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The realization of Spanish Diphthongs by Norwegian Learners.

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Abstract

Research in Spanish phonology as a foreign language has primarily concentrated on its acquisition by English L1 speakers. However, this study explores the perception of syllabification of vowel sequences (VS) in Spanish as a third language (L3) by Norwegian first-language speakers (L1). This research investigates potential Cross-Linguistic Interference (CLI) on the production of the vowel sequences in Spanish L3. Given the absence of an existing corpus for this language combination, to gather the required data, a small-scale experiment was conducted with adult participants who spoke Spanish as an L3, Spanish native speakers were also part of the experiment as the control group. The experiment involved two tasks where participants selected the syllabification option for a set of words in both Spanish and Norwegian. Using the online platform Gorilla, I aimed to reach 27 individuals from different ages (20 -70), levels of acquisition (Basic – Advanced) and backgrounds. These participants were categorised into two groups based on their L. The data was analysed in two parts, the first part consisted of general data obtained from the descriptive statistics and the second part consisted of a theoretical analysis using OT to determine the phonological processes that occurred in Spanish L3. Overall, the analyses carried out showed that (1) the level of acquisition affects the production and perception of VS. and, (2) The phonological processes found were as result of CLI from the L1, especially in rising sonority sequences. In this work, I suggest a set of constraints to analyse Spanish L3 nu Norwegian L1.

Keywords: Spanish L3, Norwegian L1, CLI, Interlanguage

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List of Abbreviations and symbols

C Consonant

CLI Cross Linguistic Interference

EN English languages

ES Spanish languages

IPA International Phonetic Alphabet

L1 First language

L2 Second language

L3 Thrid language

NO Norwegian language

OT Optimality Theory

SLM Speech Learning Model

TPM Typological primacy Model

V Vowel

VS Vowel Sequences

μ mora

σ Syllable

1. Introduction

Researchers in the theoretical linguistic department have not widely explored the field of Spanish phonology as a second/third language by Norwegian speakers. Most of the existing literature found is mainly with English L1 speakers. Henriksen (2021) summarises the ongoing projects regarding L2/L3 Spanish phonology, studies mainly focus on other aspects, such as the production of /b d g/, the rhotic, and the /l/. This work investigates the acquisition/production of Spanish vowel sequences such as diphthongs and hiatus by adult native speakers of Norwegian. This research assumes that most participants have English as a second language making Spanish their third language.

This work also aims to start filling the gap in the research of Spanish L2/3 by Norwegian speakers as it is a language that is gaining ground as a second foreign language in Norway, with around 93.000 learners (Instituto Cervantes, 2023:33).

The classification of vowel sequences (VS, from now on) includes diphthongs and hiatus, i.e., tautosyllabic and heterosyllabic sequences, like /eu.ro.ˈpe.o/ / æʉ.ro.pe.isk/. “european”. Spanish has 14 diphthongs while Norwegian six, Kristoffersen (2000). This means that there are 8 VS that are not in the lexicon of the learners, at least not in their L1, but the speakers are also proficient in another language, English, which has different VS than Norwegian or Spanish, although there are some that are the found in the three of them, which will be discussed later in this work in section 3.4.

L3 phonology is still growing and as seen in Henriksen (2021), some of the models that are used in L2 are being used for L3, in the case of the Speech Learning Model (SLM) by Flege, (1995) or the Typological Primacy Model (TPM) by Rothman’s (2015).

Most models agree that L1 would affect the phonology of the learners, especially in the early stages, this means that existing phonemes in the L1 are transferred to the L3. L2 also plays an important role as it depends on the level of proficiency of the person, if it is at a high level, this can affect the result in L3.

One of the expected results for this project is that most participants will copy the syllabification pattern from their native language, especially in cognate words such as /ˈmais/ vs /ma.ˈiθ/

‘corn’. In words that are not similar to their native language, they are expected to prefer the patterns from their L2.

Taking the *maíz* vs *mais* example, as we can see in the table below, the phonemes are almost the same, but the syllabification structure is different, Spanish has two syllables while Norwegian has only one. Therefore, as the VS [ai] exist in Norwegian, it is expected that learners copy this structure and pronounce it as monosyllable when using Spanish.

Spanish (Castilian) L1	Norwegian L1	Spanish L2/L3	English
ma.iθ	mais	maiθ / mais	‘corn’

There is also the issue in some words that have the same phonemes but different syllabification in Spanish. In this regard, Norwegian speakers are expected to not only copy their L1 syllabification pattern but also apply it consistently to both words:

Spanish (Castilian) L1	Spanish L2/L3	English
ahí /a.i/	/a.hi/	‘over there’
hay /ai/	/hai/	‘there is’

As a third element to explore in this work related to the VS, we have the VS in the derived words, for example, the word *maicena* comes from *maiz* this is also a word found in many languages, mainly because of the brand ‘maizena’. The point here is that in Spanish, occurs a change of syllabification not only because of the addition of the suffix [-ena], but the hiatus changes into a diphthong, resulting in /mai.ce.na/. Now, as said before, in Norwegian it is already a diphthong, but the question is, how the whole word is syllabified.

Spanish (Castilian) L1	Spanish L2/L3
mai. θe.na	1. mai.θe.na 2. maiθ.e.na 3. maiθ.ena

To answer this, a small experiment was conducted, and the collected data was run using the software R for soma basic statistics and, OT was used to identify the constraints that learners follow when producing VS in Spanish L2/L3 and resolve the third element exposed above.

Overall, in this work, the following questions will be addressed:

1. How do adult Norwegian native speakers produce VS in their L3 Spanish at different levels of acquisition?
2. Do they copy the syllabification pattern from their native language or L2?
3. Do they make a difference in the pronunciation of diphthongs and hiatus?

This is a study that covers Phonology in a multilingual environment, including transfer in L3 patterns in different levels of acquisition. At the same time, it deals with phonological aspects that have not been widely studied, for example, Norwegian L1 learning Spanish L2/L3, and Spanish L3 Cross-Linguistic Influence (CLI) in phonology.

Chapter 2, of this work will cover the background and literature of VS in Spanish L2, where I explore different works mainly in English L1. These works draw a path of phonological theories about Spanish diphthongs and hiatus used in this study. Chapter 3, I will explain how the syllables are formed and how the diphthong representations are placed in the syllable.

Chapter 4 is an extension of the previous chapter as here I will explain the sounds found in the languages that I cover (Spanish, Norwegian and English) and more importantly, the syllabification for each language and a comparison between the three of them. Chapter 5 is dedicated to OT analyses that are used for the syllables and VS in Spanish L1, Norwegian L1 and Spanish L3

From Chapter 6, I start explaining the methodology used for this study, including how the experiment was created and run. After presenting the data processing, in Chapter 7 I present the results and analysis from the data obtained in the experiment, answering not only the main research question but also the ones that came up and exposed during the study. Finally, in chapters 8 and 9, the discussion and conclusion of the study are presented.

2. Background

2.1. Previous works on Spanish vowel sequences / Spanish L2

The syllable structures of Norwegian, English and Spanish exhibit certain similarities, particularly the use of CV pattern and in their use of vowels in the nucleus position which in some cases English and Norwegian can also have a consonant.

This section presents an overview of previous research concerning Spanish VS such as diphthongs, triphthongs and hiatus, predominantly focusing on studies that analyse the English > Spanish (EN>ES) language combination. While the literature comprehensively addresses the EN>ES language transition, there is a notable lack of research examining the Norwegian > Spanish (NO>ES) language combination with ES>NO as the most common combination. Nonetheless, insights gleaned from existing studies contribute to our understanding of this linguistic phenomenon.

As seen in Henriksen (2021) phonological studies in Spanish L2 are increasing although we cannot say the same for L3 Spanish. For studies related to diphthongs and hiatus, we can find the work of MacLeod (2012) who highlights a corpus of studies exploring Spanish vowel acquisition, although with a relative paucity of research dedicated to the acquisition of VS. Examination of literature on Spanish as second language acquisition (L2) reveals a predominant focus on learners with English as their first language (L1), which comparatively fewer studies incorporating speakers of other L1 languages such as Italian, French or German. MacLeod's research endeavours to bridge this gap by investigating the acquisition processes of both the vocalic inventory and VS in Spanish among second-language learners. Methodologically, MacLeod employs a delayed repetition task, categorizing participants into four distinct groups representing varying proficiency levels in Spanish, including both learners and native speakers. While the primary focus of MacLeod's study lies in the phonotactics domain, it also addresses pertinent phonological considerations. The author concludes that Spanish learners with English L1 produced longer vowels and when it comes to glides, learners show transfer of phonological constraints from their native language for example instead of saying [pweɾ.to] they produce [ˈpu.er.to].

In the realm of Spanish phonological acquisition, Krause (2013) contributed with a significant work focusing on the acquisition of Spanish VS. Krause's investigation centred on the production of VS by adult native speakers at various proficiency levels in Spanish, culminating in the proposition of a set of constraints for Optimality Theory (OT) analysis, these constraints will be presented in detail in chapter 4 of this paper. The methodology encompassed both theoretical and experimental tasks, involving four distinct participant groups, of which three comprised English native speakers either proficient or in the process of acquiring Spanish, alongside a group of Spanish native speakers.

Contrasting the conventional language pairings explored in prior studies, Martinez-Paricio and Torres Tamarit (2013) examined the tautosyllabic sequences from Spanish and Catalan, although these languages are closely related the authors argue that in some cases the sonority sequences of [iu/ui] are produced differently. In their work, they run an experiment with three different groups, one monolingual Spanish, one almost monolingual Catalan and one bilingual. As a result, they found that monolinguals of Spanish mainly produce rising diphthongs while in Catalan is the opposite, in the case of bilinguals there is more variation in their responses.

2.2. Acquisition of diphthongs in L2/L3

The acquisition of VS is a topic that just like many other subjects of Spanish L2 has been analysed, especially with the language combination ENG>ES; nevertheless, it is possible to find it in other combinations like the one that Monahan (2001) presented, he studied the OT constraint ranking of Brazilian Portuguese syllable structure and with this, he analysed if speakers transferred some constraints to English. In other words, he analysed transfer in the interlanguage of English L2.

This work was inspired by the study Zárate-Sández (2009) conducted on the perception and resolution of vocalic sequences where he first points out the lack of studies related to Spanish L2 on this topic. In the study, 100 participants were asked to do a syllabification task where they had to divide words into syllables, some words were cognates, like /material/. The predicted results were CLI in the perception of VS found in cognate words. Nevertheless, the results confirmed a difference in perception between native Spanish speakers and Spanish language learners with L1 English. Hiatus is preferred for learners where natives perceived a diphthong.

Krause (2013) also mentions the work from Zárate-Sández, in her research, she also analyses the production of sequences in adult native speakers of English. The experiment for this work consisted of two tasks of word reading, one with nonsense words and the other one in a question/answer format. The data obtained from the experiment was first run on Praat to obtain not only the phonetic aspects of the sequences but also to identify the phonological processes (i.e. deletion, reduction, high vowel displacement…), to analyse them with OT to determine the most optimal diphthong. Therefore, Krause's work offers a list of constraints that are used in L2 Spanish phonology for diphthongs.

Dias & Simonet (2015) run an experiment with English native speakers with different levels of acquisition, their work focuses more on the phonetic aspect of the /e/ - /ei/ length comparing it with the native speakers. One of the arguments exposed in the paper is that it is challenging for learners to acquire a native-like pronunciation, especially for the interaction that might be the L1 and L2 languages.

2.3. Optimality Theory (OT)

Optimality Theory (OT) is a theoretical framework developed by Prince and Smolensky (1993) that consists of a set of universal, violable constraints that are ranked hierarchically according to the language grammar rules or to the specific issue that is being analysed, these constraints are divided between Faithfulness and Markedness. OT can be divided between GEN which generates the candidates (outputs), CON the constraints, and EVAL which selects the most optimal candidate from the output.

The constraints found in OT can be classified as Markedness which are the familiar aspects in the grammar like voiced, no coda, and no complex onset while Faithfulness constraints, on the other hand, avoid difference between the input and the output these constraints can be no epenthesis (DEP), no deletion (MAX), etc.

The analysis is carried out by using a table where the set of constraints goes on the top row, and on the left column the candidates are placed, in some cases, the input is shown on the top row on the left column or outside the table.

/input/	Constraint 1	Constraint 2	Constraint 3
a. Candidate 1	*		

b. Candidate 2		**	
c. Candidate 3			*

Figure 1 OT tableau model

The constraints are placed from the "most" to the "least" important meaning that, if one candidate violates constraint 1, this candidate will no longer be eligible to be the most optimal candidate, the candidate that has less violation is considered the most optimal candidate. For each violation that occurs, an asterisk (*) is placed. The optimal candidate is the one with fewer violations and it is marked with a pointing finger.

As said before, OT is based on a set of universal constraints that their ranking changes according to the language and the specific issue it is being analysed. This work focuses on the Spanish syllabification of diphthongs, therefore, considering that Spanish and Norwegian and English follow the CV rule, our first two constraints are:

ONSET: all syllables must have an onset

NO-CODA: the syllables are open (they don´t have coda)

Later, in the section for each language, there will be a list of ranked constraints that are used for Spanish L1 and Norwegian L1, but, before getting there, Kager (1999: 97) offers a table that illustrates the kind of syllabifications that can be found.

	Simple codas only	Complex codas allowed
Simple onsets only	CV, CVC	CV, CVC, CV**CC**
Complex onsets allowed	CV, CVC, **CC**V**, CC**VC (Spanish)	CV, CVC, CV**CC**, **CC**VC, **CCVCC** (English)

Table 1 Syllabification Structures. Kager (1999: 97)

In this table we can see that not all languages allow the same syllabification structures, for example, Spanish allows simple codas but allows complex onsets /tra.ba.jos/ 'works' [tra] has a complex onset while [xos] has a simple coda. In the case of English occurs something different as it also allows complex codas /help/ [hɛlp] where [lp] is the complex coda. To have a clearer

understanding of the syllabification structures, in the following chapter I am going to explain how syllables are formed and arranged when there is a VS involved.

To illustrate this on the OT analysis, let us use the word in Spanish *algo* 'something'. The input is /casa/ and the syllables are going to be marked by using a point (.), in terms of constraints let us use ONSET, and no coda *CODA for markedness. Meaning that all syllables must have an onset and codas are not allowed.

For Faithfulness constraints, we can add DEP as all phonemes represented in the output should be the same as the input (no addition) and MAX as there cannot be deletion. These two constraints can be merged into FAITH and is going to be placed above our markedness constraints as it outranked the markedness constraints, placing it first prevents deletion and/or epenthesis.

/algo/	FAITH	ONSET	*CODA
• a. al.go		*	
b. a.lgo			
c. salgo	*	*	
d. l.go	*		

Figure 2 OT tableau - algo 'something'

Candidates (c) and (d) violate the FAITH constraint making them not optimal, candidate (b) violates the markedness constraints as [kas] has a coda and the [a] is lacking the onset making candidate (a) the optimal candidate as it does not violate any of the constraints.

This is only a small example of how the analysis works, in chapter 5 I will explain the analysis in more detail, exploring the constraints that are used in Spanish L1 and L2, as well as the rankings that are found for syllabification.

3. Syllables and vowel sequences

As Krause (2013) mentioned, if we want to analyse diphthongs, it is important to discuss and analyse syllables as well, as one modifies the other. For this reason, this chapter will cover a general explanation of what syllables are and how they are analysed, I will also mention some current views and debates regarding syllabification.

3.1. Syllables

Syllables are defined mainly as a group of phonemes (i.e. consonants and vowels) grouped around a sonority peak, also known as nucleus. (Morales-Font 2018, Hualde 2014, Kristoffersen 2000). Syllabification does not have the same structure in all languages, in some, like Spanish, it is straightforward while in other languages like English, it might be more challenging, as we can see in Table 2.

Spanish syllable	**English syllable**	**Word**
/ˈrui.do/	/ nɔɪz/	'noise'
/o. ˈθe.a.no/	/ˈəʊ.ʃən/	'ocean'
/ko.ra.ˈθon/	/ hɑːt/	'heart'

Table 2 Syllabification in Spanish and English.

In Spanish, for example, 5 phonemes form of the Spanish vowel inventory (Figure 3). These vowels in combination with the consonants create a syllable. There are rules and restrictions on how to parse the syllables in a word, like syllables should have a vowel. According to Hualde (2014), the structure of Spanish makes it simple to identify the syllables rather than in English, at least in words without VS. In Table 1, we can see most syllables in Spanish start with a consonant (although it is also possible to start with a vowel, like *oceano*).

	Front	Back
Close	/i/	/u/
	/e/	/o/
Open	/a/	

Figure 3 Spanish vowels. Kaisse (2019)

The syllables usually follow the same structure in most languages, onset, and rhyme where we find the nucleus and coda (Figure 4) where the most important aspect would be the nucleus as there cannot be a syllable without one. Usually, the nucleus is a vowel phoneme but in languages like English and Norwegian it is possible to find a consonant in this position, the onset would represent everything before the nucleus, including complex onsets /sk/, /sh/, /fr/ /fl/…, and the coda is everything after the nucleus. In the Onset position, we usually find a consonantal phoneme, that can be complex or simple, codas are mainly consonants, but it is also possible to find some glides.

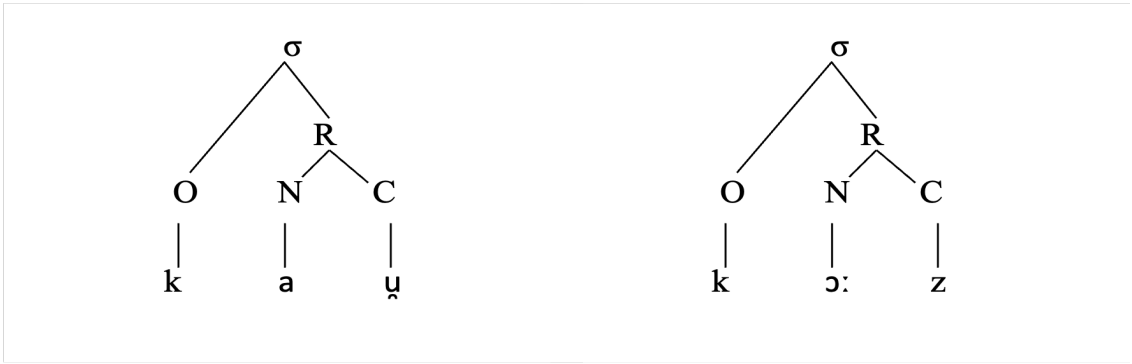


Figure 4 Syllabification model representation.

In the analysis above we have the syllabification for ‘cause’, in the case of Spanish (to the left) it’s the beginning of the word /kausa/. In the model representation, we can see that in the Spanish syllabification, there is a [u̯] instead of [u], this is because there is a glide instead of an actual vowel, this will be explained in the following section 4.1.

Now that the syllable formation is explained, there is one more aspect we can include in the analysis of the syllable, the sonority of the phonemes. In most languages the vowel takes the place in the nuclei of the syllable because they represent the highest sonority of all the phonemes. To know which segments have high sonority a universal hierarchy was stablished, (Colina, 2012, 2020).

Figure 5 shows the sonority scale ranking for each segment of phonemes, where 1 represents the less sonorous segments and the highest. The following hierarchy might be the most common and used for current studies, nevertheless, there are different variations.

Stops << Fricatives << Nasals << Liquids << Glides << Vowels

1 2 3 4 5 6

Less sonorous More sonorous

Figure 5 Sonority hierarchy (Colina, 2012).

To see this clearly in a syllable structure I present Figure 6 where again we have /kau.sa/ where [k] is a stop, [a] low vowel, [u] glide. According to the scale stops are the least sonorous, and [a] would represent the peak, although [u] is also a vocoid, according to the scale, glades are ranked below vowels.

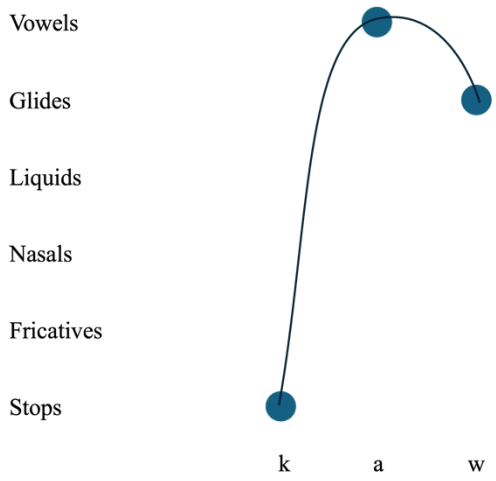


Figure 6 Sonority hierarchy representation of the syllable [kaw] from the word 'causa'.

All segments have a number in the scale, and vocoids are ranked higher, in addition to this, we can add an extension of the hierarchy and apply it to the vowels. Kiparsky (1979) cited by Golston & Krämer (2020), propose a hierarchy for vowels. Basically, low vowels have more sonority than high and mid vowels. (see figure 7).

u << i << o << e << a

Less more sonorous

Figure 7 Sonority hierarchy for vowels. Golston & Krämer (2020),.

3.2. Diphthong representation / Vowel sequences

As seen in the previous section, a syllable contains three elements, the nucleus represents the peak sonority which usually is a vocoid. It is possible to find other elements in this position but in this work, I am going to focus on the diphthong's representations in the syllable. When we have two or more vocoids together we obtain diphthongs, hiatus, triphthongs (and even tetraphthongs[1]). In this work I will cover the main VS that are found in Spanish, that are also found in Norwegian and English.

Diphthongs are formed by one vowel and a glide, the latter can be placed before or after the consonant, /ˈkau.sa/ 'cause' and /bien.to/ 'wind'. In this work, glides will be represented as [u̯] and [i̯] although in some occasions they can be represented as [w] and [j], later I will explain when are cases where the different transcriptions can be used.

Looking back at table 2, with the Spanish and English syllables, we can find some VS like /h**aʊ**s/ 'house' and /ˈt**eɪ**.bəl/ 'table' for English and /ˈk**au̯**.sa/ 'cause' for Spanish, and / hæi/ 'hello' /sæu/ 'sheep' /øy/ 'island' for Norwegian.

Languages like Spanish are straightforward regarding syllabification and most native speakers agree on the division of syllables, as long as there are no VS involved (Hualde, 2005). In the case of English and Norwegian, this is also challenging but different to Spanish, in the other languages a consonant can be placed in the nucleus and some other complexities are found. In this work, I will only focus on the issue regarding the VS. The main problem in Spanish is that VS can be either tautosyllabic or monosyllabic, in some cases this changes the meaning of the word, as a result, we can have two different syllabification patterns (see example below). The Spanish variant can be a factor in this problem, but it is only in a few cases.

/aˈβu̯ela/ '*grandma'* can be syllabified as /a. βu.ˈe.la/ or /a. ˈβu̯e.la/.

As I mentioned above, this issue does not happen only in Spanish, this is one of the main issues when analysing VS is that in some languages it is difficult to say if they are diphthongs or

[1] Tetraphthongs are complex vowel sequences ENICĂ (2011) describes them as a complex vocalic segment made of the nucleus vowel and three semivowels. Although we can find some sequences in English, I will not cover them in this work. Also, they need to be more studied.

hiatus, we can see this phenomenon using the word idiota (ES) idiot (NO-ENG), example taken and modified from the Norwegian by Kristoffersen (2000). In the three languages, the word uses the same VS /io/, now, we can divide the word as follows when pronouncing it slowly:

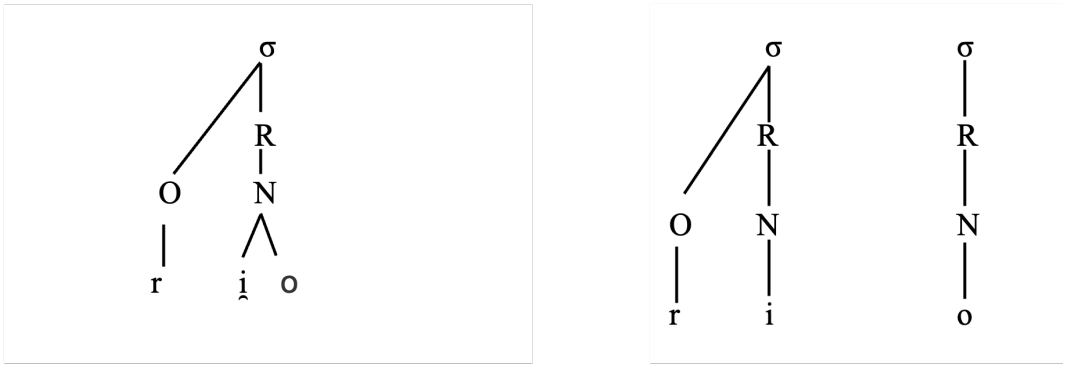
Spanish: /i.’ði.o.ta/ or /i. ˈðjo.ta/

English: /i.di.ət/ or /i.djət/

Norwegian: /i.di.u:t/ or /i.dju:t/

In the case of Spanish, we have one more syllable as it is not possible to end a syllable with a voiceless stop, therefore a vowel is needed.

The main difference between diphthongs and hiatuses is that the first one is tautosyllabic, the VS is part of the same syllable, while the hiatus is heterosyllabic, the VS is divided into two syllables, as represented in Figure 8



/rió/ ‘she laughed’ /’ri.o/ ‘river’

Figure 8 Syllabification of Vowel Sequences: Diphthong and Hiatus.

In the figures above, we can see the representation of the diphthong (left) and the hiatus (right). In this example, the same representation but in the case of ‘she laughed’ the vowel is more sonorous, like if it has stressed, while in ‘river’ the VS is disyllabic as the [í] is stressed.

As mentioned, there are two types of diphthongs, rising and falling. In the rising diphthongs, the glide goes before the vowel (prevocalic glide), like in words like ‘ciudad’ /θju.dad/ ‘cuidar’ /kwi.dar/ (‘city’ and ‘to take care’). The counterpart is falling diphthongs, where the glide goes after the vowel (postvocalic glide).

Now that I have explained the syllabification processes, I want to clarify that this work will identify VS all the vowel sequences (diphthongs, hiatuses and triphthongs). In the case that I talk about a specific VS this will be mentioned.

4. The lexicon of Spanish, Norwegian and English

In the following section, I will briefly explain the main vowel system sounds in Spanish, Norwegian, and English. Each language will be discussed in terms of its vowels inventory, its IPA consonantal phonemes as part of the syllabification system, and its VS. At the end of the section, I will analyse the differences and similarities of VS between these languages.

To have a list of all the possible VS in the language that this work is analysing can be challenging for several reasons:

1. To my knowledge, there is limited literature available on Norwegian phonology. Kristoffersen (2000, 1015) is one of the few authors who extensively discuss this topic.
2. In Norwegian dialects can have more or even fewer VS. Therefore, this work will focus the analysis on the Oslo dialect, as the author mentioned above is the one he talks about, but the Tromsø variant will be briefly commented on.
3. Regarding English L2, the exposure the learners have to English will vary the acquisition of VS, usually, European countries teach the British variant but due to media exposure, the American variant is more prevalent.
4. In Spanish, some hiatus might be diphthongs depending on the variant. Hence, this work analyses the Castilian Spanish commonly taught at schools.

4.1. Spanish

Spanish language contains 5 simple vowels. In the sound inventory, there is no distinction between long and short vowels, The VS combinations that are included in the language can be distinguished between diphthongs and hiatus. These 5 phonemes also have their allophones, which according to Díaz-Campos (2014) are the glides.

In the following IPA charts (Tables 3 and 4), we can see the phonemes that Spanish has, this is for Castilian Spanish.

	Front	Center	Back
Semi-consonant	j		w
Semivowels	i̯		u̯
High	i		u
Medium	e		o
Low		a	

Table 3 Vowel Inventory in Spanish. Diaz-Campos (2014)

	Bilabial		Labiodental		Interdental		Dental		Alveolar		Palatal		Velar		Uvular		Glottal	
	-	+	-	+	-	+	-	+	-	+			-	+	-	+	-	+
Stop	p	b					t	d					k	g				
Affricate											ʧ	ʤ						
Fricative		β	f	(v)	θ	ð			s	z	ʃ	ʝ	x	ɣ		(ʁ)	(h)	
											ʒ							
Nasal		m		ɱ		n̪		n̪		n		ɲ						
Lateral						l̪		l̪		l		(ʎ)		ŋ				
Trill										r								
Flap										ɾ								

Table 4 IPA Spanish. Diaz-Campos (2014)

As said in Chapter 3, a syllable is made by an onset, a nucleus and a coda, these last two belong to the rhyme. In Spanish, the nucleus is always formed by a vowel, in the onset we can have complex combinations (complex onsets) according to Hualde (2014) it can only have up to two consonants, usually a plosive or fricative followed by a liquid, such as pl, pr, fl, fr. Some combinations like /tl/ are only found in Mexico because of the influence of the Nahuatl, like in tlacoyo (Mexican dish). Finally, in the coda which is also formed by consonants, it is possible to find complex combinations (complex coda) rs / ps like *perspicaz* 'keen' and *biceps*, for example.

As previously mentioned, the nucleus is always a vowel as it is the peak sonority in the syllable. Spanish does not allow any consonant to be in this position. According to some authors, glides can also be in this position when they are before the vowel, if they are placed after they will be considered as part of the coda (Colina 2009).

The following list presents the basic syllable structures that can be found in most of the Spanish variants (Colina, 2009:11) where V= vowel C= consonant G= glide, this list was modified to illustrate the combinations that are VS.

c. **CVG**	soy [soj]	'*I am'*
d. **VG**	hay [aj]	'*there is'*
f. **CCVG**	**plei.**te.ar [pej]	'*to fight'*
g. **VGC**	**aus**.tral [aws]	'*austral'*
h. **CVGC**	**caus**.ti.co [kaws]	'*caustic'*
i. **CCVGC**	**claus**.tro [klaws]	'*cloister'*

In Spanish it is possible to find diphthongs and triphthongs. According to Ibarren (2005) there are 14 diphthongs in the Spanish languages. These can be divided into 'rising' and 'falling'.

Hualde (2000) describes the diphthong as a sequence that includes a vowel and a glide within the syllable. If the glide occurs before the vowel like in [i̯a], it is a rising sonority diphthong and if the glide goes after the vowel, like in [ai̯], we have Falling sonority diphthong.

The list (6) shows some examples of the rising and falling sonority examples: (Zárate-Sández, 2009; 165, table 2)

Rising Sonority			
/i̯a/	viaje	bi̯á.xe	*'trip'*
/i̯e/	viejo	vi̯e.xo	*'old'*
/i̯o/	canario	ka.na.ri̯o	*'canary'*
/u̯a/	cuatro	ku̯a.tro	*'four'*
/u̯e/	bueno	bu̯e.no	*'good'*
/u̯o/	mutuo	mu.tu̯o	*'mutual'*
falling sonority			
/ai̯/	bailar	bai̯.lar	*'to dance'*
/ei̯/	aceite	a. θei̯.te	*'oil'*
/oi̯/	estoy	es.toi̯	*'i am'*

/au̯/	jaula	xau̯.la	*'cage'*
/eu̯/	euro	ˈeu̯.ro	*'euro'*
/ou̯/	estadounidense	es.ta.ðou̯.ni.ðen.se	*'american'*

There are a total of 14 diphthongs (6 rising sonority, 6 falling sonority and 2 with sonority plateau) and in the case of hiatus, to my knowledge, there is no definite number as they are just vowels sequences that are separated in different syllables, therefore we can have the same diphthong combinations, plus some others like [ae], [ea] and [eo].

Compound words like *estadounidense* /es.ta.ðou̯.ni.ðen.se/ [es.ta.ðos + u.ni.ðos] '*American'* are usually hiatus but in this specific case it is a diphthong.

Hispanohablante /is.pa.noa.blan.te/ [is.pa.no + a.blan.te] 'Native *Spanish speaker'*

In Spanish, it is possible to find triphthongs, but these are not as common as diphthongs. Triphthongs are constructed by three consecutive vowels, for example, in words like [u.ɾu.y**u̯aj**] 'Uruguay' or [bue̯i̯] 'ox'. It is also possible to find diphthongs and hiatus that are easily mistaken as triphthongs, for example, /ɛs.tu.ðj.ais/ 'you (plural) study' if formed with a hiatus [i.a] and a diphthong [a]. This can also happen as diphthong plus a hiatus /lim.pia.u.ñas/ 'nail cleaner', in this case, is a compound word, and usually they have a hiatus rather than diphthong.

We have already seen how syllables are formed and in the case of Spanish it is straightforward and there are two generalizations or rules. The first generalization is the CV rule, meaning that a consonant needs a vowel in order to become a syllable, vowels can be a single syllable (like in hiatus) but not a consonant, these are always in Onset and Coda position.

The second generalization is a group of consonants (complex consonants) will always be part of the onset and not in the coda position, except in some Spanish variants, like in Mexico that includes words in Nahuatl like *Popocatepet'* 'name of a volcano in Mexico'.

In Spanish and other languages as well, there is one phenomenon called "re-syllabification" in which two phonemes from different words are combined to form a syllable, for example:

"Los amigos" here we have two words, the article *los* and the noun *amigos*, the first word is a closed syllable and the second word has a vowel as its nuclei in the first syllable, therefore they merged in order to create one syllable and follow the patter C.V (Colina, 2009, Bradley 2014)

*los.a.mi.gos

→ lo.sa.mi.gos

The syllabification rules in Spanish allow us to have only vowels in the nucleus position, and, according to Colina (2009) prevocalic glides can also occur in the nucleus position but not in the onset. This presents a current debate in phonology, as some scholars argue that prevocalic glides occupy the onset position, Kaisse (2016) One of the arguments for placing the glide in the nucleus us that the rhyme in Spanish can have three segments. For this work, I am going to consider the prevocalic glides as part of the nucleus, therefore the glides are going to be marked as [i̯] [u̯]. Nevertheless, there is one case when the prevocalic glides can be considered as part of the onset, known as onset maximisation marked as [j] [w] and therefore as they are placed in the onset they are nonmoraic.

webo ‘egg’ – prevocalic glide in the onset position

u̯ebo ‘egg’ – prevocalic glide in the nucleus position

4.2. Norwegian

	Bilabial		Labiodental		Dental		Alveolar		Postalveolar		Retroflex		Palatal		Velar		Uvular		Glottal	
	-	+	-	+	-	+	-	+	-	+			-	+	-	+	-	+	-	+
Stop /plosive	p	b					t	d			ʈ	ɖ	c	ɟ	k	g			ʔ	
Fricative			f			ð	s		ʃ				ç	ʝ	x	ɣ			h	
Nasal		m		ɱ				n				ɳ		ɲ		ŋ				
Lateral								l				ɭ		ʎ				ʁ		
Trill / vibrant								r												
Flap								ɾ				ɽ								
Approximant		ʋ						ɹ				ɻ		j		ɰ				
Other symbols													c͡ç	ɟ͡ʝ						

Table 5 Norwegian IPA, (Skarb & NTNU, 2002)

There is not much information about Norwegian language at least available in English. Therefore, this work is going to focus on the explanations of the author Kristoffersen and the NTNU information available about the Norwegian Language.

As mentioned before, one of the issues with Norwegian is that it has many dialects spoken around the country. There are two types of written forms, Bokmål and Nynorsk, the first one is the one that most people learn at school and is considered the closest to the Oslo dialect.

Norwegian language has a wider spectrum in their vowel inventory, they also have long and short vowels distinction, giving a total of 18 phonemes in which Kristoffersen (2000) marks /æ/ as a *marginal phoneme* (2.1.1.2) as it is unclear and is more as an allophone of /e/ before /r/ and its retroflex. according to Kristoffersen, Est Norwegian have three common diphthongs and three marginals. The last ones only occur in a few loan words.

	Front	Near-front	Central	Near-back	Back
Close	i: y:		~~ʉ: ʉ~~		u:
Near close		ɪ ʏ		ʊ	
Close mid	e:	ø:			
mid		e			o:
Open mid		œ			
Near open		æ æ:			ɒ̟
Open					ɑ: ɑ

Table 6 Norwegian vowel inventory (Skarb & NTNU, 2002)

In the matter of VS, which is the main topic of this work, Kristoffersen does not make many arguments, in fact, there is not much information about diphthongs in Norwegian, but we know the main inventory of the diphthongs. According to Kristoffersen, there are 6 diphthongs that he divides between Common and Marginal, the latter only occur in few loan words.

Common: [æj, œj, æw]

Marginal [ɔj, ʉj, ɑw]

As Norwegian can change according to the dialect, To this inventory of diphthongs, we can add those that NTNU shows from Tromsø dialect [**oeu**, ei, äi, øy, ɔj]

According to the data collection at NTNU, Norwegian language has front diphthongs [ʉʏ, œʏ, æʏ, æɪ] and back diphthongs [ɑi, ɔʏ, ui] and some examples in other dialects [ei, œu, ɑu]

As seen in this part of collecting language data, Spanish has more diphthongs and even has triphthongs, these cannot be found in Norwegian language, but they can be found in English (British) where a /ə/ is added in the third vowel positionɪə. There is no record of Norwegian having triphthongs (Not that I have found), in the orthographic it is possible but not the phonetic

Klimaveien or Klimavegen /klimaˈʊɛːjən/

Berulfsen (1969 :10) offers an overview of the words that are not considered diphthongs even if they have consecutive vowels, for example words like Haiti /ha-iːʼti/, he prposed to use a hyphen to differentiate this is similar to what in Spanish is called 'hiatus', there is a stop between the two vowels.

According to the NTNU for Norwegian as a second language, Norwegian have 5 common diphthongs, /ai, ei, ay, øy, oy/. If we classified diphthongs by its sonority, we get the following:

Plateau = ʉj

Falling = æj, œj æw ɔj aw

The nucleus in Norwegian can be either a vowel or a consonant, but only the sonorant coronals /n/ or /l/ (Kristoffersen, 2015). Just like the onset, codas are also non-moraic. In order to determine the stress in the syllable, the one that has two moras is the stressed one.

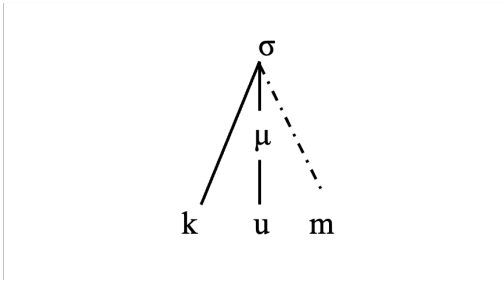


Figure 9 Syllable Structure Norwegian. (Kristoffersen, 2015)

When it comes about the VS, in Norwegian we can only (or mostly) find the diphthong, in fact, there is no data about hiatus in Norwegian but in some cases it is possible to find a hiatus as a valid syllabification option, Kristoffersen 2015, for example, uses the word 'evangelium' to explain that it is possible the find the syllabification like: ɛ.ʊɑŋ.[1]geː.li.ʉm or ɛ.ʊɑŋ.[1]geː.ljʉm, as

we can see in the last example, the vowel /i/ was changed for a semivowel /j/. another word he uses for this explanation is *idiot* some people can divided as i.di.u:t or i.dju:t

As we can see, the Norwegian syllable structure in different from Spanish and English.

4.3. English

This work assumes that most participants will have English as their L2. There are many variants of English around the world and their phonemes are different, for this work I am going to cover the British variant as it is the one thought at European schools. English L2 is the most studied language in the linguistic fields, as it is the language with more learners in the world. Another characteristic of this language is the wide variety of variants that exist around the world.

In this section, I am going to briefly present the phonetical system of English. As we can see in the table below, English has 12 phonemes for the vowels, they can be lax or tense.

	Front	Near-front	Center	Near-back	Back
Close	i:				u:
Near close		ɪ		ʊ	
Close mid					
mid			ə		
Open mid		ɛ	ɜ:		ʌ ɔ:
Near open		æ			ɒ
Open					ɑ:

Table 7 English vowel inventory (Skarb & NTNU, 2002)

	Bilabial		Labiodental		Dental		Alveolar		Postalveolar		Palatal		Velar		Glotal	
Plosive	p	b					t	g					k	g	ʔ	
Nasal		m						n						ŋ		
Tap, flap								ɾ								
Affricate									tʃ	dʒ						
Fricative			f	v	θ	ð	s	z	ʃ	ʒ					h	
Approximant		w						ɹ				j		w		

Lateral approximant								l								

Table 8 English IPA, (Skarb & NTNU, 2002)

English has 8 diphthongs plus some triphthongs. Different to Spanish, triphthongs are more common in English and these are formed by adding a [ə] after specific diphthongs. The table below shows the list of VS found in the language.

ɪə	hɪə	'here'
ɔɪ	ɔɪl	'oil'
eɪ	eɪdʒ	age
ʊə	tʊəɹist	'tourist
ɛə	ɛəpɔːt	'airport'
ɑɪ	hɑɪd	'hide'
əʊ	ɹəʊd	'road'
aʊ	haʊs	'house'
aʊə	aʊə	'hour'
ɑɪə	fɑɪə	'fire'
eɪə	pleɪə	'player'

4.4. Differences and similarities between Spanish, Norwegian and English

This work studies Spanish L3 by Norwegian L1 speakers, as seen in the information in the previous points of this section, the three languages that this study pretends to work with, show differences first, in the number of vowel phonemes, while Spanish is known for having only 5 representational vowels, Norwegian and English have more phonemes, nevertheless, we can see that Spanish have more VS. The following chart collects the diphthongs found in Spanish and Norwegian, the ones in bold are the ones that are shared in both languages. This chart was obtained in the language maps that offer NTNU (1-2 map). In the table, there are two sections for the Norwegian language, one belongs to the Tromsø dialect as I assume most of the participants have this dialect. For the English (British) language, some authors differ on the amount of VS the language has, for example, according to Roach (2009) there are 8 combinations while Hammond (1999) presents only 4 listed in his book "The Phonology of English".

Syllabification presents another difference, first in Spanish is only possible to have a vowel in the nucleus position while in English and Norwegian, it is possible to have a consonant.

Spanish diphthongs	Norwegian diphthongs	Norwegian (Tromsø)	English
With similarities			
1. a͡i	1. ai	1. ai	
2. e͡i		2. ei	1. eɪ
3. ui	2. ui		
	3. øy	3. øy	
	4. ɔy	4. ɔy	
Without similarities			
4. a͡u	5. æʉ	5. œʉ	2. ɑɪ
5. i͡e	6. ʉi		6. ɑʊ
6. o͡i	7. æi		7. ɪə
7. e͡u			8. ɔɪ
8. i͡a			9. eə
9. i͡o			10. ʊə
10. i͡u			11. əʊ
11. o͡u			
12. u͡a			
13. u͡e			
14. u͡o			

Table 9 Diphthongs in Spanish, Norwegian in English

From the chart, we can see that Spanish has more diphthongs repertoire than Norwegian, still, they share two combinations, /a͡i/ and /ui/.

The syllabification process in these languages might also have some similarities but one of the main differences is that in the NUCLEI position in both Norwegian and English, a consonant might be use while in Spanish only the vowels are allowed. In the following chart we can see the comparison between the languages regarding their syllabification process. This will help us to identify the right constraints for the OT analysis.

Language	ONSET	NUCLEUS	CODA
Spanish	• Maximally 2 consonants. • Plosive or /f/ + / l, r/ • */s/ + C */dl/	• Single vowel • Glide • Most common rising diphthong	• Maximally 2 consonants. • 2nd consonant always /s/. • Most common /d/, /s/, /n/, /l/, /r/. • Postvocalic glide • Many consonants neutralized or deleted. • Glide
English	• Maximally 3 consonants • Three consonants: /s/ + CC • */v ð z ʒ / + C • */t d θ / */l/ • */ɳ/ • Glides	• Single vowel –[ə] • Most common diphthong falling. • Consonants [l, m, n, r]	• Maximally 3 consonants • Nasal+ stop: same place of articulation • */n/ • Tendency for reduction in casual speech. • Postvocalic glides
Norwegian	• Prevocalic glides, non-moraic	• Vocals and coronal sonorants	• Postvocalic glides

Table 10 Syllabification in Spanish, English and Norwegian. Similarities and Differences

5. Optimality Theory

As said in Chapter 2.3, OT is a theoretical framework that selects the optimal candidate by checking the violation each candidate shows, the one that has less (or none) violated constraints is the optimal one. In this chapter, I will show the ranking of the constraints in OT for Spanish. As mentioned before, all languages share a set of universal constraints but their ranking change according to the language grammar or the specific phonological process we are analysing.

This work studies the diphthongs realisation in Spanish L2/L3, therefore the analysis that is going to be carried out will include the Spanish L1 constraints for Spanish diphthongs, I will also analyse the diphthongs in Norwegian L1 to later identify the rankings for Spanish L3. This will also allow me to draw more hypotheses. Another important aspect to mention here is the fact that OT has been mainly used to analyse L1 and only a few studies are related to Spanish L2, (e.g. Zárate-Sández) to my knowledge, there are no studies that include the OT approach in the study of Spanish L3.

5.1. Spanish Syllabification Constraints

As seen in Chapters 2 and 3, some scholars have been analysing Spanish syllabification and have offered a set of rankings, these can include the most basic constraints, like the ones mentioned in the examples in 2.3 or some that involve other elements like sonority. There are different elements to analyse in the syllables, in this study, of course, I am going to focus on the diphthongisation. For this, I take the compiled information so far about Spanish:

- The syllable structure of the syllables and the diphthongs in the syllables presented in 4.1. This list presents 6 diphthong structures.
- Diphthongs in Spanish can have rising and falling sonority.
- The stress window in Spanish allows the syllable stress to be in the ultimate, penult and antepenult position. Glides are considered stress attractors, for example, /es.ˈkue.la/ - */ˈes.kue.la/
- The weight in Spanish syllables: Spanish can have up to three segments in the rhyme. /b**ien**/ or /p**ers**.pi.kaθ/

Some of these points belong to the debate about the position of glides in the syllables exposed by Kaisse (2016). In 4.1.

Looking back to the Spanish lexicon and syllable formation, Spanish has different syllable structures being CV the preferred one. This type of syllable requires an onset and nucleus but, when there are diphthongs in the syllables the structure might change, violating the constraints of ONSET and *CODA (Colina, 2006, 2009, Morales-Font, 2008). As Spanish also allows more than one segment in the onset, this violates the COMPLEX ONSET CONSTRAINT.

ONSET: all syllables must have an onset

*CODA: syllables cannot end with coda.

*COMPLEX ONSETS: onsets must be simple

According to Hualde (2015) and Colina (2009), prevocalic glides are not parsed in the onset, as vocoids can only be placed in the rhyme of the syllable, in other words, Spanish allows having complex segments, violating the constraints of complex nucleus and complex coda. To add more precision to this we can add the constraints *NUC/glide and *CODA/glide, therefore, VS in the nucleus and the glide violate these constraints.

*COMPLEX NUCLEUS: the syllabic nucleus must be simple

*COMPLEX CODA: codas must be simple.

*NUC/glide: No glides in the nucleus position.

*CODA/glide: No glides in the coda

Colina (2009) also proposes MAX-IO constraint to avoid the loss of moras in the input and the output.

MAX-IO: penalises the loss of moras in the input and the output. / a mora present in the input must have a correspondent in the output

To add more precision in the parsing of glides, we know that vocoids are the most sonorous segments in the syllable and they are placed in the nucleus position, but in some cases, the glides might be placed in the onset position, violating the ONSET/glide constraint.

To analyse diphthongs the position of the glide is important for the ranking of the constraints. As glides are not allowed in the onset having these constraints over faithfulness prevents the

parsing of the glides in the onset position. Therefore, we can have the following ranking for rising diphthongs proposed by Colina (2009) and Krause (2013).

(1) Rising diphthongs in Spanish.
***ONSET/glide, ONSET >> *C.NUC, *NUC/glide, MAX-IOμ**

limˈpi̯ar	ONSET /glide	ONSET	*C.NUC	*NUC/glide	Max-IOμ
a. limˈpjar	*!		*		*
b. → limˈpi̯ar			*	*	
c. limˈpi.ar		*!			*

In the tableau above, candidate (a) is not optimal as the glide is found in the onset and candidate (c) not optimal either as there is no onset. Therefore, candidate (c) although it violates the NUCLEUS contains, is the one considered optimal as their violations are ranked low. MAX-IO was also violated by candidates (a) and (b) because the amount of moras is different from the input: limˈpi̯ar$_{\mu\mu\mu}$ → (a): limˈpjar$_{\mu\mu}$ (c) limˈpi$_{\mu}$.ar$_{\mu\mu}$

Falling diphthongs can follow almost the same structure, but, postvocalic glides are parsed in the coda position therefore, they violate *CODA/glide and *CODA.

(2) Falling diphthong.
***ONSET/glide, ONSET >> *C.NUC, *CODA/glide, *CODA, MAX-IOμ**

austral	ONSET /glide	ONSET	*C. NUC	*CODA/glide	*CODA	Max-IOμ
a. → aus.tral				*	*	
b. a.us.tral		*!			*	*
c. aws.tral	*!				*	*

The tableau above shows the ranking constraints for falling diphthongs, as we can see, candidates (b) and (c) are not considered optional, (b) violates the ONSET constraint as the VS is broken into a monosyllabic structure and candidate (c) violates de onset/glide [w] therefore, although all candidates violate de *coda constraint, candidate (a) is considered optimal as its violation is ranked low.

The two rankings shown above are the basic analysis for Spanish diphthongs, unfortunately this ranking and probably the set of constraints do not work for the hiatus or triphthongs which are also considered a VS. as we can see in the example below:

paˈis	ONSET /glide	ONSET	*C.NUC	*CODA/glide	Max-IOμ
a. → ˈpa̯is				*	*
b. paˈis		*!			

As we can see in the tableau above, candidate with a hiatus is eliminated by the second constraint, ONSET, leaving candidate (a) as the optimal candidate. One way to solve this problem is by changing the Faithfulness constraint to rank higher than markedness, and *CODA and *CODA/glide should be ranked after faithfulness, as shown above.

(3) Hiatus. Falling sonority
***COMPLEX NUCLEUS, *NUC/glide >> MAC-IOμ, *ONSET/glide, ONSET**

paˈis	*C.NUC	*NUC/glide	Max-IOμ	*ONSET/glide	ONSET
a. ˈpa̯is	*	*	*		
b. → pa.ˈis					*

The order of the VS affects the ranking of the constraints, in the tableau above, favours hiatus with rising sonority and the one below favours hiatus with falling sonority. The ranking below also works with the combinations that do not have the glides like [ae] /aeroplano/ ‘airplane’, [oa] /kokoa/ ‘cocoa’.

(4) Hiatus. Rising sonority
***CODA/glide, CODA >> MAX-IOμ, *ONSET/glide, ONSET**

aereoplano	*C/glide	*CODA	Max-IOμ	*ONSET/glide	ONSET
a. ae.ro.pla.no		*			
b. a.e.ro.pla.no					*

In the tableau candidate (a) is eliminated by *CODA as [e] is the coda in the syllable, while candidate (b) violates the ONSET constraint but as it ranks low, this one is the most optimal, allowing the hiatus.

It is not possible to analyse diphthongs and hiatus with the same ranking of constraints we also need account the sonority of the sequences as seen in the previous examples. We can also analyse VS with a different approach by taking the following grammar:

5.2. Norwegian syllabification constraints

To my knowledge, there are no (published) studies related to the syllabification of diphthongs in Norwegian, but there is the baseline for the syllable CV stressed syllable structure proposed by Kristoffersen (1999) and studies about stress by Rice (2005) therefore for this work I am going to attempt to develop a basic OT analysis for Norwegian diphthongs, using as a baseline the works previously mentioned.

Norwegian, like other languages, also prefers the CV syllable's structure, therefore it requires an onset, and the syllable must end with a vowel *CODA. In terms of stress and syllable weight, Norwegian only allows heavy syllables, hence, in the syllables is possible to have only two moras. ('σ = μμ,). Different from Spanish, Norwegian has nonmoraic codas.

(5) Basic syllable structure.
'σ = μμ, ONSET >> *CODA

'σ = μμ, ONSET >> NO V: >> *CODA

Although long vowels are allowed, none of the diphthongs in the inventory possess this quality, to analyse the VS in Norwegian I understand that diphthongs are trochaic (*.) for this reason the typology proposed by Golston and Krämer (2020), can be used, ranking IAMB higher than TROCHEE

As seen in the diphthong inventory of Norwegian in Chapter 4.2., glides are prevocalic and are placed in the coda position, therefore they break *CODA and *CODA/glide as they are falling.

(6) Falling diphthongs.
$\sigma_{\mu\mu}$, IAMB, ONSET >> *CODA, *CODA/glide, TROCHEE

/ ˈræjse /	σμμ	IAMB	ONSET	*CODA	*CODA/glide	TROCHEE
a. ˈræ.i.se	*!		*			*
b. → ˈræj.se				*	*	*
c. ˈræí.se		*!		*		

In the tableau above, candidates (a) and (b) are not optimal as (a) violates the first constraint that establishes the moraic structure as it only has one, if the vowel was long */ˈræ:.i.se/, this would satisfy the constraint but still not optimal as it also violates the onset constraint. Candidate (b) is not optimal as it violates the iamb constraint. As mentioned, Norwegian has a preference for trochees and, candidates with an iambic structure in diphthongs are disqualified. The winning candidate (b) shows some "minor" violations in the coda.

Now that the analysis for vowel sequences in both languages are established, in order to analyse the production/perception in Spanish L3 I am going to select the necessary constraints to analyse the CLI in L3 following the grammar in both languages. This is going to be explained in the following section.

5.3. OT for Spanish L3 diphthongs

With this information, I present the predictions that I expect to find in Spanish L3 by Norwegian L1 speakers, some if this production has been already established in the previous points.

- Change of sequence: Rising diphthongs not presented in the lexicon becomes Hiatus.
- Copy of VS: Words that are cognates and have the same vowel sequences are parsed the same as the L1: mais vs ma.is
- Vowel change: This aspect is not going to be analyse (maybe in the future) but I expect Spanish L3 speakers to change some vowels and diphthongs, o → u, for example.
- Stress change: In Norwegian heavy syllables are stress, while in Spanish other factors might be considered, because of this, I expect Spanish L3 speakers to change the stress pattern: / a.e.ro'pla.no / → / 'ae.ru.pla.no / - this word is similar to English *airplane* where the stressed syllable is 'ɛə.pleɪn. Here there is a CLI from the L2.

To analyse the outcomes produced by Spanish L3 by Norwegian L1 speakers, I propose the following ranking:

Basic constraints for Spanish L3 diphthongs by Norwegian L1 speakers:

- ONSET: All syllables must have an onset.
- WEIGHT-BY-POSITION: Coda consonants are moraic.
- WEIGHT-TO-STRESS: if heavy then stressed.
- *3μ = No three moras in the syllable

- IAMB = diphthongs should be
- TROCHEE

Change of sequence: from diphthong to hiatus and vice-versa.

As we can see, the chosen constraints are different from the constraints shown in Spanish L1 and are more closely related to Norwegian L1. This is because in the ranking proposed by Colina, is mainly for just diphthongs and, because I want to analyse the CLI produced by Norwegian and English I consider the rankings for Norwegian L1 will be served as a guide. As I established in the previous section, I considered the prevocalic glides as part of the nucleus, therefore I will only use [i] instead of [j] meaning that I will not use the ONSET/glide constraint.

Although some syllables in Spanish can have up to three segments in the rhyme, Norwegian does not, therefore, all the syllables with three moras violate this constraint (*3μ), parsing the VS as a hiatus.

/ mais /	*3μ	WEIGHT-BY-POSSITION	IAMB	TROCHEE	ONSET
mais	*!	*	*		
ma.is				*	*

If we look at the rankings (1), (4) and (6) that are for falling sonority sequences we can rearrange them to form a ranking for Spanish L3 different than the one proposed above. Both Norwegian and Spanish allow to have two moras in the syllable, creating a heavy syllable. In Spanish L3, consonant codas are moraic and all segments with three moras will violate *3μ

(7) VS change from rising diphthongs to hiatus:
***3μ, *C.NUC >> *CODA, IAMB, TROCHEE, ONSET**

/ pais /	*σ=μμμ,	*C.NUC	*CODA	IAMB	TROCHEE	ONSET
a. pajs	*!	*	*	*		
b. → pa.is					*	*

In the analysis above, we can see a combination of the constrains established for Norwegian L1 and Spanish L1, as we can see ONSET is ranked low and the most important aspects are the

syllable weight as mentioned above, this ranking works for sequences that require a change in parsing, similar to *maiz* vs *mais.* If we use this ranking for rising diphthongs we get the opposite optimal candidate, and, as mentioned, rising diphthongs are expected to be parsed as hiatus.

/ istoria /	*σ=μμμ,	*C.NUC	*CODA	IAMB	TROCHEE	ONSET
a. (h)is.tu.'ria		*	*		*	
b. → (h)is.tu.'ri.a				*		*

As we can see the word *historia* 'history' suffers some changes in the pronunciation of the other elements, the aspiration (h) and the change of vowel o → u, but I am not going to focus on this is not related to the VS, at least not in this example. As we can see from the tableau, the optimal candidate (b) have a hiatus instead of the diphthong found in Spanish L1. This is due to the nucleus should be simple. The winning candidate violates IAMB as the [i] is stressed, creating more sonority in the output.

Stress change.

I already mentioned one constraint that is related to syllable weight *σ=μμμ. Spanish has a three syllable stress window, the stress can fall in the ultima, penult or antepenult syllable. In Spanish L1, glides are considered stress attractors /es.ˈkue.la/ - */ˈes.kue.la/ but VS in hiatus are not, in this case, the stress is assigned by the stress rules in Spanish. In the previous tableaus, TROCHEE and IAMB analyse the diphthong, not the stress.

In Norwegian the stress syllable is determined by the weight of the syllable; heavy syllables are stressed Weight-To-Stres if we apply this constraint to our analysis we can identify if Spanish L3 changes the stress position.

(8) Stress change: determined by syllable weight.
***σ=μμμ, WEIGHT-TO-STRES >> *C.NUC, *CODA, IAMB, TROCHEE, ONSET**

/ $a_{\mu}.e_{\mu}.ro_{\mu}$'$pla_{\mu}.no_{\mu}$ / → / '$ae_{\mu\mu}.ru_{\mu}.pla_{\mu}.no_{\mu}$ /

/ aeroplano /	*σ=μμμ	WEIGHT-TO-STRES	*C.NUC	*CODA	IAMB	TROCHEE	ONSET
a. a.e.ru'pla.no			*!	*		*	
b. 'ae.ru.pla.no				*			

c. ae.ru. 'pla.no		*!			*		*

With the constraints mentioned in this section, I will be able to analyse the phonologic processes that I expect to find in Spanish L3. The data that is going to be analysed is taken from the results of a small experiment that I explain in the following sections. The analysis can be found in Chapter 7.3.

6. Methodology

6.1. Research questions.

In the previous chapters, I covered the main issues I will be addressing in this work, cross-linguistic effects in phonology, more accordingly, the syllabification structure with diphthongs in Spanish L2/L3. Having this in mind, this work pretends to answer the following research questions:

1. How do adult Norwegian native speakers produce VS in their L2/L3 Spanish at different acquisition levels?
2. Do Spanish learners copy the syllabification pattern from their native language?
3. Do Spanish learners make a difference when pronouncing diphthongs and hiatus? such as the stress pattern, for example.

6.2. The Experiment

As mentioned in the previous sections, for this project a small experiment was carried out using Gorilla. The experiment consisted of two tests. The first one was intended for Norwegian Speakers who took or were taking Spanish lessons. The second test was aimed for Spanish native speakers who formed the control group.

The test for Norwegian native speakers consisted of a small questionnaire and a set of 2 tasks. To determine if the participants were appropriate for this project and to collect demographic information, there was a small survey with questions regarding the level of Spanish, other languages the participants speak and if Norwegian was their native language. The first task comprised a set of words in Spanish that were shown individually with two to four different syllabification options, these words did not show the orthographic accent (´) as this could be used for the participants as a help. The second task included a list of words in Norwegian that were also screened one by one with their syllabification options. Before the beginning of the first task, there was a small trial that included four words and their syllabification options so the participants would get used to the format of the test, in this trial there was one word that was included one VS, later in this section I show the words and the syllabification options for the trial.

The test for Spanish native speakers also started with a small survey but, it only consisted of the first task which was in Spanish. This test was run with native speakers from different

Spanish-speaking countries to allow direct comparison between L1 versus L2/L3. The main goal with this experiment was not to evaluate the proficiency the Spanish L3 speakers but to understand how they perceived them.

The first task was composed with total of 34 words of which 28 included VS, giving a total of 30 expected diphthongs and 10 hiatuses as some words had more than one VS, *dinosaurio 'dinasour'* has two VS [ua] and [io] therefore for this word, we expect two diphthongs. As mentioned previously, the words in the dataset included from two to four syllabification options. The complete list of words and syllabification options can be found listed in Appendix III. The stimuli were selected according to the following criteria:

1. The word should include at least one VS from the Spanish inventory.
2. The word can also be found in either Norwegian or English, but it might have a different syllabification structure. This could include a close resemblance.
3. The words that do not include a VS would be considered only as distractors for the participants.

For this experiment, the IPA was not used as it was easier for the participants since they might not be familiar with it.

The participants for this project were Norwegians learning Spanish at the UiT Artic University of Norway and Norwegian teachers from Institut Nòrdic a language school located in Barcelona, Spain. This task was voluntary, and they were able to withdraw from the test at any moment. After obtaining only a few participants for the data, the experiment was expanded using an online shared link. None of the participants received any compensation for undertaking this test.

Before the launch of the test, a pilot was carried out with three participants. The reason for having only a few participants was that the I was not in contact with many Norwegian speakers who knew Spanish as a second/third language although asking the students was considered, only a few students were taking the Spanish course and they were considered to be part of the main test rather than the pilot.

The following table shows the words that were used as stimuli for the trial, in table 11, the option in bold is the correct syllabification. The words *cantar* 'to sing', *Barcelona* and *Correr* ' to run', were part of the trial as distractors. The syllabification options were placed randomly

in the whole experiment, but all options should have either a hiatus or a diphthong, and of course, different syllabification structures that are not allowed in Spanish, similar to Option 2 in *cantar*.

Word	Syllabification				English translation
	Option 1	Option 2	Option 3	Option 4	
cantar /kantar/	**can.tar** /kan.tar/	cant.ar /kant.ar/	ca.ntar /ka.ntar/		To sing
barcelona barθelona	**bar.ce.lo.na** bar.θe.lo.na	ba.rce.lon.a ba.rθe.lon.a			Barcelona
correr koˈrɛɾ	cor.rer kor.ˈrɛɾ	**co.rrer** ko.ˈrɛɾ	corr.er koˈr.ɛɾ		To run
correo koˈreo	cor.re.o kor.ˈre.o	co.rreo ko.ˈreo	**co.rre.o** ko.ˈre.o	cor.reo kor.ˈreo	Mail

Table 11 Stimuli for the trial task

As seen in the Spanish syllabification explanation in section 3.1, in the case of *cantar* the first syllabification option is the correct one as in each syllable we have a clear onset → vowel→ coda, in other words, it follows the rule CVC, while in the second option, we have a complex coda, which is not allowed in Spanish, at least not with the combination of a nasal + plosive (nt), and in the third option, there is a complex onset of nasal + plosive which is not allowed either. The development of the tasks was carried out following the trial version. A list of all the words from the test can be found in the appendix section at the end of this work. Appendix III is for the Spanish task and, Appendix IV, is for the Norwegian Task.

The analysis of the data from the tasks were analysed as follows:

1. With the help of the software R, some basic descriptive statistics were analysed. Because of the small number of participants, and data collected, running a statistical model would not be optimal, hence, the main purpose of using a statistical software was to measure the rate of frequency of the VS, as well as the sonority.
2. Upon obtaining the frequency rate, an OT analysis can be conducted, considering the constraints outlined in the previous chapter (Chapter 5) in order to compare and identify if CLI is found in the data.

6.3. The Data

In this section, I present the data obtained from the experiment by first displaying the general information of the two groups, followed by explaining how the data processing was carried out to obtained the results on R.

6.3.1. The participants

In this experiment, there was a total of 30 participants: 3 in the pilot, 15 in the Spanish L3 and 12 in the Spanish L1. In the Spanish L3, originally there was a total of 20 participants, unfortunately, 5 dropped the test in the middle of it. In the Spanish L3 group, there was expected to have participants of different levels of Spanish L3, but most of them belong to the advance (C1 – C2) group. Two participants did have Norwegian as their first language, but there acquired it before the age of 5.

The participants of the Spanish L2/L3 (Group ES3, from now on) were from ages 20 to 69 years old, and they were from different levels of Spanish, from basic (A1-A2) to advanced (C1-C2). As expected, the participants had Spanish as their third language and some of them spoke more than three languages. In the description of the results, this group is also represented as NOR to make reference to the second task which was in Norwegian.

The control group (Group ES, henceforth) was formed by native Spanish speakers from different Spanish-speaking countries; 5 from Spain, 5 from Mexico and 2 from Colombia. Although the Spanish taught at schools around the world is primarily Castilian, the heritage language factor was also considered for the ES3 and therefore the participants' ES1 nationality was not an issue at the moment of taking the test.

From all that has been exposed in this work so far, we can expect the following from the collected data of both groups:

Norwegian only has falling diphthongs [æj, oej, æw, oj, uj, aj] from here the 3 last ones are considered marginal as they occur in loan words. – the palatal glide /j/ has the same degree of rounding as the preceding vowel. Diphthongs in Norwegian are described as a short vowel plus a consonantal (non-nuclear) glide.

In Spanish, diphthongs are also formed by short vowels, but the glide can be placed before or after the vowel. As Norwegian do not have the glide before the vowel, then I expect them to syllabify *Puerta* 'door' as */pu.er.ta/

6.3.2. Data Processing

This experiment did not involve any sort of recording data and therefore no transcriptions were needed, nevertheless, after obtaining the data from Gorilla, I curated the information needed manually on Excel, also to make the needed information easier to be computed in the software R. In addition to the obtained data, I created a document to take it as a baseline for the analysis of the VS, in this file, there were all the words with their syllabification options, the VS involved, their position and finally, the sonority.

This work does not pursue to identify whether Spanish L3 speakers are accurate in their production and perception of VS, nevertheless, to obtain the descriptive statistics and to identify some CLI from the L1 and compare the results with Spanish L1 production, there was a target for each task. As mentioned previously, the Spanish task included 34 words from these words, these had from two to four different syllabification options giving a total of 165 VS (tokens) – 78 diphthongs and 85 hiatuses and 2 triphthongs, the table below shows the expected number of responses per participant from the stimuli for the Spanish and the Norwegian task. As we can see, with the stimuli I am expecting to have more falling sonority preference and more diphthongs. For the Norwegian task, consisted of 13 words with only one distractor, there was a total of 54 VS (tokens) from the stimuli. From all 54 tokens there were 29 hiatuses and 25 hiatuses, in the Norwegian task there were no triphthongs involved.

Sonority	Target ES	Target NO
Falling diphthongs	13	10
Rising diphthongs	15	0
Plateau diphthongs	4	0
Hiatus	10	5
Triphthongs	1	0
Total	**43**	**15**

Table 12 Number of word targets based on their sequence.

To measure the preference for which VS is made by the participants, the list of targets per VS is found in the following table 13. As we can see, I tried to add an even number for each VS, these presented diphthongs were also found in a hiatus form. In the case for these one, there were other combinations.

Rising Sonority	
/ia/	3
/ie/	2
/io/	4
/u̯a/	2
/u̯e/	3

/u̯o/	1
Falling sonority	
/au̯/	3
/ai̯/	3
/ei/	2
/eu̯/	2
/oi̯/	2
/ou/	1
Sonority plateau	
/iu/	2
/ui/	2

Table 13 Target of sequences

After the fulfilment of the experiment, I realised my mistake of not designing the test with equal portions of targets for each language, but because it was complicated to find participants for the experiment, I decided to keep these numbers and make the analysis expecting the following:

For both Spanish L3 and Norwegian L1, I expect I higher preference for falling sonority,

7. Results and analysis

This chapter presents the data results and the analysis obtained from the experiment. In this section, the software R was used to provide descriptive analysis shown with plots and charts. As mentioned in the previous section, creating a statistical model with the small, collected data it was not optimal. The results are displayed in different sections. The first section covers the three main points that were analysed with R such as the type of VS preference. The results are also divided into 3 groups that were mentioned in the previous chapter, where Group ES3 represents the Spanish L3 participants, Group ES the Spanish L1 and NOR the Norwegian L1.

Although this was a phonology study, the collection of the data could not be made with recording as this would have taken more time than the one established, therefore, this can be considered for future PhD work.

The presentation of the results is displayed as follows, first, the frequency rate and preference of VS, divided into the preference in VS in ES, ES2 and NOR, as well as the sonority and finally the most common VS selected by the participants. After this, a set of words that are shown, this sets are because they shared some features as, VS and cognate words. Finally, an OT analysis for Spanish L3 diphthongs by Norwegian L1 will be carried out.

7.1. Frequency and Preference of VS

As mentioned in the data processing section, there was a total of 165 tokens: 81 diphthongs and 84 hiatuses, I used this number to compare and take the frequency chosen by the participants. In task 1, the participants were shown a list of words (with no orthographic accent) that included all the diphthongs found in the Spanish inventory, there was an expectation of 30 diphthongs and 10 hiatuses, at least from each of the participants from the Group ES.

The first point to cover in this part of the analysis is to find out which VS structure is preferred by the speakers, from what we know so far, there is not a precise number of how many hiatuses exist in the three languages that cover this study, but we know the number for the diphthongs, mentioned in section 4 and some other sequences that have been presented.

In table 12 there was an expected number of target responses, from there, I expect to have more diphthongs than other forms of VS. In the test, the participants were exposed to different syllabification patterns, meaning that they were able to choose between options like /a.ɣu̯a/ and /a.ɣu.a/ ‘water’.

As expected, diphthongs were more common in the three groups, although the ES3 group showed a higher preference than the other groups. Although there was expected a big gap between diphthongs and hiatus, (32 – 10), the preference in the ES1 group shows an almost similar preference. In the case of ES3 group, compared to the ES1, we can see that the preference for diphthongs it was higher than the control group. In the case of triphthongs, the number of items with this feature on the dataset was indeed low, resulting in the lowest VS structure, although ES3 shows a similar rate for this structure, meaning that the participants have acquired triphthongs in their lexicon.

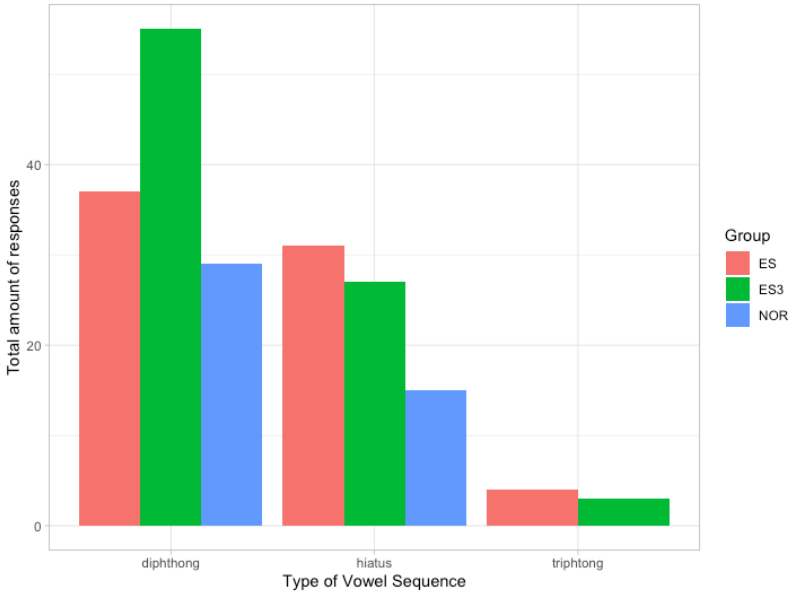


Figure 10 Preference for VS structure.

Now that we have confirmed that diphthongs are preferred, the next point to address is which sonority is more common. Looking back at the data in section 4, we know that in Spanish out of the 14 diphthongs, 6 are falling sonority and 6 rising sonorities, plus 2 more that have a sonority plateau [ui] [iu]. In the case of Norwegian, there are 5 with falling sonority and only one with a sonority plateau.

As shown in the data processing section, I expect for the Spanish task that the rising sonority will be preferred, as the target for this feature is higher. Table 13 above presented the expected number of responses according to the sequence found in the Spanish task.

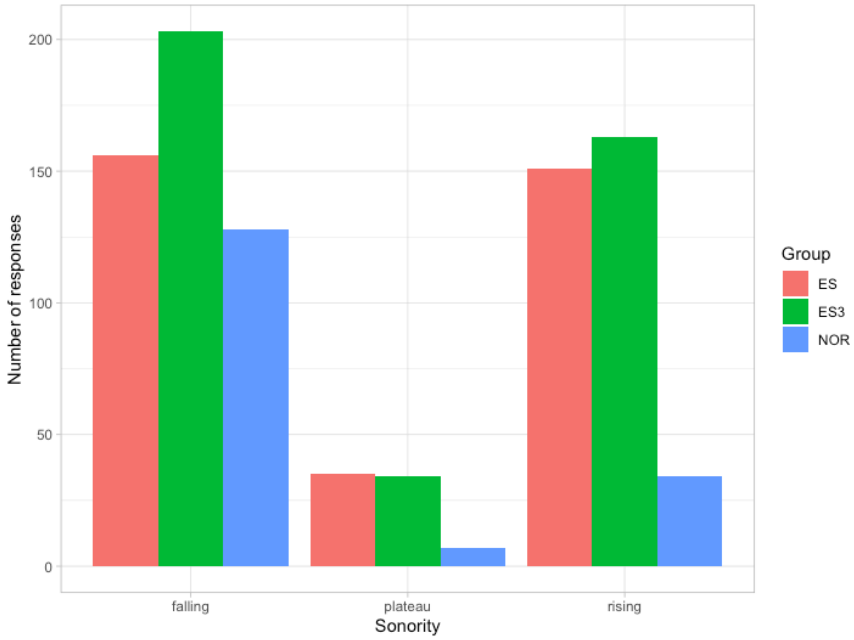


Figure 11 Sonority preference.

As presented in the chart above, all three groups show a higher preference for falling diphthongs, although I expected more preference for rising diphthongs for the ES. In the case of ES3, I expected more preference for falling sonority, which the data confirms, as in Norwegian this is the proffered sonority and although the group belongs to the advance category, transfer is still expected. The ES3 group shows a high rate of rising diphthongs, this can also be explained because of the level of the participants.

The collected data so far shows that ES3 speakers have a preference for falling diphthongs, similar to their L1. The following point to clarify is which VS pattern is more frequent. For this part of the analysis, I am going to show three different charts, in which the EFFECT is for the type of VS (diphthong, hiatus or triphthong), the sequences found in the dataset of each task and the number of responses per token. All hiatuses found in the dataset were transformed into diphthongs. As a result, there are 19 VS: the 14 diphthongs, plus their hiatus representation and the triphthongs.

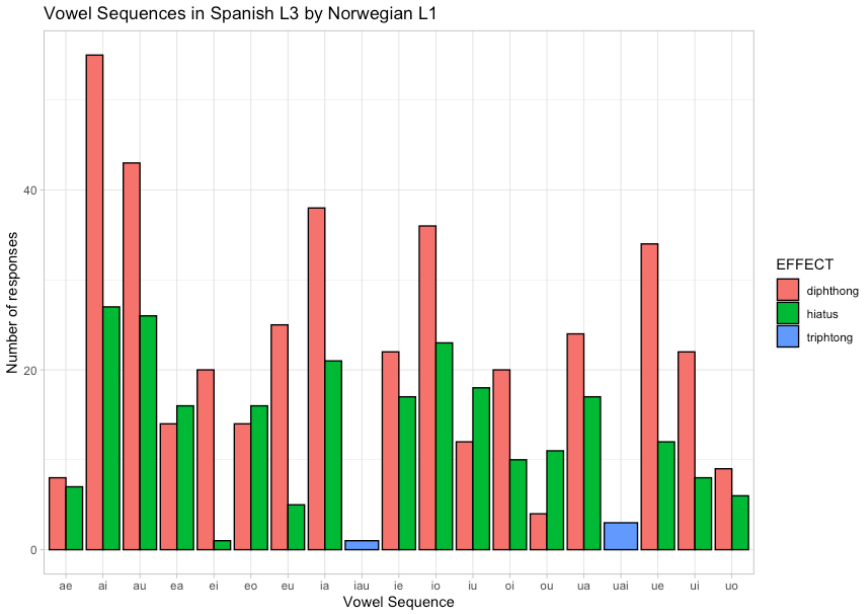


Figure 12 Vowel Sequences in Spanish L3 by Norwegian L1.

In Spanish L3, we can see that [ai] is the most frequent diphthong, followed by [au], [i̯a], [i̯o] and [ue]. On the other hand, the preferred VS to be produced as a hiatus are [a.i], [a.u] and [i.o]. In almost all sequences, diphthongs are the preference but not in [ea] and [eo]. This phenomenon will be compared further with the ES group. Among the preferred diphthongs, there are 3 that are rising sonority which are not found in the L1.

As we can see from the NOR answers in the chart below, diphthongs are preferred on most occasions, surprisingly there is an equal preference for [ei̯] but if we go back to the ES3 group, the rate for hiatus is almost inexistent. The most common diphthongs are [æʉ] and [eu] and the rate for hiatus of these combinations is extremely low in Norwegian.

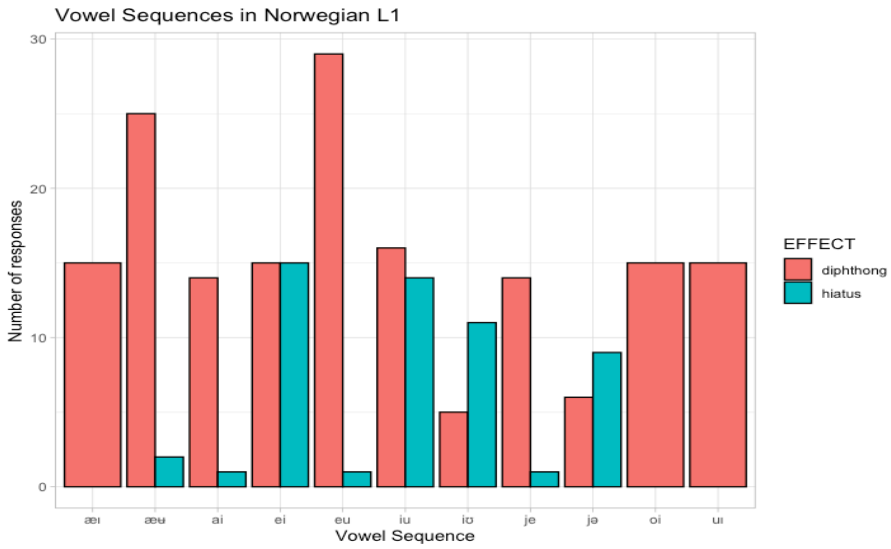


Figure 13 Vowel Sequences in Norwegian L1.

Similar to the ES3 group, the ES group show a preference for the diphthongs [aį], [i̯o] and [ue]. Referring back to the ES3 chart, an interesting point is that some participants perceived the [i̯au] triphthong a plausible while for the ES3 group this is not a valid option. This sequence is found in the word *limpiauñas* 'nail cleaner' a compound word, this kind of words usually are syllabified (both, in Norwegian and in Spanish) separating as heterosyllabic, e.g., /limˈpi̯aˈu.ɲas/ 'nail cleaner' or /ˈeːnɛr.gi.ŋ.geˌni.œr/ 'energy engineer' in Norwegian, in the next part of the analysis, I am going to present a set of words divided in words that share the same VS sequence (both, diphthongs and hiatus), cognate words and compound words.

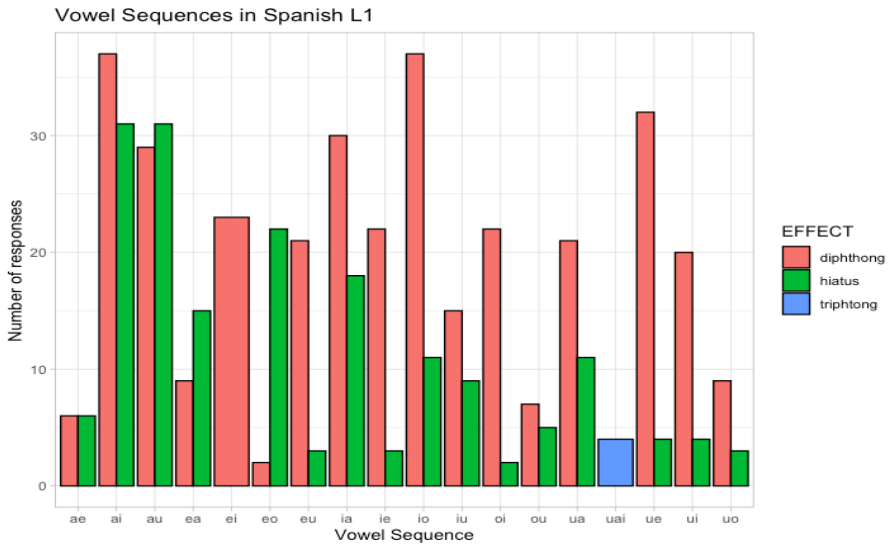


Figure 14 Vowel Sequences in Spanish L1

As seen in Table 9 found in Chapter 4, there are some VS with similarities in Spanish. Although there are not many similarities, there are approximations in the realisation of the VS. For example, taking the word from the data set 'australia', which is a cognate in both languages (later on this work, I analyse the cognate words from the data set). This word contains the [au] sequence in Spanish L1/L3, in Norwegian this does not exist but there is a sequence similar to the target one, [æu]. This means that we can expect Spanish L3 speakers with Norwegian L1 to produce [æus.tra.lja]. rather than [aus.tra.lja].

From all the analysed data so far, we can say that Spanish L3 speakers with Norwegian L1 have close preference to Spanish L1 speakers, although in the sonority representation, falling diphthongs were more frequent due to transfer.

Although in the experiment the data for English language was missed, we can hypothesise that this L2 could interfere in their production of Spanish L3, although as seen in the section of English sounds, English also do not have as many VS as the Spanish language. And, according to the language analysis English have a majority of falling / rinsing VS.

7.2. Words

According to Hualde (2005) most Spanish speakers agree on the syllabification of the words, in the test there were some words that did not include VS therefore these words were expected to be syllabified the same, nevertheless the results show discrepancy, but this could be as the control group was formed by different varieties of Spanish and in the case of the ES3 group, these words were [look for the words with no VS]. I am not going to go into details of this, as the main purpose for this study are the diphthongs. In this section, I present the analysis of some group of words, divided into vowel sequence, cognate words and compound words.

In the first section, I took from the information in the previous point/section the relevant information, in Spanish L3 the preference is falling diphthongs, and the most common VS is [ai]. From this information, I selected some words with that VS to show the answers of the participants and see which syllabification options were chosen.

7.2.1. Vowel sequences

The main VS in ES3 according to the data were [ai] and [au], these sequences have falling sonority. The [ai] sequence in ES3 shows a higher rate of preference for both diphthongs and hiatuses. In the dataset, there was a total of six words that included this sequence *ahi* 'there',

airear ‘ventilate’, *graduais* ‘you (pl) graduate’, *hay* ‘there is’, *maiz* ‘corn’, and *retraimiento* ‘isolation’. This sequence is also found in Norwegian in words like *mai* ‘May’.

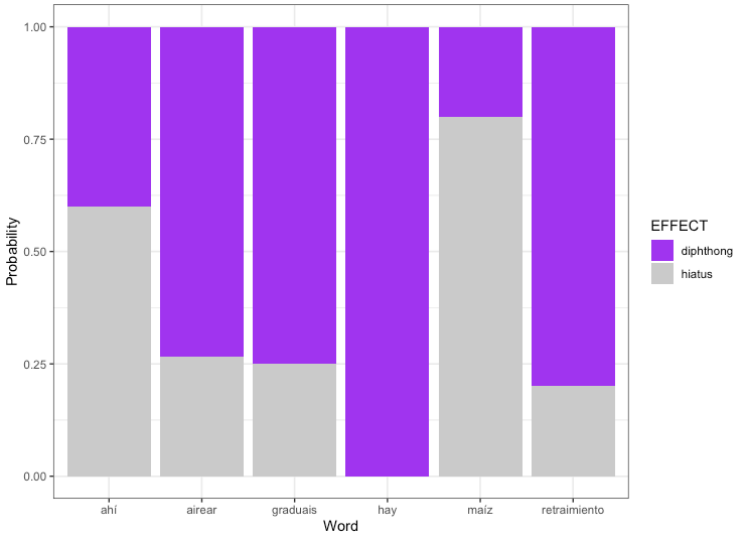


Figure 15 Words with the sequence [ai] in Spanish L3

Looking at the results, it is clear diphthongs are preferred in ES3, this was also expected as the first section of the analysis shows this preference. From the results we can see that, in fact, the syllabification of the word *maíz* ‘corn’, is not syllabified as expected since the beginning of this work, transfer in this specific word was proposed, as it is a cognate, but in Norwegian is perceived as heterosyllabic. Therefore, although there is transfer in some aspects, we can expect that advanced speakers, like in this case, have a closer perception as the native speakers.

In the case of *graduiais* ‘you pl. graduate’ can be considered tricky, as not even Spanish native speakers agreed on how the vowel sequences is considered, here the Spanish variation plays an important role in the perception of it. The participants in ES from the Latin-American countries, consider a hiatus plus a diphthong while the peninsular variant prefers the triphthong. From the data, participants of the ES3 group show a preference for the Latam syllabification.

/gra.ðu̯ai̯s / ← Castilian

/gra.ðu.ai̯s / and /gra. ðu.a.is/ ← Latam

In the case of words includes another VS besides [a̯i] such as *retraimiento* 'isolation' I expect the ES3 group to syllabified as /re.trai.mi.en.to/ as [je] is a raising diphthong, surprisingly, the majority of the participants found /re.trai.mi̯en.to/ as their preferred syllabification.

In the ES1 answers, we see that native speakers do not perceive this VS [ai] the same, but, the majority of this words are syllabified with the [ai] as a diphthong, except in the words *ahi* and *maiz*.

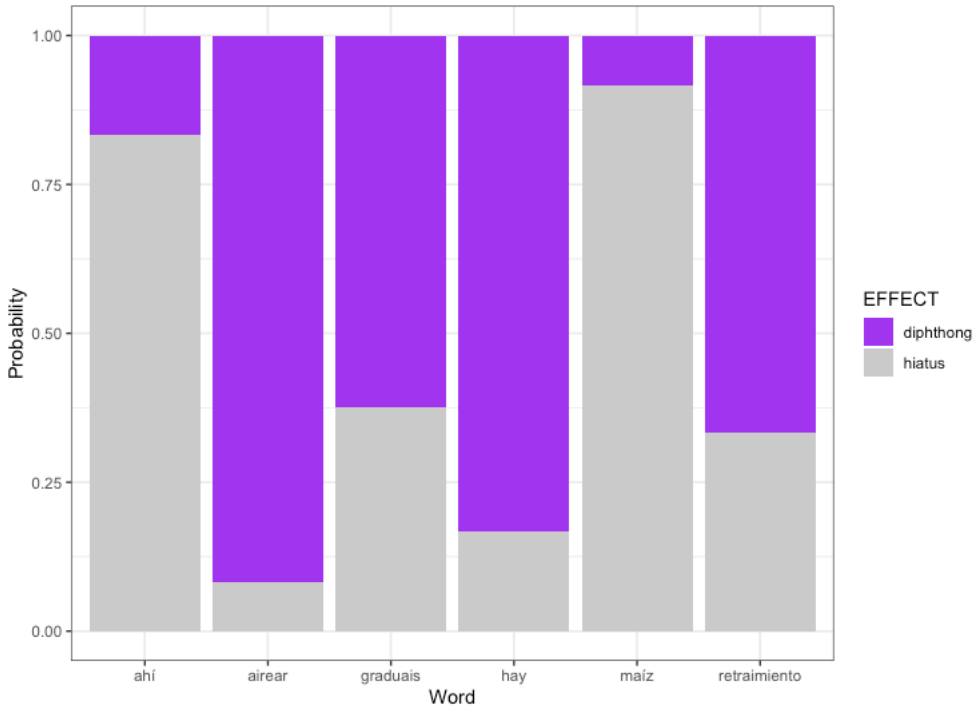


Figure 16 Words with the sequence [ai] in Spanish L1

Another interesting sequence in Spanish L3 is [au], in the following chart, we can see that in the answers of the control group, words like *Australia* and *Claudia* the sequence is classified as diphthong and *ataud* 'coffin' as a hiatus. In the case of the compound word, no one chose most participants identify the sequence as diphthong plus a hiatus.

The chart below shows that the sequence [au] in Spanish L3 has a high rate of diphthongization, while in Spanish L1 not that much. I do not expect L3 Spanish to be close to native speakers, as we have seen in the literature, some scholars find this almost impossible. Nevertheless, this sequence draws my attention because this precise VS can be considered "high-rate" in the answers and, this also shows transfer from the L1. In the list of words that form this group, we can find the compound word *limpiauñas* 'nail cleaner' which is going to be analyse later in this section.

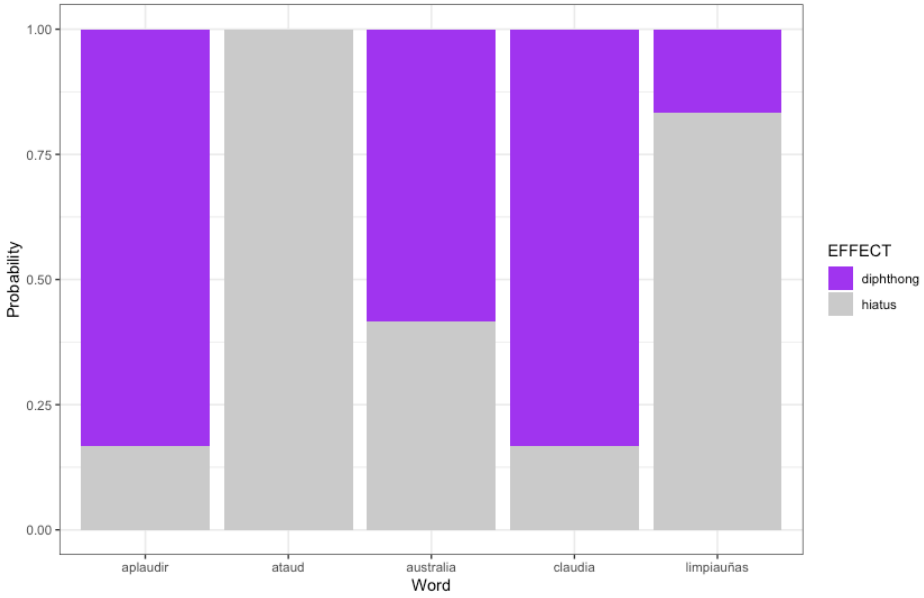


Figure 17 Words with the sequence [au] in Spanish L3

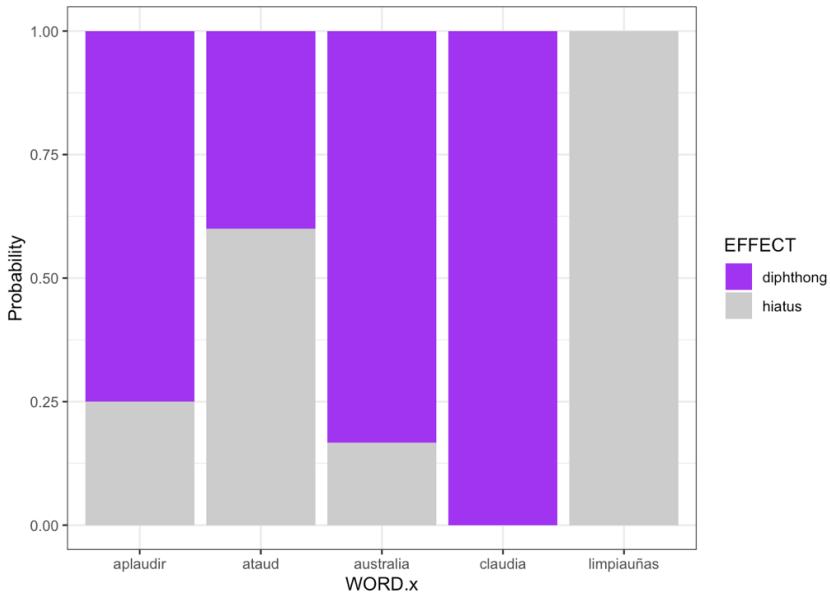


Figure 18Words with the sequence [au] in Spanish L3

According to Hualde (2015) for Spanish native speakers is easy to agree on the syllabification of the words but this changes when there is a VS involved and, as we can see from the data exposed in these charts, there are some discrepancies, in some cases, can be considered as a mistake from the participant as it is easy to click in the wrong answer. Therefore I will ignore the small differences like in the case of *limpiauñas*, and take the majority of the answers.

ES3 sees the [au] in *ataud* as a diphthong, surprisingly, the perception of how this word is syllabified is different for some participants, in this case is not about the VS but the structure,

as seen in the syllable formation, syllables are constructed with three elements, onset, nucleus and coda. The main restriction in Spanish is that in the nucleus position there can be only a vowel, some participants /ata.ud/ was their perception but this violates the rules of Spanish and Norwegian.

Taking a look to the results of ES3 and ES, the answers from the groups do not have a huge difference from each other, in some cases where a diphthong was expected a hiatus was found. This happened in cognate cases, such as, Australia, maíz, or europeo, I am going to present and analyse these cognate words in the following section.

7.2.2. Cognate words

The main hypothesis of this work is that Spanish L3 learners/speakers will copy the syllabification pattern, especially in words that are similar to their L1, therefore in the data set there were some cognate words, some already mentioned before.

The first cognate word, and the one that has been discussed since the introduction of this work, is *maiz* – mais 'corn'. In Spanish, this word is disyllabic, with the stressed syllable at the end while in Norwegian is monosyllabic.

The perception of the participants shows that for native speakers there is a clear separation between the syllables and in Spanish L3 it was expected for participants to prefer a structure similar to the L1. In the answers there were some participants that skipped this word.

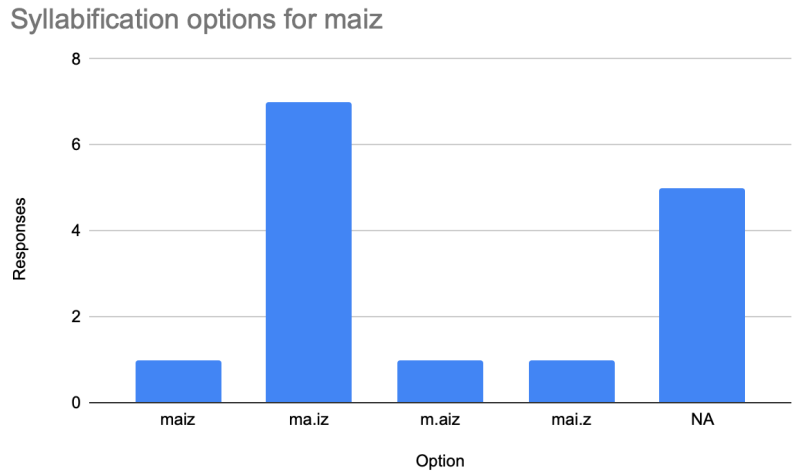


Figure 19 Syllabification answers for 'Maiz' Spanish L3

Australia has two different VS, the first VS was already commented in the precious section, but there is also the [i̯a], this is a rising diphthongs and as it is not found in Norwegian, I expect the ES3 to syllabify it as hiatus, in Spanish these sequences is considered a diphthong.

Spanish syllabification: /au̯s.tra.li̯a/

Expected syllabification ES3: /au̯s.tra.li.a/

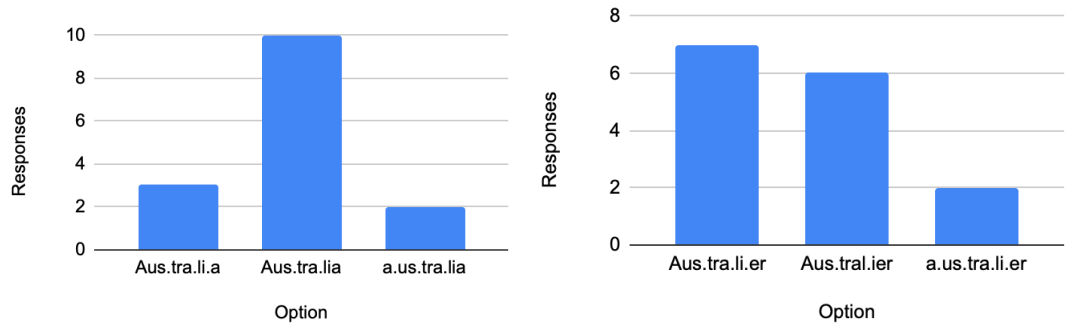


Figure 20 Syllabification answers for Australia Spanish L3 (left) and Norwegian L1(right).

As we can see in the chart the prefer syllabification is similar to the ES, meaning that there is no transfer either. There are two more words that are cognates *biología* and *violín*. The first one also involves two different VS [io] [i.a].

The [io] in *biología* 'biology' is a diphthong while [i̯a] is a hiatus, comparing this to Norwegian, the first VS is a rising sonority diphthong meaning that is /bi.o.lo.gi/, the last VS, only found in the Spanish.

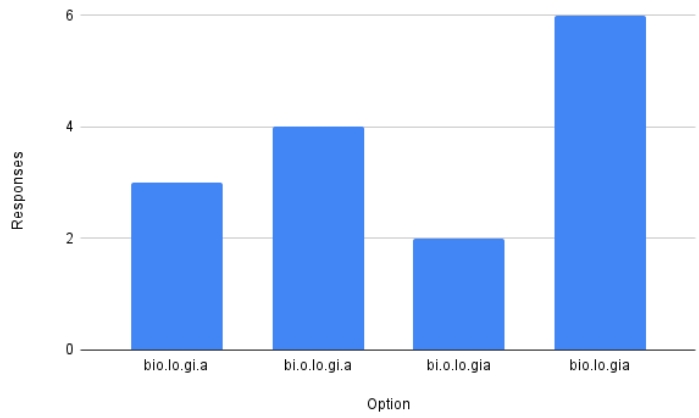


Figure 21 Syllabification options. - Biología Spanish L3

In the case of violin, we are able to find transfer, the Norwegian word *fiolin* has a falling sonority VS that is perceived as hiatus /fi.u.lin/ while in Spanish this in considered a diphthong /vi̯o.lin/. According to the obtained data, only three participants showed tranfer from their L1, as they perceived the syllabification as [i.o] while the other as [jo] where we find the same VS.

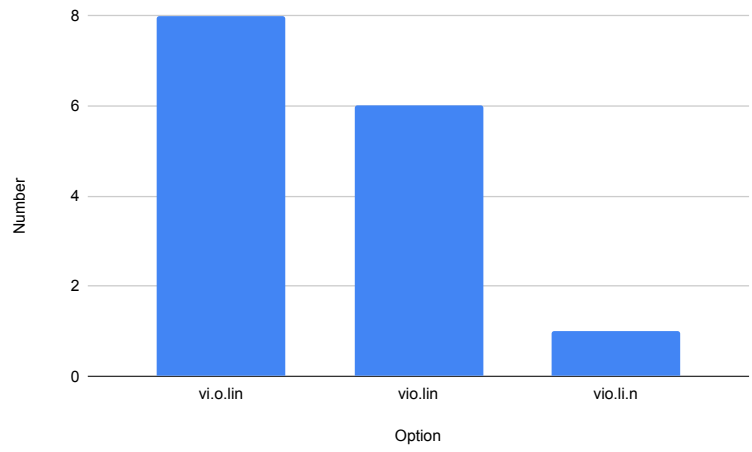


Figure 22 Syllabification options. - Violín Spanish L3

We can see some differences in the words 'biología', 'europeo', and 'violin', the first two words from this list end with a VS, this in Norwegian L1 would result in a diphthong and this pattern was in fact, copied. This can also be seen in non-cognate words like *ingenuo, Claudia.*

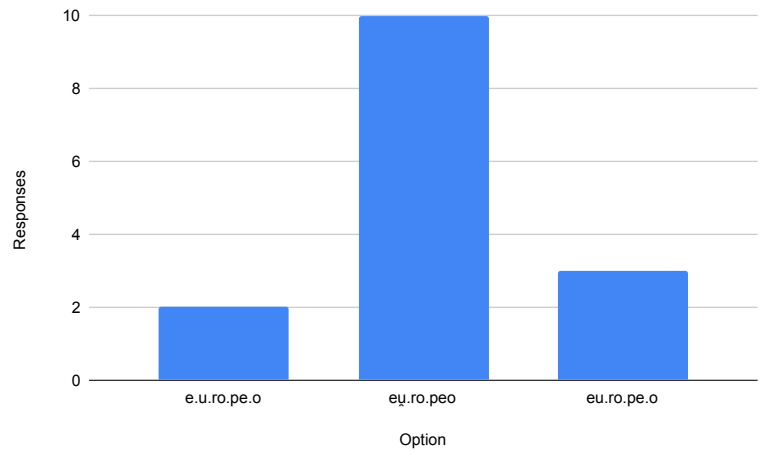


Figure 23 Syllabification options. - Europeo Spanish L3

As Kistoferssen mentioned, in Norwegian is possible to perceive a word with different syllabifications as we can see from the chart above, most of the words are perceived differently by the participants. The words presented are also found in Spanish words (cognates) but before showing those results, I can point out some interesting information, all participants agree on the

syllabification of “mais”, considered as a VS with diphthong and almost the same in the case of “europeisk” where only 13% perceived as hiatus.

In the case of Spanish L3, most of the participants selected the option with two syllables for the word “maíz” although 33% did not answer this question. If we compare the results from the syllabification words we can see that, at least in cognate words, Spanish L3 prefers the diphthongs over the hiatus.

7.2.3. Compound words

Compound words were also presented in the experiment in the Spanish task but not in the Norwegian task. In the dataset, we can find the words *estadounidense* ‘american’ and *limpiauñas* ‘nail cleaner’.

Usually, these kinds of words are syllabified by separating the words, e.g., /sa.ka + pun.tas/ ‘pencil sharpener’, but there can be some exceptions like in the word *estadounidense*, as explained in the Spanish lexicon. The main purpose of adding compound words in the experiment was to identify.

The main purpose of adding compound words in the experiment was to identify if the perception of the VS change when facing compound words and the perception of three vowels together (I already covered the case for *graduais* which has a triphthong). The VS found in these words are both, falling and rising.

Starting with the analysis of *limpiauñas*, we can see that the ES group excludes the option with the triphthong, as said above, this sequence is mainly as diphthong plus a hiatus, most of the participants chose /lim.pia.u.ñas/ while only two participants /lim.pi.au.ñas/. On the other hand, the ES3 group share the same perception about the syllabification of this word, selecting the same options just in different rates.

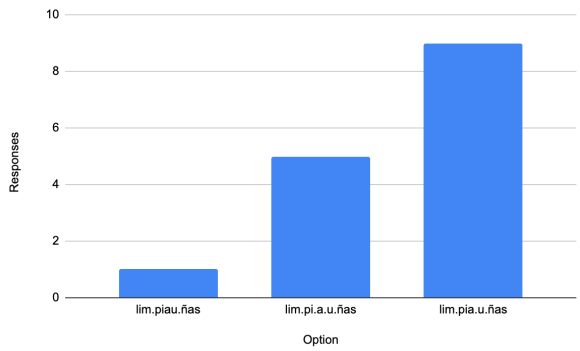


Figure 24 Syllabification options. - limpiauñas Spanish L3

In the case of *estadounidense* I expected ES3 to diphthongize the VS, as it is a falling sonority VS, nevertheless, according to the collected data, the perception of this word, follows the rule for compound words that separates the words.

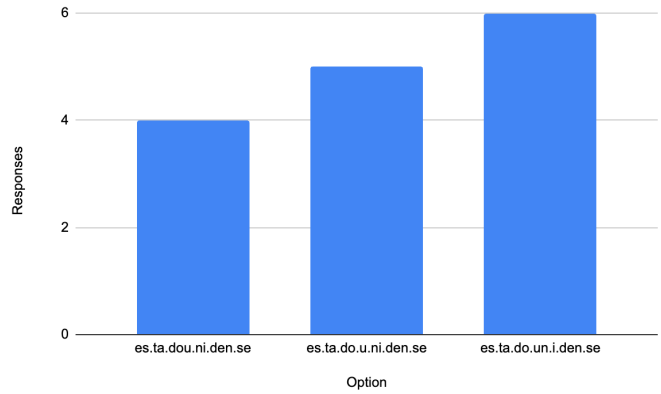


Figure 25 Syllabification options. - estadounidense Spanish L3

Overall, the ES3 group showed similarity in the perception of VS, including with they face rising diphthong, meaning that the transfer that was expected did not occur, but there are some words where the syllabification the participants perceived break some rules in Spanish.

In the following section, I present a small OT analysis of these words. For this part of the analysis, the following was taken into account:

In the following section, I analyse some of the words mentioned above, the selected words were selected as they presented some CLI issues that can be illustrated for better understanding in OT. The elements that I took into account for the realization of the OT analysis were:

1. According to the predictions and results, some VS structures were change from diphthongs to hiatus and vice-versa. This occurs specially in the rising sonority diphthongs.
2. According to the results, Spanish L3 keeps the rule of separating the words /sa.ka.pun.tas/ even when the compound word is bound with a diphthong like in the case of /pun.tia.gu.do/ or /es.ta.dou.ni.den.se/.
3. Some participants opted for a syllabification that break the Spanish rules, like in the case of aplaudir or ataud, buitre, correo were we found.

7.3. OT analysis

This section of the analysis presents the OT analysis for Spanish L3. In Chapter 5, I presented the OT for the syllabification of diphthongs, Spanish and Norwegian and a suggestion for Spanish L3. Summarising, there are two analyses for Spanish diphthongs, one for rising sonority and one for falling sonority. Syllable weight play an important role when analysing diphthongs following the typology of Golston and Krämer (2020).

In this work, I presented how syllables are formed, their structure, and the lexicon for each language, there I mentioned the debate regarding the analysis of diphthongs in Spanish. This work supports that prevocalic glides are parsed as part of the nucleus in Spanish but for English and Norwegian glides can be parsed in the onset position. To analyse Spanish L3, I will only use the glide parsing in the nucleus position. With this analysis, I am going to cover some of the issues exposed in the first part of the analyses where I also selected some words for this analysis.

As seen in chapter 6.3 the basic constraints for analysing Spanish L3 diphthongs are:

- *3μ: no more than three moras in the syllable. In Spanish consonant codas are considered moraic.
- *COMPLEX NUCLEUS: nucleus should be simple.
- IAMB (diphthongs): diphthongs are iambic (iá aí).
- TROCHEE (diphthongs) : diphthongs are trochaic (ía ái) .
- *CODA: the syllable should not have coda.ñ
- ONSET: all syllables have onset.
- WEIGHT-BY-POSITION: Coda consonants are moraic.
- WEIGHT-TO-STRESS: if the syllable is heavy it is stressed.

Change of sequence: from diphthong to hiatus and vice-versa.

In Spanish L3 by Norwegian L1 speakers, it is expected learners change the VS of the rising diphthongs to a hiatus, like in the case of /iŋxenu̯o/ *ingenuo* 'naïve' or /bi̯olin/. *Violin* 'violin'.

Words like iŋxen[u̯o] and b[i̯o]lin have a rising diphthong, and, as this study has been discussing, it is an aspect that Norwegian L1 lacks therefore one of the expected results was participants to change the sequences from a diphthong to a hiatus.

Tableau for Spanish L3 – 'naïve'

/ iŋxenu̯o/	*σ=μμμ,	*C.NUC	TROCHEE	*CODA	ONSET	IAMB
a. →iŋ.xe.nu.o					*	*
b. iŋ.xe.nu̯o		*!	*			

In the previous section I exposed the answers given by the participants but not for this word. in the case of *ingenuo*, the available options (now candidates) appear in the tableau below, were we have two more candidates (c) and (d). These new candidates present different phonological problems not just the one regarding the diphthongs. According to the results the candidate with more selectivity was (a) meaning that the prediction was correct in this word.

/ iŋxenu̯o/	*C.NUC	TROCHEE	*C.CODA	*CODA	ONSET	IAMB
a. →iŋ.xe.nu.o				*	*	*
b. iŋ.xe.nu̯o	*!					
c. iŋ.xen.u̯o	*!			*		
d. iŋx.en.u.o			*!	*	*	*

Another important aspect I would like to mention is that candidate (b) also was highly selected in the results of the test but having this candidate requires other elements to be selected as optimal. As there were other elements in the candidates, I changed one constraint *σ=μμμ for *ComplexCoda, to avoid candidate (d). This tableau represent the whole syllabification of the word rather than just the diphthongs.

Violin is another word that not only have a rising diphthong [io] but as seen in the previous section, is considered a cognate between Spanish and Norwegian (and of course, English /vɪəˈlɪn/) .

With this word we are expected to see two things, 1) continue with the rising diphthongs assumption, the VS changes from a diphthong to a hiatus), and 2) check if this happens because of the similarities of the cognate word- changing the vowel. The tableau shown below illustrates the expected result from the experiment. Candidate (a) is eliminated by *Complex Nucleus as in Spanish L3 by Norwegian L1, only allows simple nucleus parsing rising sequences [iu] as hiatus. Note that in the tableau the representation of /o/ is already change to [u].

Tableau for Spanish L3 – violin (expected result)

/ bi̯olin /	*σ=μμ μ,	*C.NUC	IAMB	*CODA	ONSET	TROCHEE
a) bi̯u.lin		*!				*
b) → bi.u.lin				*	*	*

Norwegian does not have a complex nucleus or nucleus/glide, as this is a property from Spanish, therefore, to show the Norwegian syllabification of the cognate word, some constraints should be changed and so the ranking. To analyse the rising sonority in Norwegian then, the constraint of *complex nucleus is changed for *NoCoda/glide, ranking low. With the constraints previously mentioned in the *ingenuo* case, we can say that the optimal candidate for *fiolin* is (b) because the opponent (a) is eliminated by IAMB.

Tableau for Norwegian L1 – fiolin

/ fi̯ulin /	*σ=μμ μ,	IAMB	ONSET	*CODA	*CODA /glide	TROCHEE
a. fi̯u.lin		*!				
b. → fi.u.lin			*			*

The precious tableaus were to show the resemblances in the expected outcome in Spanish L3 and Norwegian L1. In the following tableau, I show the results from the experiment where

candidate (a) was the most chosen by the participants. Just like in the previous case, in this tableau I change a constraint as I am analysing not just the VS but the whole syllable structure.

Spanish L3

/ bi̯olin /	*C.NUC	TROCHEE	*C/liquid	*CODA	ONSET	IAMB
a. → bi̯.u.lin				*	*	*
b. biu.lin	*!	*				
c. bi.ul.in			*!	*	*	
d. biu.li.n	*!	*				*

In the tableau above candidates (b) and (d) were eliminated by *ComplexNucleus, as they include the rising diphthong parsed in the nucleus, candidate (c) is not optimal either as it contains a liquid in an onset position. Although, this last constraint is allowed in Spanish as we can see in the words like *cal.ma* 'calm'*, cal.do* 'stock'*, cuel.ga* 'hang'*, palma* 'palm'*,* what it is not allowed is to have the liquid followed by a vowel separated *cal.i → ca.li.

Until here, I have shown two words that fulfil the prediction of transfer in rising diphthongs in Spanish L3 but, there were other words that disprove this statement. *Biología* 'biology' is a word that is a cognate in the three languages (baɪ.ɒ.lə.dʒi, in english). This word in Spanish involves two different VS, a diphthong and a hiatus, both of the sequences are rising sonority. Section 6.1. shows a ranking for rising hiatuses.

bi̯oloˈxia	*CODA/glide	*CODA	Max-IOμ	*ONSET/glide	ONSET
a. bi̯o.loˈxia		*!			
b. bi.o.loˈxia		*!	*		*
c. bi.o.loˈxi.a			*!		*
d. →bi̯o.loˈxi.a					*

The tableau presented above, represents the analysis for the word *biología* in Spanish L1. As we can see, candidates (a) and (b) are eliminated by *CODA, both candidates present a coda in

/xia/ /x/ is onset, /i/ nucleus and /a/ coda, while candidate (c) changed the moraic structure found in the onset /bjo$_{\mu\mu}$/ → /bi$_{\mu}$.o$_{\mu}$/ leaving candidate (d) as the optimal one.

In Norwegian, the VS [io] is in the form of a hiatus, but as we can see from the chart presented below, at least 9 participants chose options with a diphthong. Therefore before analysing the Spanish L3, I am going to analyse the Norwegian L1.

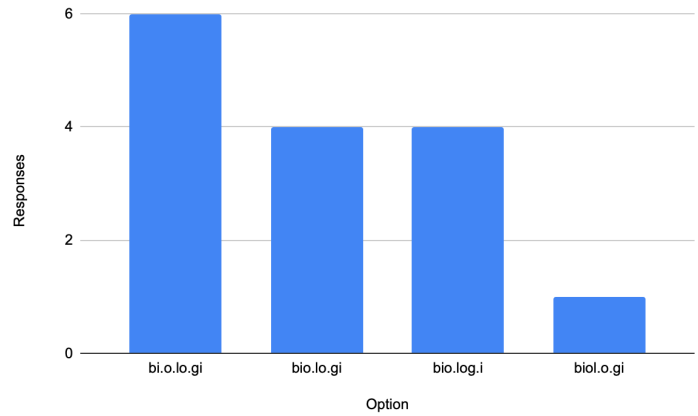


Figure 26 Syllabification options. - biologi Norwegian L1

If we go back to the chart 18 we can see that the preference for the [ia] sequence shows a preference for diphthong. This raises the question about the influence of L2 and the level of acquisition of the language.

biulogi	ONSET	*CODA
a. → biu.lo.gi		*
b. bi.u.lo.gi	*!	

As the expected result for the analysis includes a hiatus rather than a hiatus like in the previous cases, basically candidate (b) cannot be the optimal candidate as it violates the ONSET constraint, while candidate (a) satisfies it. The question is if this result is a mistake made by the L1 speakers or in fact the /bio/ is a diphthong. According to the studies this cannot be parsed as a diphthong.

Following the rules we have established for Spanish L3, we expect to have two hiatuses instead of one /bi.u.lo'xi.a/. Going back to the results obtained in the experiment, this rule was broken, this I considered it might have been for the following reason:

Most of the participants presented an advance level of acquisition, meaning that they have already acquired elements that are not present in the L1, but their perception is not as L1 speakers. This can be considered inconvenient or at the same time a mistake but unfortunately, there are no other words with the same sequence in the Norwegian data set, to compare it. We can find in the Spanish data set other words like *viudo* 'widow' that is similar to the previous entry *violin* that can be used.

In the following tableau, I will present the obtained outcome for biology in Spanish L3. By changing the position of ONSET and Coda we get (a) the optimal candidate.

bi̯oloˈxia	*ONSET/glide	*ONSET	Max-IOμ	*CODA	*CODA/glide
a. → bi̯u.loˈxi̯a			*		
b. bi.u.loˈxia		*!	*	*	
c. bi.u.loˈxi.a		*!	*!		
d. bi̯u.loˈxi.a		*!			

From hiatus to diphthong

I covered the VS structure change from a diphthong to a hiatus, but this can also be expected the other way, like in the case of the main example of this thesis 'ma.is' vs 'mais' (The analysis for this is shown in 6.3) To analyse then this change I am going to use as a base the ranking (7) also presented in 6.3.

In the following tableau, I present the analysis for *europeo* 'european'. This entry is also found in the list of cognates *europeisk*. This word has two VS that originally in Spanish L1 [eu] is a falling diphthong and [eo] is a hiatus. Because I expect this last VS to be parsed as hiatus, the constraints should be ranked as follows:

/eu̯ɾopeo/	*σ=μμμ,	ONSET	*CODA	*CODA/glide	IAMB	TROCHEE
a. e.u.ɾo.pe.o		*!				*
b. eu̯.ɾo.peo			*	*		*
c. eu̯.ɾo.pe.o		*!		*		*

d. e.u.ɾo.pe.o		*!				*

With this ranking option b is the optimal candidate, as we can see the ES3 group perceive the VS [eo] as a diphthong, here I also suggest that in fact speakers would produce the last VS as /əʊ/ thefore instead of / e̯u̯.ɾo.peo/ we have / e̯u̯.ɾo.pəʊ/, if this is true, then speakers transfer from English this phonemic change.

Different syllable structure

In the previous tableaus, I have shown the difference between analysing just the VS found in the input and analysing the whole syllabification structure, focusing on the VS. As seen in the syllable chapter, although the elements on the syllables are the same, the element found in the Onset and Rhyme changes according to the language. In Spanish L1 for example, prevocalic glides can be parsed in the nucleus while in Norwegian they are parsed in the onset or, consonants are not allowed in the nucleus position in Spanish but they are in Norwegian and English.

/atauð/	*3μ	***ONSET/vowel**	**ONSET**	***CODA**
a. ata.uð		*!		*
b. a.tauð	*!		*	*
c. a.ta.uð			*	*

In the tableau above, I present the results of Spanish L3, as we can see, the constraints are meant two show not just the vowel sequence but also the syllable structure, in Spanish L3 syllables with three syllables are not allowed, eliminating candidate (b) ./tauð $_{\mu\mu\mu}$/. Onsets are not allowed but they rank lower than *ONSET/nucleus, as this is only for consonants, this constraint also allowed us to eliminate constraint (a) although this was an options that participants also preferred, leaving candidate (a) as the optimal.

Syllable weight.

Before the start of this study, other topics related to Spanish as a foreign language one of the topics that was considered was the stress but there were not significant changes in the production of them. Although it represents almost the same stress, in the following table I propose a ranking for the stress in Spanish L3. In Spanish L1 *violín* has the stress syllable in the ultima syllable /bi̯oˈlin/, this stress is also found in English and Norwegian.

/bi̯olin/	*3µ	WEIGHT-TO-STRESS	IAMB	*CODA	ONSET	TROCHEE
a. →$bi_{\mu}.o_{\mu}$ˈlin_{μ}					*	*
b. ˈ$bi̯o_{\mu\mu}.lin_{\mu}$			*!	*		
c. $bi_{\mu}.$ˈ$ol_{\mu}.in_{\mu}$				*!		*
d. $bi̯o_{\mu\mu}.$ˈ$li_{\mu}.n$		*!	*	*		

The tableau above shows the analysis for the cognate word ‘violin’ in Spanish L3. None of the candidates violated the moraic structure, all candidates had only two moras maximum. As we can see, candidates (b) and (c) are not optimal as they have codas, candidate (b) is not optimal as it does not have the stress in the heavy syllable, therefore candidate (a) is the optimal one, although it violates the onset and trochee constraints. Candidate (d) not only violates the weight to stress candidate, here it has another issue non-related to the VS, but it also contains an [n] as a syllable, and this is not permitted in Spanish as it lacks a the sonority peak. Therefore, continuing with

In some cases, the option chose by some participants break the Spanish syllabification rules such as, only vowels are allowed in nucleus position, and vowels are not allowed in the onset position.

With the analysis presented in this last section and overall, we can say the following aspects belong to the Spanish L3 by Norwegian L1 speakers production and perception of the VS.. Although it is not clear by just the statistics (mainly because the data was small) the CLI found in this language combination are transfer in rising sonority sequences.

Syllable stress might not be a key factor but the moraic structure of the syllables is, therefore although 3 moras are allowed in some cases in Spanish (Aus.tra.lia) this is mainly not allowed in Spanish L3, changing also the VS as already mentioned.

I also conclude that the level of acquisition affects the production and perception of VS syllabification. In most cases, the predicted structures were avoided or eliminated as the participants were familiar with the syllable structures of Spanish L1.

8. Discussion

This work studied the syllabification of diphthongs in Spanish L3 by Norwegian L1 speakers. This study aimed to know if there was some CLI in Spanish L3 such as transfer. According to the research question established at the beginning of this work and along the results obtained in the data, we can say the following:

1. How do adult Norwegian native speakers produce VS in their L2/L3 Spanish at different acquisition levels?

The level of acquisition can be a factor that influences the outcome of the L3, most of the participants stated that they had medium to high-level of Spanish, while only 5 were at basic Spanish level.

Overall, the performance of the participants show understanding on how the syllables worked in Spanish, as I mentioned before, we can say they high level of command in Spanish is because their level of Spanish and/or in the cases where the level is basic, they use English (or other language that they have as L2) as support for the realization and perception of diphthongs.

Rising diphthongs are not visible in Norwegian but they are in English and, even if the specific VS are not in the inventory, the L2 can help learners to have an idea of how the production of these should be.

The participants in the basic level overall showed a preference for the VS that resembles the Spanish syllabification grammar, except in the cases exposed in chapter 7.3, but they showed also other issues like change of syllabification structure, like in the case of *ataud.*

The participants in the intermediate and high level, showed also a preference for VS that resembles the Spanish syllabification grammar, in fact there were some that were able to identify the correct VS while the Spanish L1 struggled and changed the VS structure.

Although in both cases the answers showed proficiency in the VS, when it comes to rising sonority participants presents CLI, they either change the diphthongs for a hiatus or vice-versa, this helps resolve the following question:

2. Do Spanish learners copy the syllabification pattern from their native language?

There was an expectation for learners to produce a hiatus when they faced rising diphthongs *bi.en / *bu.e.no. This happens because in *bien* ‘good’ the syllables would have three moras,

and this does not happen in Norwegian. In the case of Spanish, this matter is part of the debate on how the VS are placed in the syllable, for some scholars following the structure like Norwegian is more doable than the one proposed by Spanish linguists where it is possible to have three moras (or segments) in the rhyme.

Looking at the results we can say that learners do copy the syllabification pattern from their L1. And in the case of L2, what they are predicted to transfer are changing the vowel phonemes to those that are familiar.

3. Do Spanish learners make a difference when pronouncing diphthongs and hiatus?

We might not know if there is a marked difference between the realization of diphthongs in Spanish L3, as mentioned, the experiment was not possible to be run it with audio recordings, but from what we gathered we can assume some points, first as mentioned in the analysis, as Norwegian lacks some diphthongs, L3 speakers might use the referents they have from other languages these one can be either the L1 or the L2. For example, /viu.lin/ - /vio.lin/, this can also be applied to stress but as I mentioned before, there are no many differences between Spanish and Norwegian stress.

9. Conclusion

This study was the first approach on Spanish L3 VS by Norwegian L1, therefore all the information included might have some incongruencies, because of this I suggest that this becomes a research line for future studies related to L3. As I mentioned in the introduction, Spanish language as a foreign language is popular in Norway and the number of learners is increasing year by year.

In this study I suggest a grammar for Spanish L3VS (Chapter 5.3 and 7.3), these rules can be implemented with basic to medium level of acquisition, advanced levels do not produce all these rules as they are closer to the target language. The rules are the followings:

(1) Change of sequence:

Rising diphthongs not present in the lexicon, becomes hiatus:

ES1 ES3

iŋ.xe.n[**u̯o**] → iŋ.xe.n[**u.o**]

Rising hiatus not present in the lexicon, becomes diphthong:

ES1 ES3

eu̯ .ɾo.[pe.o] → eu̯ .ɾo.[peo]

(2) Copy of VS: (only basic levels of acquisition)

words that are cognates and have the same VS are parsed as the L1

NO1 ES1 ES3

mais → ma.iθ → mais/ maiθ

(3) Vowel /diphthong change:

Change vowels or diphthong in the L3 that are not present in the L1. Spanish /o/ for Norwegian /u/

ES 1 ES3

ist[**o**]ria - (h)is.t[**u**].'ri.a

b[i**o**]lin – b[i.**u**.]lin

(4) Stress change: The stess changes to the heavy syllable created in the VS.

ES1 ES3

/ a.e.ro'pla.no / / 'ae.ru.pla.no /

Some of the rules were proven by the results obtained in the experiment. This grammar happens in Spanish L3, proving that there is CLI in the production and perception of VS.

For future research I suggest then the following:

1. The experiment should be larger, with more participants and of course, recordings. This would be helpful and, in this way, start building a corpus to keep analysing phonological processes. Having nonce words in the experiment would be beneficial, especially if the participants have a high command in Spanish, like what happened in this study.
2. Regarding the OT constraints, Spanish phonology is complex, and creating rules for specific analysis requires a deeper understanding of the grammar, therefore I suggest Colina (2009) where she explains the syllabic structures in Spanish and how they interact with the constraints.

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Appendix

I. Survey for the Spanish L3 test

Datos personales (personal data)

Edad (Age): .

Nivel de español (Spanish level) :

- ☐ Básico (A1 – A2)
- ☐ Intermedio (B1 – B2)
- ☐ Avanzado (C1 – C2

¿Qué idiomas hablas? (Which languages do you speak?)

.

¿Tu idioma materno es noruego? (Is Norwegian your first language?)

- ☐ Sí
- ☐ No

II. Survey for the Spanish L1 test

Datos personales (Personal data)

Edad (Age): .

Variante del español (Spanish language variant)

- ☐ Mexicana
- ☐ Española
- ☐ Colombiana
- ☐ Chilena
- ☐ Otra: .

¿Qué idiomas hablas? (Which languages do you speak?

.

III. List of items – Spanish. The words in the following table are shown as they were presented in the task, without the orthographic mark (á, é, í, ó, ú). The words in **bold** are the target.

Word	Option 1	Option 2	Option 3	Option 4	English
Acuario	**a.cua.rio**	a.cu.a.ri.o	a.cua.ri.o	a.cu.a.rio	*Acuarium*
Australia	aus.tra.li.a	a.us.tra.li.a	a.us.tra.lia	**aus.tra.li a**	*Australia*
Biologia	**bio.lo.gi.a**	bi.o.lo.gi.a	bi.o.lo.gia	bio.lo.gia	*Biology*
Aeropuerto	**a.e.ro.puer.to**	ae.ro.puer.to	aer.o.puer.to	a.e.ro.pu. er.to	*Airport*
Diecinueve	**die.ci.nue.ve**	di.e.ci.nue.ve	di.e.ci.nu.e.ve	die.ci.nu. e.ve	*Nineteen*
Ingenuo	in.ge.nu.o	**in.ge.nuo**	in.gen.uo	ing.en.u.o	*Naïve*
Ingenuidad	i.nge.nu.i.dad	in.ge.nu.id.ad	**in.ge.nui.dad**	in.ge.nu.i .dad	*Naiveness*
Retraimiento	re.tra.i.mi.en.to	re.trai.mi.en.to	re.tra.i.mien.to	**re.trai.m ien.to**	*Separation*
Airear	a.i.rear	a.i.re.ar	**ai.re.ar**	ai.rear	*To ventilate*
Veintiun	vein.ti.un	**vein.tiun**	ve.in.tiun	ve.in.ti.u n	*Twenty-one*
Europeo	e.u.ro.pe.o	eu.ro.peo	**eu.ro.pe.o**	e.u.ro.peo	*European*
Boicotear	**boi.co.te.ar**	bo.i.co.te.ar	bo.i.co.tear	boi.co.tea r	*To boycott*
Estadounidense	**es.ta.dou.ni.den. se**	es.ta.do.u.ni.den .se	es.ta.do.un.i.den. se		*American*
Esternocleidomastoideo	es.ter.no.cle.i.do. mas.to.i.de.o	es.ter.no.clei.do. mas.toi.deo	**es.ter.no.clei.do. mas.toi.de.o**		*Sternocleidomastoid*
Acentuacion	a.cen.tu.a.ci.on	a.cen.tua.ci.on	a.cen.tu.a.cion	**a.cen.tua .cion**	*Stress*
Limpiauñas	lim.piau.ñas	lim.pi.a.u.ñas	**lim.pia.u.ñas**	lim.pi.au. ñas	*Nail cleaner*
Graduais	gra.du.ais	gra.du.a.is	**gra.duais**	gra.dua.is	*You graduate*

Comprueba	com.prue.ba	com.pru.e.ba	com.pru.eb.a	com.pru.eb.a	*You confirm*
Claudia	cla.u.di.a	clau.di.a	cla.u.dia	clau.dia	*Claudia*
Aplaudir	ap.la.u.dir	ap.lau.dir	a.pla.u.dir	a.plau.dir	*To applaud*
Farmaceutico	far.ma.ce.u.ti.co	**far.ma.ceu.ti.co**	fa.rma.ce.ut.i.co		*Pharmacist*
Viudo	vi.ud.o	vi.u.do	**viu.do**	viud.o	*Widow*
Buitre	**bui.tre**	bu.i.tre	bu.it.re	buit.re	*Vulture*
Hay	ha.y	**hay**			*There is*
Ahí	**a.hi**	ahi			*There*
Margarita	mar.ga.rit.a	mar.gar.i.ta	**mar.ga.ri.ta**	marg.ar.it a	*Dandelion*
Sacapuntas	**sa.ca.pun.tas**	sa.ca.pu.nta.s	sa.cap.un.tas	sac.a.pun t.as	*Pencil sharpener*
Cafetera	ca.fet.e.ra	**ca.fe.te.ra**	cafe.tera	caf.ete.ra	*Coffee machine*
Celular	cel.u.lar	**ce.lu.lar**	ce.lu.la.r	ce.lul.ar	*Cellphone*
Extravagante	**ex.tra.va.gan.te**	e.xtra.va.ga.nte	extra.vagante	ext.ra.va. gant.e	*Extravagant*
Computadora	co.mpu.ta.do.ra	co.mput.ado.ra	com.put.a.do.ra	**com.pu.t a.do.ra**	*Computer*
Maiz	maiz	**ma.iz**	m.aiz	mai.z	*Corn*
Violin	vi.o.lin	**vio.lin**	vi.ol.in	vio.li.n	*Violin*
Ataud	ata.ud	a.taud	**a.ta.ud**	at.aud	*Coffin*

IV. List of items – Norwegian

Word	Option 1	Option 2	Option 3	Option 4	English
Australier	**aus.tra.li.er**	aus.tral.ier	a.us.tra.li.er	a.us.tra.lie r	*Australia*
Biologi	**bi.o.lo.gi**	bio.lo.gi	bio.log.i	biol.o.gi	*Biology*
Europeisk	e.u.ro.peisk	**eu.ro.pe.isk**	e.u.ro.pe.isk	eur.ope.isk	*European*
Boikott	**boi.kott**	bo.i.kott	boik.ott	bo.ik.ott	*Boycott*

Sternocleido mastoideus	ster.no.clei.do. mas.toi.deus	ste.rno.cle.i.do m.as.toi.de.us	sterno.cleid o.mastoi.de us		*Sternocleid omastoid*
Siljie	sil.je	si.lje	si.lj.e	sil.j.e	*Silije (Name)*
Akvarium	**ak.va.ri.um**	a.kva.ri.um	a.kva.rium	a.kv.a.ri.u m	*Aquarium*
Mais	ma.is	**mais**			*Corn*
Pause	pa.u.se	**pau.se**	paus.e		*Pause*
Fiolin	fi.o.lin	fio.lin	fi.ol.in	**fi.o.li.n**	*Violin*
Trondheim	trond.heim	tro.ndhe.im	trond.he.im	tron.dheim	*Trondheim*
Arranger	a.rran.ger	**ar.ran.ger**	arr.an.ger	a.rra.nger	*To Arrange*
Begynne	be.gy.nne	**be.gyn.ne**	beg.ynn.e	beg.y.nne	*To begin*