 feature explicitly? Despite the paucity of studies that can presently answer this question, it seems likely that learners would benefit from this kind of learning. Some of the results in this study do actually point in this direction. The extensive literature on implicit and explicit learning suggests that explicit learning might be particularly beneficial when the item to be learned is “too hard to notice” (DeKeyser, 2003, p. 334) as, I believe, is the case of diphthongs and hiatuses. In conclusion, L2 acquisition of diphthongs and hiatuses might be a good candidate for explicit learning, which, potentially, could allow participants to notice the form and, with enough exposure and opportunities for practice, progress in their interlanguage phonology to produce more target-like forms.

7. Limitations and Future Research

First, an improved selection of target items could have enhanced this study. The inclusion of nine types of diphthongs subdivided into cognates and non-cognates was probably too ambitious. Future research should focus on fewer categories and increase the number of items for each. Also, as noted by one anonymous reviewer, the design would have produced more interesting results if participants had been tested on regular Spanish hiatuses as well, that is, vocalic sequences where neither of the vowels is [+high]. Based on anecdotal data collected during the initial stages of this project, I would predict that English-speaking learners will overwhelmingly produce hiatuses in this context. There is also some previous research that suggests this would be the case (e.g., Lord, 2005). However, these predictions need to be tested empirically.

Finally, as emphasized in the body of the paper, this study examined learners’ intuitions, and not their language production or perception. Therefore, the results and interpretations must be read with this in mind. Stronger conclusions might have been drawn if the analysis had included production tests. Nevertheless, given the scarcity of studies dealing with diphthong formation in L2 acquisition, this exploratory study lays the foundation for future research that does incorporate both production and perception measurements.

Appendices

Appendix A. Target items

| Spanish diphthong | non-cognates (<i>n</i> = 19) | cognates (<i>n</i> = 17) | |
|-------------------|--|---------------------------|---------------------------------------|
| | | [+L1 hiatus] | [-L1 hiatus] |
| Rising | /ia/ <i>viaje, iglesia</i> | <i>material</i> | <i>historia</i> |
| | /ie/ <i>caliente, nieto</i> | <i>dieta</i> | <i>diciembre</i> |
| | /io/ <i>espacio, canción</i> | <i>violento</i> | <i>pensión</i> |
| | /ua/ <i>guapo, cuaderno</i> | <i>puntual</i> | <i>adecuado</i> |
| | /ue/ <i>sueño, almuerzo</i> | <i>dueto</i> | <i>frecuente</i> |
| Falling | /ai/ <i>baile, aislar</i> | <i>arcaico</i> | <i>Jamaica</i> |
| | /ei/ <i>veinte, peinar, aceite, reinar</i> ¹⁶ | | |
| | /au/ <i>aula, bautismo</i> | | <i>autógrafo, fauna</i> ¹⁷ |
| | /eu/ <i>deuda</i> | | <i>feudal, neurona, neutro</i> |

¹⁶ No cognates were found for this diphthong.

¹⁷ Sequences with ‘au’ and ‘eu’ never correspond to a hiatus in English, at least among the Spanish-English cognates consulted.

Appendix B. Syllabification test

INSTRUCTIONS

- Divide the following words into syllables. All the words in the list are Spanish words.
- Use slashes to mark the division. Example: c a s a → c a / s a
- Divide the words carefully but please do not spend too long on a given word and do not go back to check or change your answers. Try to divide each word following your first intuition, without thinking about it too much. There are no right or wrong answers.
- Say the word silently to yourself, and use any techniques you think might help you to divide the word: clapping, tapping your finger or foot, etc.

| | | | |
|-----------------|-----------|-----------|-----------|
| Let's practice: | sala | música | sol |
| dieta | cartón | frecuente | veinte |
| presidente | autógrafo | caliente | guapo |
| historia | cuaderno | reinar | deuda |
| baile | sueño | viaje | terminal |
| violento | gris | canción | silla |
| programa | almuerzo | fauna | neurona |
| densidad | arcaico | bautismo | colectivo |
| espacio | famoso | aislar | típico |
| puntual | pensión | levantar | aceite |
| bolígrafo | dueto | diciembre | iglesia |
| Jamaica | semana | aula | neutro |
| nieto | cultura | dibujar | material |
| camisa | feudal | adecuado | peinar |

Appendix C. Background and debriefing questionnaire

INSTRUCTIONS

Please read the following questions and answer them to the best of your knowledge. As stated in the consent form, this information will be kept confidential, and your name shall never appear in any part of this project.

- (1) Name: _____
- (2) Gender: _____
- (3) Age: _____
- (4) First language: _____
- (5) Spanish class: _____ Teacher's name: _____
- (6) Do you speak any other language(s) besides English and Spanish? Yes No
If your answer is 'yes,' please specify: _____
- (7) Number of semesters of formal college instruction in Spanish: _____
Were your previous teachers native speakers of Spanish? Yes No
If your answer is 'yes,' please specify for which courses
- (8) Have you ever been to a Spanish-speaking country for more than 10 days?
If your answer is 'yes,' please specify where, why (holidays, study abroad, etc.), and for how long.
- (9) Do you have – or did you have – any Spanish-speaking relatives? Yes No
If your answer is 'yes,' please specify who and whether you ever speak/spoke in Spanish with them.
- (10) In general, did you find the task (dividing into syllables) easy or difficult? If difficult, why?
- (11) Have you ever learned any rules about how to divide words into syllables in Spanish? Yes No
If your answer is YES, do you remember those rules? Yes No
If your two previous answers are YES, did you use any of those rules when doing the task before? Yes No

Appendix D. Target items ($n = 36$) and scores for SLG and CG¹⁸

| Item Type | Item | SLG | | | | CG | | |
|------------------------------|----------------------------|---------------------------|-----------------|-------|-------|-------|-------|------|
| | | Overall | EL | IN | AD | | | |
| non-cognates ($N = 19$) | <i>guapo</i> | 98.0 | 97.1 | 100.0 | 97.0 | 86.4 | | |
| | <i>cuaderno</i> | 98.0 | 97.1 | 100.0 | 97.0 | 100.0 | | |
| | <i>sueño</i> | 94.0 | 88.6 | 100.0 | 93.9 | 95.5 | | |
| | <i>bautismo</i> | 93.0 | 94.3 | 93.8 | 90.9 | 95.5 | | |
| | <i>baile</i> | 93.0 | 91.4 | 96.9 | 90.9 | 95.5 | | |
| | <i>aislar</i> | 91.0 | 94.3 | 93.8 | 84.8 | 86.4 | | |
| | <i>almuerzo</i> | 83.0 | 77.1 | 81.3 | 90.9 | 100.0 | | |
| | <i>veinte</i> | 79.0 | 74.3 | 78.1 | 84.8 | 95.5 | | |
| | <i>peinar</i> | 71.0 | 68.6 | 65.6 | 78.8 | 90.9 | | |
| | <i>aula</i> | 69.0 | 65.7 | 68.8 | 72.7 | 86.4 | | |
| | <i>aceite</i> | 69.0 | 60.0 | 68.8 | 78.8 | 90.9 | | |
| | <i>reinar</i> | 66.0 | 65.7 | 78.1 | 54.5 | 100.0 | | |
| | <i>espacio</i> | 44.0 | 45.7 | 43.8 | 42.4 | 90.9 | | |
| | <i>iglesia</i> | 38.0 | 37.1 | 37.5 | 39.4 | 90.9 | | |
| | <i>canción</i> | 27.0 | 22.9 | 37.5 | 21.2 | 86.4 | | |
| | <i>deuda</i> | 29.0 | 31.4 | 31.3 | 24.2 | 86.4 | | |
| | <i>nieto</i> | 16.0 | 8.6 | 15.6 | 24.2 | 86.4 | | |
| | <i>viaje</i> | 16.0 | 22.9 | 18.8 | 6.1 | 86.4 | | |
| | | <i>caliente</i> | 15.0 | 11.4 | 25.0 | 9.1 | 95.5 | |
| Cognates ($N = 17$) | [-Lhiatus] ($N = 11$) | <i>autógrafo</i> | 99.0 | 100.0 | 100.0 | 97.0 | 100.0 | |
| | | <i>frecuente</i> | 95.0 | 91.4 | 93.8 | 100.0 | 86.4 | |
| | | <i>neurona</i> | 87.0 | 94.3 | 81.3 | 84.8 | 90.9 | |
| | | <i>Jamaica</i> | 85.0 | 91.4 | 84.4 | 78.8 | 86.4 | |
| | | <i>adecuado</i> | 78.0 | 68.6 | 81.3 | 84.8 | 95.5 | |
| | | <i>fauna</i> | 72.0 | 80.0 | 71.9 | 63.6 | 86.4 | |
| | | <i>feudal</i> | 66.0 | 71.4 | 59.4 | 66.7 | 95.5 | |
| | | <i>neutro</i> | 60.0 | 54.3 | 56.3 | 69.7 | 90.9 | |
| | | <i>historia</i> | 39.0 | 40.0 | 40.6 | 36.4 | 95.5 | |
| | | <i>pensión</i> | 34.0 | 31.4 | 40.6 | 30.3 | 86.4 | |
| | | <i>diciembre</i> | 25.0 | 28.6 | 31.3 | 15.2 | 86.4 | |
| | | [+Lhiatus] ($N = 6$) | <i>arcaico</i> | 58.0 | 57.1 | 65.6 | 51.5 | 90.9 |
| | | | <i>dueto</i> | 29.0 | 25.7 | 28.1 | 33.3 | 72.7 |
| | | | <i>material</i> | 22.0 | 22.9 | 31.3 | 12.1 | 90.9 |
| | | | <i>violento</i> | 15.0 | 11.4 | 21.9 | 12.1 | 95.5 |
| | | | <i>puntual</i> | 13.0 | 11.4 | 18.8 | 9.1 | 90.9 |
| | | | <i>dieta</i> | 4.0 | 2.9 | 3.1 | 6.1 | 68.2 |

References

- Aguilar, Lourdes (1999). Hiatus and diphthong: Acoustic cues and speech situation differences. *Speech Communication*, 28, 57–74.
- Archibald, John (1993). The learnability of English metrical parameters by adult Spanish speakers. *International Review of Applied Linguistics*, 31, 129–142.
- Benson, Bronwen (1988). Universal preference for the open syllable as an independent process in interlanguage phonology. *Language Learning*, 38, 221–242.

¹⁸ Scores represent the percentage of participants who syllabified an item as containing a diphthong. Scores are rounded up to one decimal. Items appear in descending order based on the overall score for the SLG.

- Beritognolo, Gustavo (2008). Hiatus in Argentinian Spanish. In Sylvia Blaho, Camelia Constantinescu, & Erik Schoorlemmer (Eds.), *Proceedings of ConSOLE XV, Brussels, 2007* (pp. 1–23). Retrieved from <http://www.hum2.leidenuniv.nl/pdf/lucl/sole/console15/console15-beritognolo.pdf>
- Blevins, Juliette (1996). The syllable in phonological theory. In John A. Goldsmith (Ed.), *The Handbook of Phonological Theory* (pp. 206–244). Cambridge, MA: Blackwell.
- Borzone de Manrique, Ana M. (1976). Acoustic study of /i, u/ in the Spanish diphthong. *Language and Speech*, 19, 121–128.
- Broselow, Ellen, Chen, Si-I, & Wang, Chilin (1998). The emergence of the unmarked in second language phonology. *Studies in Second Language Acquisition*, 20, 261–280.
- Cabr e, Teresa, & Prieto, Pilar (2006). Exceptional hiatuses in Spanish. In Fernando Mart nez-Gil & Sonia Colina (Eds.), *Optimality-Theoretic Studies in Spanish Phonology* (pp. 205–238). Amsterdam: John Benjamins Publishing Co.
- Carlisle, Robert S. (1991). The influence of environment on vowel epenthesis in Spanish/English interphonology. *Applied Linguistics*, 12, 76–95.
- Carlisle, Robert S. (2001). Syllable structure universals and second language acquisition. *International Journal of English Studies*, 1(1), 1–19.
- Chen, Shih-Wei (2006). *Phonological processing unit transfer: The impact of first language syllable structure and its implications for preferred subsyllabic division units*. Unpublished doctoral dissertation. University of Maryland, College Park.
- Davies, Mark (2009, June 7). Corpus del Espa ol (100 million words, 1200s-1900s). Retrieved from <http://www.corpusdelespanol.org>
- Davis, Stuart, & Hammond, Michael (1995). On the status of onglides in American English. *Phonology*, 12(2), 159–182.
- DeKeyser, Robert (2003). Implicit and explicit learning. In Catherine J. Doughty & Michael H. Long (Eds.), *The handbook of second language acquisition* (pp. 313–348). Malden, MA: Blackwell Pub.
- Detey, Sylvain, & Nespoulous, Jean-Luc (2008). Can orthography influence second language syllabic segmentation? Japanese epenthetic vowels and French consonantal clusters. *Lingua*, 118, 66–81.
- Dijkstra, Ton, Grainger, Jonathan, & Van Heuven, Walter J. B. (1999). Recognition of cognates and interlingual homographs: The neglected role of phonology. *Journal of Memory and Language*, 41, 496–518.
- Eckman, Fred R. (1977). Markedness and the contrastive analysis hypothesis. *Language Learning*, 27, 315–330.
- Eckman, Fred R. (1991). The Structural Conformity Hypothesis and the acquisition of consonant clusters in the interlanguage of ESL learners. *Studies in Second Language Acquisition*, 13, 23–41.
- Eckman, Fred R. (2004). From phonemic differences to constraint rankings: Research on second language phonology. *Studies in Second Language Acquisition*, 26, 513–550.
- Ellis, Rod (2008). *The study of second language acquisition*. Oxford: Oxford University Press.
- Flege, James Emil, Bohn, Ocke-Schewn, & Jang, Sunyoung (1997). Effects of experience on non-native speakers' production and perception of English vowels. *Journal of Phonetics*, 25, 437–470.
- Garrido, Marisol (2007). Diphthongization of mid/low vowel sequences in Colombian Spanish. In Jonathan Holmquist, Augusto Lorenzino, & Lotfi Sayahi (Eds.), *Selected Proceedings of the Third Workshop on Spanish Sociolinguistics*, (pp. 30–37). Somerville, MA: Cascadilla Proceedings Project.
- Hodne, Barbara (1985). Yet another look at interlanguage phonology: The modification of English syllable structure by native speakers of Polish. *Language Learning*, 35, 405–22.
- Hualde, Jos  Ignacio (1991). On Spanish syllabification. In H ctor Campos & Fernando Mart nez Gil (Eds.), *Current Studies in Spanish Linguistics* (pp. 475–493). Washington, DC: Georgetown University Press.
- Hualde, Jos  Ignacio (2005). *The Sounds of Spanish*. Cambridge, UK: Cambridge University Press.
- Hualde, Jos  Ignacio, & Prieto, M nica (2002). On the diphthong/hiatus contrast in Spanish: Some experimental results. *Linguistics*, 40(2), 217–134.
- Hualde, Jos  Ignacio, Simonet, Miquel, & Torreira, Francisco. (2008). Postlexical contraction of nonhigh vowels in Spanish. *Lingua*, 188, 1906–1925.
- Jacobs, April Lynn (2007). *Segmental production in bilingual speech: A psycholinguistic approach*. Unpublished doctoral dissertation, The Pennsylvania State University.
- Kabak, Bariř, & Idsardi, William J. (2007). Perceptual distortions in the adaptation of English consonant clusters: syllable structure or consonantal contact constraints? *Language and Speech*, 50, 23–52.
- Kroll, Judith F., & Stewart, Erika (1994). Category interference in translation and picture naming: Evidence for asymmetric connections between bilingual memory representations. *Journal of Memory and Language*, 33, 149–174.
- Kroll, Judith F., & Sunderman, Gretchen (2003). Cognitive processes in second language learners and bilinguals: The development of lexical and conceptual representations. In Catherine J. Doughty & Michael H. Long (Eds.), *The handbook of second language acquisition* (pp. 104–129). Malden, MA: Blackwell Publishing.
- Lado, Robert (1957). *Linguistics across cultures*. Ann Harbor: University of Michigan Press.

- Lord, Gillian (2005). (How) Can we teach foreign language pronunciation? On the effects of a Spanish phonetics course. *Hispania*, 88, 557–567.
- Major, Roy C. (2008). Transfer in second language phonology. In Jette G. Hansen Edwards & Mary L. Zampini (Eds.), *Phonology and second language acquisition* (pp. 63–94). Amsterdam: J. Benjamins Publishing.
- McCarthy, John, & Prince, Alan (1993). Prosodic morphology I: Constraint interaction and satisfaction. Unpublished manuscript, University of Massachusetts at Amherst and Rutgers University, New Brunswick, NJ.
- McCarthy, John, & Prince, Alan (1994). The emergence of the unmarked: Optimality in prosodic morphology. *Proceedings of the North East Linguistics Society*, 24, 333–379.
- Navarro Tomás, Tomás. (1968). *Manual de Pronunciación Española*, 14^a ed. Madrid: Consejo Superior de Investigaciones Científicas.
- Odlin, Terence (2003). Cross-linguistic influence. In Catherine J. Doughty & Michael H. Long (Eds.), *The handbook of second language acquisition* (pp. 436–486). Malden, MA: Blackwell Pub.
- Prince, Alan, & Smolensky, Paul (1993). Optimality Theory: Constraint interaction in a generative grammar. Unpublished manuscript. New Brunswick, NJ: Rutgers University Center for Cognitive Science.
- Roca, Iggy, & Johnson, Wyn (1999). *A course in phonology*. Oxford, UK: Blackwell.
- Rosenthal, Samuel (1994). *Vowel/glide alternation in a theory of constraint interaction*. Unpublished doctoral dissertation, University of Massachusetts, Amherst.
- Sánchez Miret, Fernando (1998). Some reflections on the notion of diphthong. *Papers and Studies in Contrastive Linguistics*, 34, 27–51.
- Sato, Charline J. (1984). Phonological processes in second language acquisition: Another look at interlanguage syllable type. *Language Learning*, 34, 43–57.
- Schwartz, Ana I., Kroll, Judith F., & Diaz, Michele (2007). Reading words in Spanish and English: Mapping orthography to phonology in two languages. *Language and Cognitive Processes*, 22, 106–129.
- Tarone, Elaine E. (1980). Some influences on the syllable structure of interlanguage phonology. *International Review of Applied Linguistics in Language Teaching*, 18(2), 139–152.
- Van Orden, Guy C. (1987). A ROWS is a ROSE: Spelling, sound, and reading. *Memory & Cognition*, 15, 181–198.

Selected Proceedings of the 2009 Second Language Research Forum: Diverse Contributions to SLA

edited by Luke Plonsky
and Maren Schierloh

Cascadilla Proceedings Project Somerville, MA 2011

Copyright information

Selected Proceedings of the 2009 Second Language Research Forum:
Diverse Contributions to SLA
© 2011 Cascadilla Proceedings Project, Somerville, MA. All rights reserved

ISBN 978-1-57473-444-7 library binding

A copyright notice for each paper is located at the bottom of the first page of the paper.
Reprints for course packs can be authorized by Cascadilla Proceedings Project.

Ordering information

Orders for the library binding edition are handled by Cascadilla Press.
To place an order, go to www.lingref.com or contact:

Cascadilla Press, P.O. Box 440355, Somerville, MA 02144, USA
phone: 1-617-776-2370, fax: 1-617-776-2271, sales@cascadilla.com

Web access and citation information

This entire proceedings can also be viewed on the web at www.lingref.com. Each paper has a unique document # which can be added to citations to facilitate access. The document # should not replace the full citation.

This paper can be cited as:

Zárate-Sández, Germán. 2011. Speakers' Intuitions about L2 Syllable Structure: Diphthong vs. Hiatus Resolution in Spanish by English-Speaking Learners. In *Selected Proceedings of the 2009 Second Language Research Forum*, ed. Luke Plonsky and Maren Schierloh, 164-181. Somerville, MA: Cascadilla Proceedings Project. www.lingref.com, document #2533.