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The duration of stressed and unstressed vowels in English speakers of Spanish

Trvání přízvučných a nepřízvučných vokálů u anglických mluvčích španělštiny

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Vedoucí práce: doc. Mgr. Radek Skarnitzl, Ph.D.

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Prohlašuji, že jsem bakalářskou práci vypracovala samostatně, že jsem řádně citovala všechny použité prameny a literaturu a že práce nebyla využita v rámci jiného vysokoškolského studia či k získání jiného nebo stejného titulu.

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Eliška Kubánková

Abstrakt

Hlavním tématem práce je slovní přízvuk ve španělštině a jeho akustické koreláty. Skutečnost, že se názory odborníků k tomuto tématu v posledních desetiletích liší, poukazuje na složitost jevu. Přízvuk je totiž vázaný nejen na určitý jazyk, ale také na kontext. Při nauce druhého jazyka mají mluvčí tendenci do cílového jazyka přenést fonetický a fonologický systém ze své mateřštiny. Cílem této práce je prozkoumat akustický korelát trvání ve španělštině u anglických rodilých mluvčích, s ohledem na jazykový transfer. Pro tento účel byly pořízeny nahrávky španělštiny u dvanácti anglických mluvčích. Trvání vokálů v přízvučných a nepřízvučných slabikách bylo změřeno v dvojslabičných, trojslabičných a čtyřslabičných slovech s různou pozicí přízvučné slabiky. Výsledky ukázaly rozdíly mezi jednotlivými přízvukovými schématy. Lze konstatovat, že delší trvání vokálu v přízvučné slabice se našlo u dvojslabičných a trojslabičných oxyton a u čtyřslabičných paroxyton. V trojslabičných paroxytonech a proparoxytonech se projevil relativní rozdíl mezi trváním vokálu v přízvučné a nepřízvučné slabice jen nepatrně, což je zřejmě dáno tendencí k prodlužování poslední slabiky ve slově, která byla zachycena u všech druhů slov. V dvojslabičných paroxytonech nebyl nalezen žádný významný rozdíl mezi trváním vokálu v přízvučné a nepřízvučné slabice.

Klíčová slova: slovní přízvuk, akustické koreláty, trvání, vokál, španělština, jazykový transfer

Abstract

The thesis discusses the topic of word stress in Spanish and its acoustic correlates. The fact that studies in the last decades have shown conflicting opinions regarding the subject demonstrates the complexity of the phenomenon. Stress is not only language-specific, but also bound to context. When acquiring a second language, speakers have the tendency to transmit the phonetic and phonological system of their mother tongue to the target language. The aim of the thesis is to examine the acoustic correlate of duration in the Spanish of English speakers, considering the impact of language transfer. Twelve English speakers were recorded speaking Spanish. The duration of vowels in both stressed and unstressed syllables was measured in disyllabic, trisyllabic and quadrisyllabic words with different positions of the stressed syllable. The results indicated variation across stress schemes. Overall, a longer duration of the vowel in stressed syllable was found in disyllabic and trisyllabic oxytone words, and in quadrisyllabic paroxytone words. In trisyllabic paroxytone and proparoxytone words, the relative difference of vowel durations between stressed and unstressed syllables was less significant, likely due to the tendency of final syllable lengthening, which was recorded in all word types. No significant difference was found in disyllabic paroxytone words.

Key words: word stress, acoustic correlates, duration, vowel, Spanish, language transfer

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List of Abbreviations

RAE	Real Academia Española
F_o	Fundamental frequency
F1	First formant
F2	Second formant
IPA	International Phonetic Alphabet
L1	First language
L2	Second language
ANOVA	Analysis of Variance

List of Tables, Figures and Graphs

1. Introduction

Stress and its acoustic correlates has been the subject of countless studies in the last decades. The fact that these studies vary widely in their results indicates the complexity of the phenomenon. Scholars have not come to an agreement in terms of the importance of individual acoustic correlates of stress; the way each language makes use of the parameters varies greatly. Phoneticians have concluded that stress is not only language-specific, but also largely depends on context and the influence of other prosodic features, e.g. intonation (Fry, 1955; Kelm, 1987; Eriksson, Barbosa & Åkesson, 2013; Ortega-Llebaria, Gu & Fan, 2013). In this thesis we investigate the acoustic parameter of duration in the Spanish of English speakers. Based on this correlate we would like to discuss how certain features in the mother tongue have an effect in the acquisition of a second language. In specific, we aim to examine whether non-native speakers will use duration as a correlate to stress in the same way as they do in English.

It has been claimed that due to the absence of a phonemic opposition between long and short vowels in Spanish, duration is not a primary correlate of stress in native speakers (Monroy Casas, 1980: 22). Historical studies of stress in Spanish have tended to consider the parameter or duration only marginally; the correlates to which more attention was normally given were fundamental frequency (Monroy Casas, 1980; Quilis, 1981) and intensity (Cuervo [1954] & Navarro Tomás [1984] in: Quilis, 1981: 327; Gili Gaya, 1988). Newer studies discuss the role of duration to a greater extent and show that duration is an important correlate to stress in some contexts (D'Introno, Del Teso & Weston, 1995; Ortega-Llebaria, Prieto & Del Mar Vanrell, 2007; Ortega-Llebaria & Prieto, 2011). However, fundamental frequency is still preferred as the main correlate to stress in Spanish (Real Academia Española[1], 2011; Čermák, 2015). In English, years of research have highlighted the importance of duration in marking stressed syllables (Fry, 1955; Campbell & Beckman, 1998; Roach, 2000; Mo, 2008; Frost, 2011; Plag, Kunter & Schramm, 2011). Following the theory of language transfer, the fact that the two languages make use of duration differently might manifest in the speech of non-native speakers of Spanish. Based on this knowledge, we assume that English speakers of Spanish will produce vowels in stressed syllables with a longer duration than vowels in unstressed syllables.

To acquaint the reader with the subject matter, we will provide a description of the theoretical aspects of stress in Spanish and a gradual comparison of the Spanish phonemic and

1 The abbreviation RAE will be used in all future references

phonological system with the English one. We will also present an overview of both historical and modern studies of stress and its problematics in Spanish and base our conclusions on them. The main part of the thesis will be a practical analysis in which we will measure the duration of vowels in stressed and unstressed syllables in the Spanish of English speakers. The target words will be extracted from recordings of twelve native English speakers of Spanish. The reader of this paper will be familiarized with the methodology and results of the research in detail. Based on the research and theoretical knowledge, we will aim at proving or disproving the hypothesis that English speakers make use of duration to signal word stress in Spanish.

2. Theoretical background

2. 1. The Spanish vocalic system

2. 1. 1. The vowel, definition

Vowels are sonorous phonemes, differing from consonants by their openness (Gili Gaya, 188: 105). Modern studies (Čermák, 2015: 43) characterize vowels by several basic features including their tone character (as opposed to the noise character of the consonant) and the ability to form a syllable. According to their capacity to constitute syllables separately, Spanish phonemes are normally classified as *syllabic* (vowels) and *non-syllabic* (consonants) (Quilis & Fernández, 1999: 139). The vowel creates the nucleus of the syllable and can constitute the whole syllable alone, which would be the case in the word *aéreo*, syllabically divided as follows: a.é.re.o. In English, even some consonants function as vowels and can form the syllable by itself, for example in the word *shuttle* /ʃʌtl̩/, the last syllable consists entirely of the consonant **l̩** (Roach, 2000: 76, 81). These are called *syllabic consonants* and include the phonemes **l** and **n**.[2]

It is important to consider the Spanish phonemic system in comparison to the English scheme, since this might prove to be a relevant factor in the final realization of Spanish vowels in native English speakers. The Spanish vocalic system is essentially a simple one, reduced across varieties to solely five phonemes: /i/, /e/, /a/, /o/ and /u/, which are systematically represented by graphemes of the same denomination (Alarcos Llorach, 1994: 30). Such is the case for Castilian Spanish, which is the variety chosen for the practical part of this work. In some regional varieties, for example American Spanish (in this context referring to the mother tongue spoken in the territory of the Americas; e.g. Mexican Spanish, Ecuadorean Spanish, Caribbean Spanish), both qualitative and quantitative alterations in the vocalic system are present, but apart from these slight modifications, the Spanish vocalic system is relatively consistent (Čermák, 2009: 108).

2. 1. 2. Characteristics of Spanish vowels

2. 1. 2. 1. Articulatory characteristic

Spanish vowels can be classified from two fundamental viewpoints- the articulatory and the acoustic, the former of which is the more traditional source of categorization. The acoustic criteria have stepped into the classification noticeably in recent phonetic studies (Čermák, 2009: 43). From the articulatory perspective, whilst producing a vowel, the

2 There are no syllabic consonants in Spanish, but note the existence of some non-syllabic vowels (viz. 2.1.3)

expiratory flow does not encounter any obstacle in its trajectory. The flow that originates and passes through the glottis encounters a resonator structure formed by the pharynx, the nasal cavity and the oral cavity (Gili Gaya, 1988: 105). The individual vowels are then distinguished primarily by the position of the tongue (Čermák, 2009: 43). The articulatory classification considers two aspects of the placement of the tongue- its vertical and horizontal shift. The *vertical* shift of the tongue corresponds to the height of the jaw and differentiates vowels into low (/a/), medium (/e/, /o/) and high (/i/, /u/). The horizontal placement is sometimes called the *point of articulation* and classifies the vowels into front (/i/, /e/), back (/o/, /u/) and central (/a/) (D'Introno et al., 1995: 144).[3] In comparison to the Spanish system, the English vocalic system is much more complicated, as it involves more categories of the vertical position of the tongue and thus more phonemes. A comparison of the Spanish and English vocalic systems is shown in Figures 1 and 2. As can be seen, the Spanish system, represented by the so called "Hellwag Triangle" (the typical representation of the place of articulation of individual vowels) is simpler then the quadrilateral figure formed by English vowels.

	Front	Central	Back
High	**i**		**u**
Medium	**e**		**o**
Low		**a**	

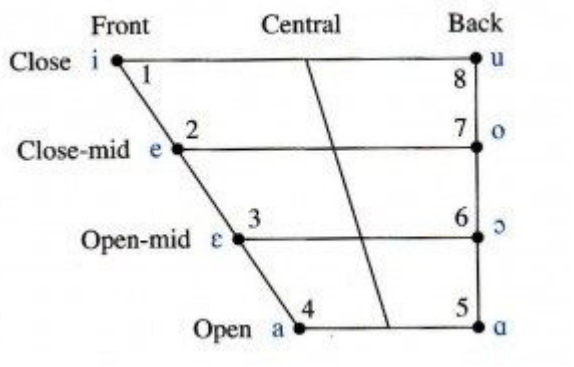


Figure 1: The Spanish vocalic system (Hellwag Triangle)

Figure 2: The English cardinal vowel quadrilateral with IPA transcription (Roach, 2000: 14)

2. 1. 2. 2. Acoustic characteristic, formant values

As mentioned previously, the freedom of the path of the expiratory flow results in the creation of a framework of resonators, which adopt different dimensions and forms that vary in the articulation of each vowel. The resulting qualities of the organs involved in articulation

3 D'Introno et al. (1995) use a separate terminology: anterior/palatal for front vowels, posterior/velar for back vowels. The terms front, back and central are used internationally.

determine which components of the tone will be amplified or weakened. The amplified components are called *formants* and their structure is the chief target of interest of the acoustic characteristic. In reference to vowels, the first and second formants are most substantial (Čermák, 2009: 43). The first formant indicates the openness of the vocal tract (the vertical position of the tongue): the more open the vowel is, the higher the value of the first formant F1 (Čermák, 2015: 46). The second formant relates to the horizontal position of the tongue: the more frontal the vowel is, the higher the value of F2; that is why the highest value is found in the vowel /i/ (ibid: 46). Emilio Alarcos Llorach (1964: 146) and Antonio Quilis (1981: 157-159) both measured the average formant values in Spanish vowels and obtained similar results. The average values of F1 and F2 for each vowel are shown in Table 1. Notice the highest value of F2 in the vowel /i/, app. 2000 Hz.

	/i/	/e/	/a/	/o/	/u/
F1	400	500	700	500	400
F2	2000	1800	1500	1000	700

Table 1: Average values of Alarcos Llorach's and Quilis's measurements of F1 and F2 in Spanish vowels. All values are in Hz.

Figure 3 shows the distribution of Spanish vowels according to formant values. The pattern of distribution approximately reflects the shape of the Hellwag Triangle (viz. Figure 1). In reality, the specific realization of each vowel oscillates around the ideal values shown in Figure 3. These values differ due to the influence of surrounding sounds, stress, or register; what is important is their relative maintenance (Čermák, 2015: 48).

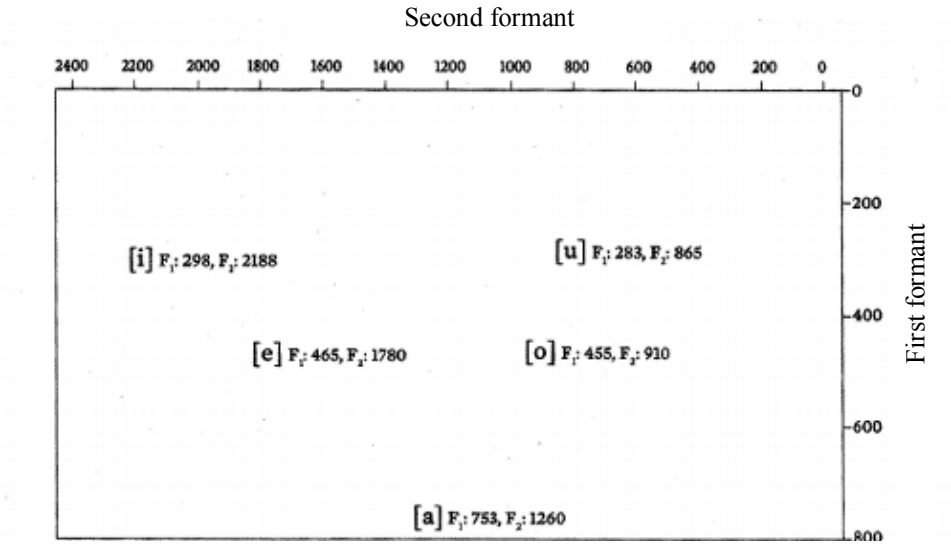


Figure 3: The distribution of Spanish vowels according to formant values. All values are in Hz (RAE, 2011: 87)

2. 1. 3. Non-syllabic vowels, diphthongs, triphthongs

Clusters of vowels can belong to one syllable or to different ones. If the vowels belong to the same syllable, a *diphthong* or *triphthong* is formed.

Diphthongs are a combination of two vowels, one of which is greater in intensity and longer in duration. This vowel is called the *syllabic vowel* and creates the syllabic nucleus (Čermák, 2015: 52; Quilis & Fernandez, 1999: 65). The remaining vowels in the group are called *semiconsonants* or *semivowels*[4] and form a pre-nuclear or post-nuclear *syllabic margin* (Quilis & Fernandez, 1999: 65). The acoustic characteristic of semiconsonants and semivowels is similar; they are both forms of a transition between vowels and consonants (RAE, 2011: 333). As Čermák (2015: 52-53) and D'Introno et al. (1995: 206) state, the difference is given by their position in the vocalic group (diphthong):

The **semiconsonant** forms the pre-nuclear syllabic margin and thus precedes the syllabic vowel. The transition is from a consonantal closure to a vocal openness. Semiconsonants are part of *rising diphthongs*, for example *ie* (tiene ['tje.ne], has), *ia* (piano ['pja.no]), *ua* (cuándo ['kwan.do], when) or *ue* (suelo ['swe.lo], floor).

The **semivowel** (post-nuclear syllabic margin) follows the syllabic vowel. The transition is from a vocal openness to closure. Semivowels are part of *falling diphthongs*, for example *ei* (peine ['pei̯.ne], comb), *ai* (aire ['ai̯.re], air), *au* (auto ['au̯.to], car) or *eu* (Ceuta ['θeu̯.ta]).

A summary of the system of non-syllabic vowels in Spanish is shown in Table 2, demonstrating the relationship between the vowels *i* and *u* and their non-syllabic realizations, transcribed phonetically.

Vowel	Semiconsonant	Semivowel
i	**[j]** tiene ['tje.ne]	**[i̯]** aire ['ai̯.re]
u	**[w]** cuándo ['kwan.do]	**[u̯]** auto ['au̯.to]

Table 2: Non-syllabic vowels in Spanish

4 In earlier studies (Martínez Celdrán, 1994: 171; Čermák, 2009: 48) the term *glides* was used to label semiconsonants and semivowels.

The **triphthong** consists of one syllabic vowel and two non-syllabic vowels (a pre-nuclear and post-nuclear margin), e.g. *despreciáis* [des.pre.'θjajs], *averiguáis* [a.ve.ri.'gwajs], *buey* ['bwej], etc. (D'Introno et al., 1995: 206).

2. 1. 4. The hiatus, syneresis, synalepha

The linguistic phenomenon that occurs if two adjacent vowels each belong to a different syllable, unlike in the case of diphthongs or triphthongs in the previous section, is called a *hiatus*. The hiatus stems from the combination of two medium or low vowels (/a/, /e/, /o/), ex. **pe.or** (worse); or from the combination of a medium or low vowel with a high vowel (/i/ and /u/), as long as the high vowel is stressed and orthographically marked, ex. **dí.a** (day). Therefore, two weak vowels do not always have to form a diphthong (apart from the connection of the two high vowels /u/ and /i/, which does not allow for syllabic division).

In natural speech (usually colloquial or non-standard language), speakers sometimes tend to replace the hiatus for a diphthong, since the pronunciation of the latter is easier (Čermák, 2015: 85; D'Introno et al., 1995: 209). This phenomenon occurs both within the word and on word boundaries and is respectively called *syneresis* or *synalepha*.

Syneresis is the pronunciation of a diphthong within a word in the place of a hiatus (Čermák, 2015: 85), e.g. *alcohol* [al.'kol] instead of [al.ko.'ol]; *ahí* ['a̯i̯] instead of [a.'i].

Synalepha is the pronunciation of a diphthong in the place of a hiatus on word boundaries, e.g. *e indica* [e̯in.'di.ka] instead of [e.in.'di.ka]; mucha hambre [mu.'ʧam.bre] instead of ['mu.ʧa.'am.bre].

2. 2. The syllable

2. 2. 1. Definition, structure

Considered as a functional unit in a phonemic sequence, the syllable is defined as the "basic building unit of continuous speech" (Čermák 2009: 115). The syllable is crucial in relation to stress, because it is precisely the unit on which stress manifests itself. The syllable is internally structured, carrying a compulsory tone structure (the *syllabic nucleus*, explained shortly), which is optionally accompanied by a noise component (Zavadil & Čermák, 2010: 104).

The syllable consists of the following parts or phases:

1. The **peak of the syllable** or **syllabic nucleus** (also the *culminating* or *central phase*). This is the compulsory tone structure of the syllable, formed by a vowel phoneme. As the peak of the syllable, this stage also presents greatest sonority, openness, intensity

and perceptibility (Čermák, 2015: 149; Quilis & Fernández, 1999). The phoneme that constitutes the syllabic nucleus can be prolonged quantitatively.

In other languages such as Czech or English, the presence of syllabic consonants (Czech- **l**, **r**; English: **l**, **n**) allows for greater variety in the structure of the syllabic nucleus.

2. **Syllabic margins** (optional noise component). These are divided according to their pre- or post-nuclear position:
    a) The **onset** (*initial*) phase, in Spanish terminology called the **prætura** is found before the nucleus. During this phase the articulatory organs start opening up. It is formed by one or more consonants (RAE, 2011: 14). Acoustically, the pre-nuclear phonemes show an increase in intensity (Quilis & Fernández, 1999: 37).
    b) The **coda** or *final phase* is found after the nucleus, which implies the process of *closure* of the organs (Quilis & Fernández, 1999: 135-136). Post-nuclear phonemes show a decrease in intensity and a diminution in air pressure/intensity (Quilis & Fernández, 1999: 37).

2. 2. 2. Syllabic division

The *maximum onsets principle* which sets the basic guidelines for syllabic division in English is not entirely applicable to the Spanish language. This principle states that where two syllables are to be divided, any consonants between them should be attached to the right-hand syllable as far as possible (Roach, 2000: 77-78).[5] In Spanish, intervocalic consonants group together with the right-hand vowel due to the tendency of open syllables (casa ['ka.sa]). However, in a cluster of two consonants, the syllabic division is generally drawn between the two and not before: *cuenta* (['kwen.ta], bill), with the exception of fixed clusters of consonants formed by liquids plus another component: /pr/, /br/, /pl/, /bl/, /fr/, /fl/, /gr/, /gl/, /kr/, /kl/, /dr/, /tr/ (Quilis & Fernández, 1999: 140). These clusters cannot be separated into two syllables, e.g. **o.tro** (other), **a.gri.cul.tu.ra**, **o.bra** (work). As discussed previously, diphthongs and triphthongs belong to the same syllable while the hiatus is formed by a syllabic boundary between two strong vowels (or between a stressed weak vowel and a strong vowel).

5 The maximum onsets principle is applied within the restrictions governing onsets and codas (e.g. in the word *extra*, we must reject **e.kstrə** because of its impossible onset and ekstr.ə because of its impossible coda. The correct syllabic division is **ek.strə** (Roach, 2000: 77). For more detail on syllabic division in English see Wells's allophone principle.

2. 2. 3. Classification

The syllable can be divided according to the following characteristics: the presence or absence of a coda, the number of phonemes that constitute it and the presence or absence of stress (Čermák, 2015: 150).

A. Presence/absence of a coda:

a) Open: the coda is missing and the syllable ends in a vowel (the syllabic nucleus itself), e.g. both syllables in the word casa (**ca**.**sa**). The vowel in this type of syllable is *free*. In present-day Spanish, the most natural and harmonic syllabic structure is the open variant CV.[6] This is consequently the least marked and most frequent structure, forming about 70% of Spanish syllables (RAE, 2011: 296). CV is at the same time the most preferred syllable structure universally.

b) Closed: the coda is present so the syllable ends in one or more consonants, e.g. the first and last syllables in ***trans***.*fe*.***rir***. The vowel in the closed syllable is called *locked* (Quilis & Fernández, 1999: 138).

B. Number of syllabic constituents

The syllable can be formed by one phoneme only- *monophonemic*, e.g. the first, second and last syllable in ***a***.***é***.*re*.***o***; or by a cluster of phonemes- *polyphonemic*, e.g. both syllables in ***tan***.***to*** (Quilis & Fernández, 1999: 139). Polyphonemic structures are more common in Spanish. Čermák (2009: 120) arranges the frequency of some of the most common syllabic structures as follows: CV, CVC, V, CCV, VC, CCVC, etc.[7]

C. Presence/absence of stress

Stress is defined as the greatest degree of prominence with which a given syllable is pronounced in relation to the other syllables of the same word or the stress group which it is part of (RAE, 2011: 16; for more detail viz. 2.3.). Primary stress is associated with one syllable only. Spanish distinguishes between two types of syllables according to the presence or absence of stress: **stressed** and **unstressed syllables** (D'Introno et al., 1995: 156). This way, in the word *casa*, the stress falls on the first vowel /a/, thanks to which the syllable /ka/ acquires special prominence in relation to the second syllable /sa/, which makes it a stressed syllable (RAE, 2011: 355-356). In the same way, in the sequence *Se lo comió* (He ate it) the

6 C stands for consonant, V for vowel.
7 The order is from most frequent to least frequent. The frequency of further less common structures varies across studies.

stress of the unit falls on the last syllable /mio/, while the other syllables of the group remain unstressed.

In English, stress also determines whether a syllable is strong or weak. Ingo Plag et al. (2011) studied correlates of stress in North American English and concluded that only stressed syllables can contain the full range of vowel phonemes, while in unstressed positions most vowel contrasts are absent. Some vowel phonemes in English, like schwa (ə) can occur only in weak forms. The peak or nucleus of the strong (stressed) syllable is formed by a vowel phoneme, possibly triphthong, but not the schwa. Weak syllables can have only a small number of possible peaks (Roach, 2000: 82). In contrast, due to the absence of stress-governed vowel reduction[8] in Spanish, all vowel phonemes can be found in both stressed and unstressed positions.

2. 3. Stress

2. 3. 1. Definition, nature of stress

There are two approaches to the question of the characteristics that identify a syllable as stressed. One of the approaches is to consider what the speaker does in the production of stressed syllables, and the other is to look at what sound characteristics make a syllable seem to be stressed to a listener (Roach, 2000: 93). In other words, stress can be studied from the point of view of *production* and *perception*. The production of stress is generally given by greater muscular energy that the speaker uses in the production of stressed syllables, which leads to higher subglottal pressure. Many different sound characteristics are important in making a syllable stressed and their use varies across languages, but all stressed syllables have a feature in common, and that is relative *prominence*. The components of prominence are: loudness (stressed syllables are louder than unstressed), length (stressed are longer), pitch (which is essentially a perceptual characteristic of speech) and quality of the vowel (Roach, 2000: 34).

2. 3. 2. Stress in Spanish

As mentioned in the previous chapter on the syllable, stress can be defined as the major degree of prominence with which a syllable is pronounced in relation to other syllables in the same word or in relation to the stress group which it is part of (RAE, 2011: 355). It is associated with one syllable and determines the contrast between stressed and unstressed syllables. Stress in Spanish is marked by a combination of the variations in three vocalic

8 Here the term *reduction* refers to reduction in vowel quality, i.e. the realization of stressed vowels with more peripheral qualities and of unstressed vowels with more central qualities (Ortega-Llebaria & Prieto, 2011: 78).

parameters in articulation: pitch, length and loudness (RAE, 2011: 365; Čermák, 2015: 163), the respective acoustic correlates of which are fundamental frequency, duration and intensity. Greater energy in the production of a more open vowel along with higher tension in articulation cause the syllable to be more sonorous and perceptible (Hidalgo Navarro & Quilis Merín, 2004: 221). Figure 5 shows an oscillogram of the pronunciation of a pair of words, one with stress on the first syllable ('llame) and the other with stress on the second syllable (lla'mé), demonstrating the elevation of pitch on the stressed syllables.

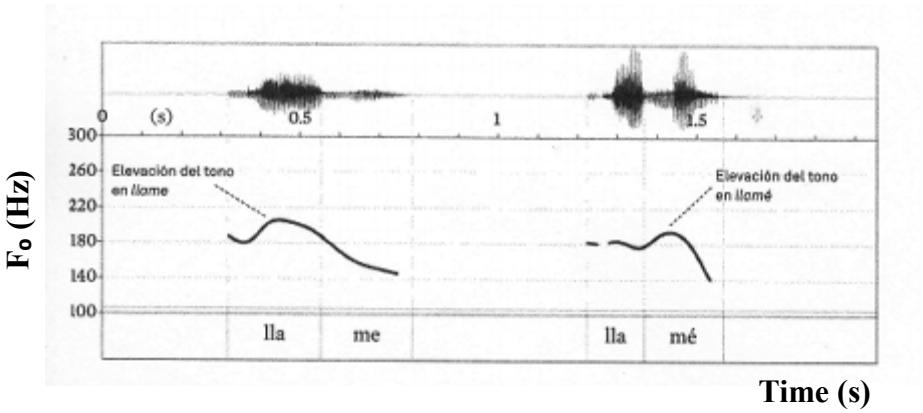


Figure 4: Pronunciation oscillogram of llame ("to call" subjunctive) and llamé (past tense), showing the elevation of pitch (F_0) on the stressed syllable (RAE, 2011: 367)

All vowels are under normal conditions sonorous, since the vibration of the vocal chords is an inherent feature. Nonetheless, the degree of articulatory energy enables the distinction between stressed and unstressed vowels (Hidalgo Navarro & Quilis Merín, 2004: 124). Stressed vowels are produced with greater articulatory energy (i.e. a greater intensity in exhalation). They are articulated more firmly, more openly and are perceptually most pronounced; their quality is stable. In unstressed vowels, a certain degree of vocal relaxation might be present, but the quality remains more or less unaltered. Unstressed vowels are produced with less articulatory energy than stressed vowels and are perceptually less pronounced, but are still marked enough to be identified (Čermák, 2009: 47). The distinction between stressed and unstressed vowels is relative. What matters are not absolute values, but the comparison to other vowels (or syllables): a vowel or syllable can be stressed only in between unstressed syllables.

2. 3. 3. Levels of stress

The word in Spanish always has one main primary stress marked by major prominence in a word (Čermák, 2015: 164). Like in English, apart from primary lexical stress, Spanish also has secondary stress, which refers to the rest of the minor prominences both within the word and higher domains (RAE, 2011: 356; Čermák, 2015: 164).[9] In IPA transcription, secondary stress is marked with the sign (ˌ), e.g. *cómetelo* ['kometeˌlo]. Secondary stress tends to appear in the position before the primary stress or in alternating syllables, e.g. *nacional* [ˌnaθjo'nal], *nacionalismo* [naˌθjona'lismo]. It can also fall on the initial syllable of the word, which is a phenomenon frequent in certain emphatic speech styles, e.g. *nacional* [ˌnaθjo'nal]. Two secondary stresses or one secondary and one primary stress in consecutive syllables do not generally tend to occur (RAE, 2011: 365). In this thesis the opposition between primary and secondary stress is not considered; the focus is on the stressed-unstressed dichotomy.

2. 3. 4. Types of stress

Traditionally, the following dichotomies are presented in languages of the world: *dynamic* or *melodic*, *fixed* or *free*. Spanish stress in described as **dynamic** and **free**.

a) **Dynamic stress:** the stressed syllable is pronounced with greater strength (intensity), more tension (particularly in the vowel), a different pitch and duration and greater force of expelled air (Hidalgo Navarro & Quilis, 2004: 218; Čermák, 2015: 162).
b) **Melodic stress:** the difference in strength as described above is accompanied by a distinctive pitch accent, as it is for example in the Swedish or Serbian language (Čermák, 2015: 162).
c) **Fixed stress:** the stress falls constantly on a fixed position in the word: e.g. in Czech or Hungarian on the first syllable, in French on the final position (Čermák, 2015: 162; Alarcos Llorach, 1994: 45).
d) **Free[10] stress:** there is no fixed position of stress; it can be attributed to different syllables in the word (Alarcos Llorach, 1994: 45). This way, stress in Spanish contributes to the differentiation in the meaning of words (Čermák, 2015: 162), e.g. the typical opposition between the first person present tense and the third person past simple tense: *hablo-habló*, *fallo-falló* etc. Recent studies also show that the position of

9 The alternation of syllables with secondary intensity in higher domains is usually established by speech rhythm (Alarcos Llorach, 1994: 46).
10 The term *free* does not mean absolute freedom in position; the stressed syllable in each word is given. The term free stress only implies that there is no singular or easily definable position where it may appear in the given language.

stress is only partially free, because it can fall solely on one of the last three syllables of the word (RAE, 2011: 14, 358). Phonological studies call this phenomenon the "window of the three syllables".

2. 3. 5. Stress schemes, graphic accent

2. 3. 5. 1. Stress schemes

The possibility of changing position allows for the existence of various stress schemes, which can serve to distinguish the meaning of words (Alarcos Llorach, 1994: 45). According to the position of stress, words in Spanish are divided into:

1. **Oxytone**: words ending with a consonant. The stress falls on the last syllable, e.g. *ha.**cer***.
2. **Paroxytone**: words ending with a vowel, *-n* or *-s*. The stress falls on the penultimate syllable, e.g. ***ca**.sa*, *pro.**tes**.ta*.
3. **Proparoxytone**: words in which the stress falls on the antepenultimate syllable, e.g. ***sí**.la.ba*; rarely on a syllable further to the left, e.g. ***dí**.ga.se.lo*.

2. 3. 5. 2. Graphic accent

At this stage it is necessary to differentiate between *prosodic stress* (viz. 2.4.) and the Spanish **graphic accent**. The graphic accent ("*acento ortográfico*") is orthographically represented by the sign [´] and is used to indicate the tonic syllable of a word (RAE, 2011: 368). Naturally not all words correspond to the stress schemes, i.e. the actual stress realization correspond to the prosodic stress rules. Some oxytone words for example end in a vowel (**ca.fé**), some paroxytone words in a consonant (**lá.piz**). To mark the stress on the correct syllable, the use of the graphic accent is necessary. In summary, the main function of the graphic accent in Spanish is to indicate the tonic syllables that do not follow the basic norms of accentuation (RAE, 2011: 369). In proparoxytone words the graphic accent is obligatorily placed on the antepenultimate syllable. The ***diacritic accent*** further serves to differentiate meaning and classes of words, ex. *te* (objective case of the personal pronoun *tu*) − *té* (tea); *el* (masculine article) − *él* (3rd person personal pronoun), etc.

2. 3. 6. Functions of stress

Traditional studies of Spanish (Quilis, 1981; Hidalgo Navarro & Quilis Merín, 2004) distinguished between four functions of stress: *contrastive*, *demarcative*, *culminative* and *distinctive*.

a. The ***contrastive*** function relates to the ability to contrast stressed and unstressed units, for example syllables (Čermák, 2015: 162). It is a distinction between two elements standing next to each other, i.e. in a syntagmatic relation.
b. The ***demarcative*** function signals the limits of different units in a sequence. It can mark the beginning of a word (Czech, Finnish), end of a word (French) or it can occupy a fixed position in relation to the beginning or end of a word, as in Polish (Hidalgo Navarro & Quilis Merín, 2004: 229).
c. The stressed syllable in Spanish forms the core of the phrase and binds surrounding unstressed units to form a stress group. Free stress marks the peak of the stress unit; this is called the ***culminative*** function (Čermák, 2009: 124).
d. The ***distinctive*** function is a function of free stress and serves to differentiate units with different meaning within one paradigm (RAE, 2011: 358; Čermák, 2015: 163). This can be seen for example in the opposition of *ánimo* (n., "spirit" ['a.ni.mo]), *animo* (v., 1st person present [a.'ni.mo]), *animó* (v., 3rd person past tense [a.ni.'mo]). Similarly to English, stress can differentiate between classes of words ('in.crease/in.'crease). As demonstrated in the examples, stress is the only differentiating mechanism between the two phonemes and words, therefore it is phonologically distinctive.

2. 4. Prosody

Prosodic (or *suprasegmental*) elements of the language serve to modulate speech as a whole, i.e. they do not relate to one segment only (a sound or a phoneme) but occur on superior linguistic units like the syllable, the word or clause (Hidalgo Navarro & Quilis Merín, 2004: 217). Their complexity stems from the fact that they do not measure absolute values but mutual relations (Čermák, 2015: 161). Stress is a *prosodic* feature of the language and can occur both on the word and sentence level.

2. 4. 1. Word Stress, sentence stress, stress groups

Word stress falls on the stressed syllable of a lexical word; **sentence stress** is normally found at the end of the **stress group**, which is formed by one stressed syllable and one or more unstressed syllables (RAE, 2011: 42)**.** Several stress groups form a *phonic group*, which

can further be part of more complex prosodic structures called *melodic units* (RAE, 2011: 356).

2. 4. 2. Stressed and unstressed words, function words, clitics

If considered in isolation, words in Spanish can be stressed or unstressed, depending on whether they carry lexical stress or not (Čermák, 2015: 164). The ratio between stressed and unstressed words in Spanish is app. 63.44% : 36.56% (RAE, 2011: 370). The majority of unstressed words are monosyllabic words, followed by disyllabic paroxytone words (Čermák, 2015: 166). Unstressed words are usually (but not necessarily) *function words*, which as opposed to content words lack lexical meaning and fulfill an essentially grammatical function.[11] Examples of unstressed words are: determinate articles (*el*, *la*…), personal pronouns (*le*, *lo*…), possessive pronouns (*mi*, *tu*…), relative pronouns (*que*, *quien*…), the adverbials *medio* and *tan*, relative adverbials (*adonde*, *como*…),[12] prepositions (*ante*, *frente*…) and conjunctions (*aunque*, *como si*...).

Unstressed words that connect to an adjacent stressed word to form a stress unit are called **clitics**. They are usually monosyllabic or disyllabic words, namely articles, prepositions, conjunctions or pronouns (Čermák, 2015: 165). Those that form a stress group with the preceding word are called *enclitic* (e.g. "lo" in *hacerlo*[13] [a.'θer.lo], or *se* and *lo* in *dígaselo* ['di.ga.se.lo), and those that form a stress group with the following word are called *proclitic* (e.g. *el* in *el mío* [el.'mi.o]).

2. 4. 3. Other prosodic elements

As stated before, a stressed syllable is defined by its contrast to unstressed syllables in loudness, pitch and length. Similar rules apply for rhythm and intonation, which are the two main prosodic elements apart from stress. They reflect variations in intensity, pitch, voice quality and speed with which the sequence is pronounced (RAE, 2011: 355). The listener perceives some parts of the sequence as uttered with a greater or smaller strength, slower or faster, with a higher or lower pitch, or with a certain rhythmical demarcation, which can all influence the meaning of an utterance (Čermák, 2015: 161).

11 The grammatical function comprises properties as tense, modality, definiteness, number, degree, interrogativity, etc. (Corver & Riemsdijk, 2001).
12 This does not apply to relative adverbial in an interrogative or exclamative function.
13 When a verb is accompanied by an enclitic pronoun, the two forms are joined into one word.

2. 4. 3. 1. Rhythm

Rhythm is a prosodic element that combines word stress with sentence stress; it is the perceptual sensation produced by the organization of prominent elements of an utterance in regular time intervals (RAE, 2011: 356). Stress structures are different in each natural language which explains the variations in rhythmical patterns (RAE, 2011: 445). Rhythm is perceived in function of the number of stress groups and the duration ratio of stressed and unstressed syllables. Languages are classified as **stress-timed** or **syllable-timed** according to the characteristics of the rhythmical patterns. Spanish is a language in which vowels in unstressed positions are not reduced and the rhythmical unit is the syllable, hence the designation *syllable-timed* (RAE, 2011: 357). In English on the other hand, stressed syllables tend to occur at relatively regular intervals, whether they are separated by unstressed syllables or not (Roach, 2000: 134). In other words, the times from each stressed syllable to the next tend to be equal, regardless of the number of intervening unstressed syllables, which is called *stress-timed rhythm* (Roach, 2000: 135). Recent studies open new perspectives on the possible presence of different types of rhythm within the same language (RAE, 2011: 448).

2. 4. 3. 2. Intonation

Intonation is one of the basic characteristics of speech. It is a movement in the melody that occurs in the pronunciation of an utterance (Čermák, 2015: 171). This movement is described in terms of an intonation curve, formed by joining the alterations in pitch. Traditional studies set forth that the main part of this curve is the final *cadence*, or the section from the last stressed syllable to the end of the utterance. The cadence can show schemes of decrease, increase or it can remain constant (Čermák, 2015: 173). Some functions of intonation are the attitudinal function (expresses emotions and attitudes), the accentual function (highlights the prominence of units), grammatical function (serves to recognize grammatical and syntactic structures) or the discourse function (signals new information) (Roach, 2011: 183-184).

2. 5. Acoustic correlates of stress

Traditionally, four acoustic correlates that are responsible for prominence are indicated: **vowel quality**, **intensity**, **fundamental frequency** and **duration** (D'Introno et al., 1995: 126). Different languages vary in the extent to which each of the correlates is applied as to signal stress. Below is a description of each of the correlates in relation to Spanish.

2. 5. 1. Fundamental frequency

The sound wave is characterized by three parameters: duration, frequency and intensity (RAE, 2011: 33). Complex sound waves are composed of a series of simple sound waves; the sound wave of the lowest frequency is called the *fundamental frequency* (F_0) and is a correlate to stress in many languages (RAE, 2011: 33). The rest of the simple sound waves are called *harmonic components*, and their frequency is always a multiplication of the fundamental frequency (RAE, 2011: 34; Hidalgo Navarro & Quilis Merín: 45). Spectrographic analysis has revealed a regular pattern in Spanish in that the fundamental frequency is higher in stressed syllables (D'Introno et al., 1995: 127-128). In latest studies (RAE, 2011), the variation in fundamental frequency has been established as the most important acoustic cue to stress in Spanish.

2. 5. 2. Vowel quality

The dynamics between muscular tension and relaxation are accompanied by a modification in the quality of a vowel (D'Introno et al., 1995: 126). This quality is defined as the "acoustic coloration of a vowel" (Hidalgo Navarro & Quilis Merín, 2004: 47) and depends on the configuration presented in the spectrum of the complex sound wave- the number, audibility and conformation of the harmonic components (Quilis, 1981: 49). Vowel quality, in Spanish called *timbre*, is what distinguishes individual vowels from each other (Gili Gaya, 1988: 105).

The variations of vowel quality in Spanish are not substantial, since the entire scope of vowel phonemes can appear in unstressed positions (D'Introno et al., 1995: 126). In English, on the other hand, the ə sound indicates the presence of numerous allophones and neutralized vowels. Fry (1955) considers the vowel quality as an important correlate of stress, yet he still labels duration as the most important cue to stress in English.

2. 5. 3. Intensity

Some studies (Navarro Tomás, 1950; Cuervo, 1954) considered that stress was a mere consequence of increased intensity (In: Quilis, 1981: 327). Modern approaches based on electroacoustic analysis show that the peaks of intensity do not always correspond to stressed syllables, and even unstressed syllables may present great energy in articulation (D'Introno et al., 1995: 127). In addition, lower or higher intensity is an inherent characteristic of some sounds. Recent studies have recurred to analyzing intensity using spectral balance, which has resulted more accurate than measuring overall intensity (Campbell & Beckman, 1997; Sluijter & Van Heuven, 1996, 1997; Volín & Zimmermann, 2011).

2. 5. 4. Duration

Duration, also called *quantity* in the domain of linguistics, is the main parameter studied in this work. Antonio Quilis (1981) claims that perceptually, duration is the most discernible acoustic parameter. In languages that use duration as a cue to stress, the syllabic nucleus in stressed syllables is longer in duration than in unstressed syllables (D'Introno et al., 1995: 129). This is due to the fact that greater energy is needed in the articulation of stressed syllables. Prosodic features, for example the speed of an utterance, can largely affect vowel quantity.

2. 6. An overview of the problematics of acoustic correlates of stress in Spanish

2. 6. 1. Historical studies of the acoustic correlates

Studies have varied in the results determining the most prominent correlate for the detection of word stress in Spanish. Samuel Gili Gaya (1988: 46-47) mentions that duration was established as the difference between long and short syllables in antiquity, when short syllables were said to last half the quantity of long syllables. The differences between short and long syllables have shown to be much greater than the 1:2 ratio. Gili Gaya states that in non-quantitative languages (languages that do not have a phonemic contrast in terms of vocalic duration, like Spanish), these variations are given by the position of stress and also by the nature and number of components that form the syllable, since each sound has a different minimal time interval to be produced according to its nature and the nature of adjacent sounds. Antonio Quilis (1981: 81) writes that the minimal duration necessary to perceive a sound with all its attributes (frequency, intensity, quality, internal structure, etc.) is approximately 60 milliseconds.

The studies of Gili Gaya and Quilis are only a part of the extensive research conducted in the twentieth century investigating the correlates of stress in Spanish. As mentioned earlier, before the 1960's, intensity was considered the most important cue to stress in the Spanish language, a fact stated in the studies of Navarro Tomás (1950) or José Cuervo (1954) (In: Quilis, 1981: 327). Later in the century, even Gili Gaya (1988) argued that intensity was the primary cue to stress. However, with the invention and application of electroacoustic methods, new possibilities were opened for measurements of the individual parameters and the opinions on their relative importance began to differ. For example, Rafael Monroy Casas (1980) and Antonio Quilis (1981) in the 1980's were inclined to the theory that

fundamental frequency was the main acoustic correlate of stress. Most of the mentioned phoneticians admit that stress is given by a combination of the individual parameters and it is difficult to mark the most distinctive one.

2. 6. 2. Modern Studies of the acoustic correlates

2. 6. 2. 1. General observations

Phonetic research in the past decades has exerted great effort to describe the principles of relative prominence in speech across languages, and even modern studies vary in determining the most prominent correlate for marking word stress in Spanish. As Marta Ortega-Llebaria, Gu & Fan (2013, 186) write, fifty years of study of lexical stress have led to the conclusion that stress realizations are context-sensitive and "subject to the requirements of sentence intonation and language-specific constraints". Ortega-Llebaria and Pilar Prieto (2011, 78) argue that cues to stress generally result more robust in declarative sentences. In *reporting clauses*[14] the differences in stress are not as prominent, since they are pronounced with a flat F_0 contour. Various studies (Fry, 1955; Kelm, 1987; Eriksson et al., 2013) emphasize the role of intonation in relation to stress. For example, Fry (1955) observed an interaction between duration cues and sentence intonation, where intonation showed to be an over-riding factor in determining the perception of stress. In other words, fundamental frequency outweighed the duration cue.

2. 6. 2. 2. Studies on duration and fundamental frequency

As mentioned in the historical studies, for some time it was believed that fundamental frequency was the main acoustic correlate of stress. Monroy Casas (1980: 22) highlights the fact that Spanish does not make a phonemic contrast in terms of quantity, that is, there is no dichotomy of long versus short vowels (as opposed to English), therefore that duration loses relevance as an indication of stress. For this reason among others, quantity was overlooked as a cue to stress until the 1990's. In 1995, D'Introno et al. indicate duration precisely as the most important cue along with fundamental frequency. The same authors admit that even though the importance of both correlates is evident, there is no consensus in determining whether fundamental frequency or duration is the main cue to stress in Spanish (D'Introno et al., 1995: 127). To show the complexity of the relationship, let us consider their study with more detail. The distinction of stressed and unstressed syllables using fundamental frequency is applicable only in syllables that belong to the same stress group, i.e., the same word (*ibid*:

14 As defined by Navarro Tomás (1948), reporting clauses are the "insertion of an additional element, which has its own characteristics and whose melody is independent of that of the main clause (In: Ortega-Llebaria, 2011).

128). The last unstressed syllable of a unit composed of various words will normally be higher than a stressed syllable at the beginning of the unit. In some cases, even an ascending pattern can happen and the unstressed syllable can become higher in pitch than the stressed syllable. For example, in the phrase *a lo niños no los he visto en todo el día* (I haven't seen the children all day), the syllable *ños* is higher than *ni*, yet ni will still be perceived clearly as the stressed syllable. These contradictions do not negate the general affirmation that fundamental frequency is the basic element of stress, but they show that the perception of stress can depend on many factors combined and that there are contexts where fundamental frequency is not the primary cue to stress. In these cases, duration seems to take over as the parameter determining stress.

Ortega-Llebaria, Prieto & Del Mar Vanrell (2007) carried out a study on the perceptual evidence for direct acoustic correlates of stress in Spanish. The experiment was based on identifying oxytone words which varied in two paroxytone-oxytone continua (where the cues of duration, overall intensity and spectral tilt were manipulated). The results indicate that duration and overall intensity were cues to stress while spectral tilt was not. Ortega-Llebaria et al. further came to the conclusion that stress detection in Spanish depends on vowel type, despite the lack of vowel reduction: the stress contrast was perceived more consistently in [a] than in [i]. This proves that, despite the absence of pitch accents and vowel reduction, stress in Spanish has its own phonetic material to signal stress. In a later study, Ortega-Llebaria & Prieto (2011) compared the acoustic correlates of stress in Catalan and in Spanish, which are two languages that differ in the use of vowel reduction. While Spanish does not make use of vowel reduction, Catalan (like English) does. They measured all four correlates: fundamental frequency, vowel quality, intensity and duration. The use speakers made of intensity was not as pervasive as that of duration and changes in spectral tilt were significant only in Catalan, where vowels in stressed syllables were produced with a more peripheral realization. Duration showed to be a consistent correlate of stress on the word level, while fundamental frequency on the sentence level in both languages. Surprisingly, it was clearly established that stressed syllables were longer in duration than unstressed syllables in both languages, independently of vowel reduction. In other words, duration was a cross-linguistic cue to stress regardless of vowel quality.

2. 7. Language transfer

2. 7. 1. Second language acquisition

Certain features of a learner's mother tongue (L1) influence the process of learning a second language (L2). When there are many discrepancies between L1 and L2, it is expected that language transfer will occur in second language acquisition (Frost, 2011: 73). This means that intuitively, the learner will transmit some of the features of his or her mother tongue to the second language. Robert Lado (1956), who analyzed the differences in the phonetic material of Castilian Spanish and standard mid-west American English, came to the general conclusion that the speaker of one language will tend to transfer the entire system to the second language, including the phonetic and phonological material (positional variants, restrictions on the distribution of phonemes, syllable patterns, word patterns, intonation, etc.).

Spanish and English differ to a large extent in many aspects, from their basic typology to their phonetic and phonological systems, as we have shown until this point. English has a wider range of vowel phonemes, while the Spanish vocalic system is relatively simple. Being a stress-timed language, in English the time interval between stressed syllables is pretty constant (no matter how many syllables occur in between). As a consequence, unstressed syllables are often reduced and certain vowels or syllables may even disappear completely (Frost, 2011: 71). Spanish, on the other hand, does not use vowel reduction in unstressed syllables and the vowels maintain a relatively stable quality. Consider the *schwa* sound, which is restricted to unstressed positions in English but has no counterpart in the Spanish language. As a consequence to the L2 learner's seeking for equivalents of his or her mother tongue in the new language, the *schwa* is applied by native English speakers in Spanish instead of full vowels such as a/o/e in weak positions. This process is called the obscuration of vowels and shows how the assumption that Spanish should be a language easy to learn for English speakers due to the presence of fewer vowels is problematic (Hualde, 2014). Apart from the issues of allophones and positional variants, stress has also shown to be a problematic domain in the acquisition of Spanish by English speakers.

2. 7. 2. Stress as a function of language

Studies have led to the conclusion that the parameters that mark stress (duration, fundamental frequency, intensity, vowel quality) are not of equal importance and vary across languages: each language differs in the extent to which the individual correlates are used to signal stress. In English and other languages with pitch-accents, there is consensus in that changes in fundamental frequency play a major role in the production of stress (Fry, 1955;

Campbell & Beckman, 1998; Roach, 2000; Mo, 2008; Ortega-Llebaria & Prieto, 2011; Plag et al., 2011; Frost, 2011). The same studies attribute duration a decisive role in marking stress in English. Despite the fact that Spanish, as opposed to English, does not make a phonemic contrast in terms of vocalic quantity (i.e. there is no distinction of long to short vowels), recent experiments have shown that duration is a consistent stress correlate on the word level (D'Introno et al., 1995; Ortega-Llebaria et al., 2007; Ortega-Llebaria & Prieto, 2011).

2. 7. 3. Hypothesis

Duration plays a major role in marking stress in English and due to language transfer we assume that English speakers will transmit the use of the correlate to L2. Recent studies have shown that in Spanish, the role of duration is not negligible either. Basing our hypothesis on the modern studies of English and Spanish, we have reason to assume that English speakers of Spanish will produce vowels in stressed syllables with a longer duration.

3. Material and Method

3. 1. Subjects

This study featured twelve subjects, all native English speakers who knew Spanish as a second language, aged between eighteen and twenty-five years. At the time of the recording, all participants were actively studying at the University of Oxford. The subjects spoke a standard variety of their native language with RP (Received Pronunciation). There was more variety regarding the Spanish language, since some of the speakers had a pronunciation proper to Castilian Spanish[15] (which has the phonological opposition between [θ] and [s]), whereas others applied the *seseo*[16] (where the opposition is lost). This should not influence the results of the study, since its primary focus is the duration of vowels. The Spanish language proficiency of the subjects was not tested, apart from the requirement to be able to read out loud a relatively difficult text in Spanish after sufficient preparation. The degree of foreign accent in their speech varied. Some speakers sounded almost native-like, while others had a strong foreign accent. The differences, which may impact the results, are due to the fact that the subjects were volunteers who reacted to an advertisement on the university notice board and we could not be more selective in the choice of volunteers. Each subject received a financial reward worth 5£ for the task. None of the subjects had a hearing or speech impediment.

3. 2. Material

The recording took place in a phonetic laboratory at the University of Oxford. Every speaker successively recorded two texts, each one approximately a page long (530 words). This created a set of 24 recordings in total. All participants recorded the two texts in one day to prevent possible changes in their voice disposition.

The samples of texts were two recorded broadcasts from the online archive of Radio Praga (the Spanish section of the Czech radio station *Český rozhlas*). The texts were edited to imitate the style of BBC news entries, so that each was divided into seven shorter parts and an introducing and concluding sentence (viz. Appendix 1, 2). Six of the sections touched the topics of home news, culture, politics, economics or sport, and the seventh presented a short

15 In Castilian Spanish, the voiceless interdental fricative [ɵ] corresponds in spelling to c, z (cinco ['θiŋk$_o$], Zaragoza [θar$_a$'goθ$_a$]; the grapheme s then corresponds to the voiceless alveolar fricative [s], e.g. casa ['kasa] (Zavadil & Čermák, 2010: 70).

16 The seseo is a phenomenon found in most of Hispanic America (with the exception of the Colombian and Bolivian inland), Andalusia, Valencia and the Canary Islands. The corresponding representation [s, z̪] is pronounced instead of [ɵ, z̪], e.g. cerca ['serk$_a$] (Zavadil & Čermák, 2010: 77), therefore the opposition between the graphemes c, z and the grapheme s is lost.

weather forecast. After enough preparation, the speakers were simply asked to read each document (Text A, Text B) out loud, making short pauses between the individual sections. The effect of style on vowel and syllable length was not considered in this study. Only read, continuous but not spontaneous speech was analyzed. In this sense, there was a possible concurrence of word stress with sentence stress and also an influence of prosodic elements like rhythm and intonation.

To compare stressed and unstressed vowels of syllables in different positions, words of two, three and four syllables were extracted from the material. These words were then divided according to the position of stress into oxytone (stress on the last syllable), paroxytone (stress on the penultimate syllable) and proparoxytone (antepenultimate) words. Due to the uneven distribution of the type of words in the texts, we were unable to collect equal amounts of data. Out of the samples of texts A and B, sixteen examples of disyllabic words were selected (eight oxytone and eight paroxytone), twenty-two of trisyllabic words (eight oxytone, seven paroxytone and seven proparoxytone) and ten examples of quadrisyllabic words (all of which were paroxytone). One recording of text A could not be used because of technical problems (overlapping sections, other sections completely left out), which resulted in the loss of 22 words in total.

The selection was a careful process and a large set of words could not be considered due to certain unwanted characteristics, as will be explained presently. First of all, proper nouns and words of foreign origin were excluded. Names of people and locations, technical terms, Czech words and complex numerals were hard to pronounce and led to speech interruptions or repetition, and were therefore eliminated. Function words (words that lack lexical meaning) were also removed from the selection, because they are phonologically and morphologically dependent and typically unstressed (e.g. clitics [Corver & Riemsdijk, 2001]). Mostly nouns, full verbs, adjectives, adverbs and simple cardinal numerals (*trece*) were chosen. In addition, the selection also contained a stressed preposition *según*. Words in the final position in a phrase (or immediately preceding a significant pause) were avoided to avoid prosodic lengthening of the final syllable.

Moreover, words other than monophthongs (diphthongs, triphthongs, viz. 2.1.3.) were disregarded in order to facilitate segmentation of the material and to help prevent variation in the results. Words that contained hiatus were also disposed of, as were words with the potential of syneresis or synalepha (viz. 2.1.4.). We tried to avoid words that formed a stress group with clitics (viz. 2.4.2.), because their attachment to the word could change the position of the stressed syllable. Due to the mandatory presence of articles and the frequent use of

monosyllabic prepositions in Spanish, clitics could not unfortunately be avoided in all cases. The final number of retrieved words is shown below in Table 3 (for the final selection of words viz. Appendix 3).

	Disyllabic	Trisyllabic	Quadrisyllabic
Oxytone	93	81	
Paroxytone	94	92	115
Proparoxytone	-	79	-
Total	**554 words**		

Table 3: Total number of collected words according to the number of syllables and position of words stress

3. 3. Data processing

The data acquired in the phonetic laboratory was processed in the computer program for phonetic editing, *Praat* (Boersma & Weenink, 2015). The long audio signals were transformed to monophonic sound reproduction to facilitate work with the recordings. First, we created boundaries between the individual sections of texts A and B for each speaker and added the matching sections of text as Textgrid files. Using a Praat script, the sound files were further divided into the corresponding parts. Subsequently, applying the software for automatic segmentation of the Czech language, *Prague Labeller* (Pollák, Volín & Skarnitzl, 2007), the data was segmented into words and individual speech sounds. Using a Czech segmentation program was not a problem thanks to the fact that the Czech and Spanish vocalic system bear close resemblance. In addition, the orthography more or less corresponds to the sound system in both languages. The grapheme that had to be edited to secure correct recognition before running the segmentation script was the Spanish *ñ*, substituted by the Czech *ň*. Due to other discrepancies, some of the target words had to be adapted to the Spanish phonetic system later during the process, for example the word *siguen* (where the Prague Labeller, based on the Czech graphotactic rules, identified two vowels [u, e] instead of one [e]); or the word *caso* (where *c* was recognized as [t_s], not [k]), etc.

Employing the methods of segmentation in Machač & Skarnitzl (2009), we then carefully manually edited the vowel boundaries in all selected words. We added one point tier to label the first vowel of the word. In this tier, we marked the number of syllables in the word and the position of the stressed syllable; for example *2,1* would signify a word with two syllables in which the first is stressed, viz. Figure 5.

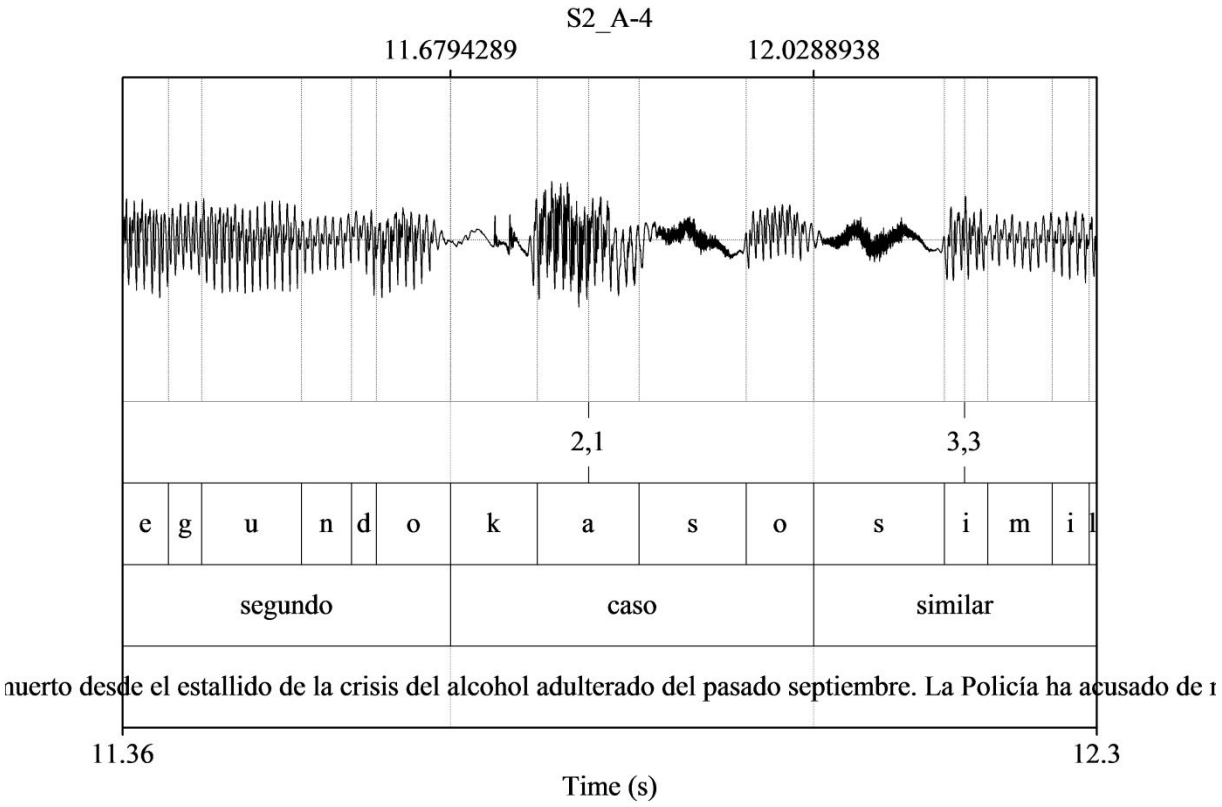


Figure 5: A sample of the segmentation method showing the text, individual words, phonemes, number of syllables and the position of the stressed syllable (from bottom tier up) (Extracted from Praat, 2015)

By means of these entries, we sorted the data into different groups to be able to compare their values. To obtain the duration values of all vowels in the selected words, we created and ran a special Praat script. For further statistical analysis, we used the software *Statistica* by *StatSoft*.

In the software *Statistica*, we carried out several tests to analyze the relationships in between various sets of data and the statistical significance of the differences. The dependent variable was the duration of the syllable measured in milliseconds; additionally the duration of the vowel expressed in percentage, relative to the duration of the entire word (in disyllabic words). As independent variables we chose stress (meaning its presence or absence), the position of stress, the number of syllables, and the speakers for one set of values (again disyllabic words). We did not consider independent variables such as the speaking style or sex of the speakers.

To compare the relationships between dependent and independent variables, and to test the variation between the group means for statistical significance, we used the collection of statistical models *Analysis of variance* (ANOVA for future reference).We applied a single-factor ANOVA for the analysis of data with one independent variable and a multiple-factor ANOVA for the analysis of data with more independent variables, which resulted more

transparent than applying multiple two-sample Student t-tests. Within this procedure, we turned to the p-values to analyze the statistical significance of values obtained in each test. For example, a p-value of 0.001 would indicate that there is only a 0.1% probability that the differences are due to chance, a p-value of 0.1 would mean a probability of 10% that the differences are due to chance. Below is a table (Table 4) that shows the significance of p-values. The table represents a conventional evaluation of the significance of relationships in the humanities.

p-value	Statistical significance
$p < 0.001$	Highly significant
$0.001 < p < 0.05$	Significant
$0.05 < p < 0.1$	Marginally significant
$p > 0.1$	Not significant

Table 4: Statistical significance according to p-values

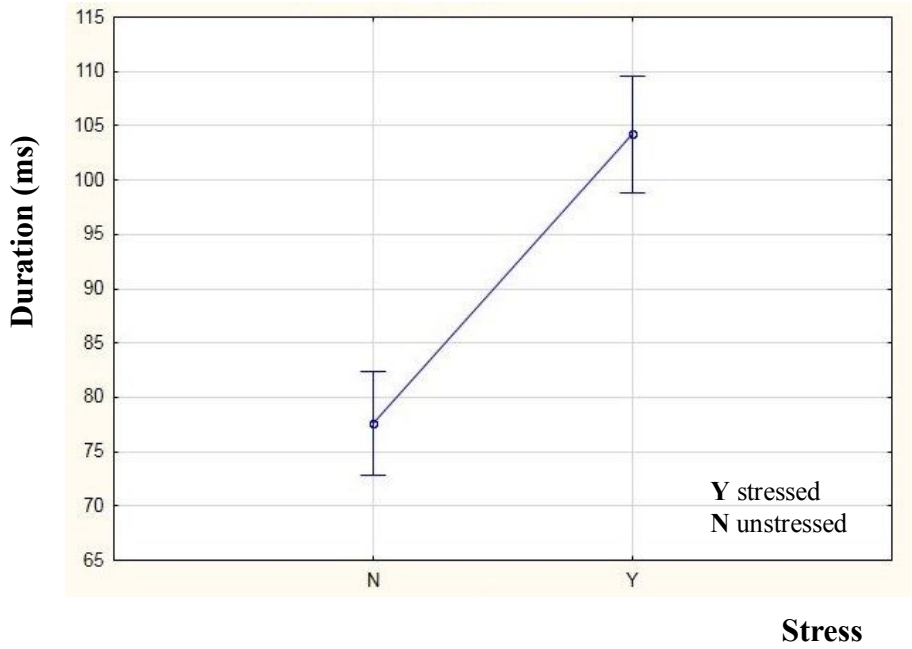
We further performed a *post-hoc test* to compare the effect of all variables respectively- *Tukey's HSD* (Honest Significant Difference) *test*. This test provides a multiple correlated comparison of values, meaning that it compares all possible pairs of means to identify means that are significantly different from each other (as opposed to the multiple-factor ANOVA, which compares whole group-means). The data was extracted into an extensive chart to show the statistical differences among and between all the variables.

4. Results and Discussion

The following section contains a detailed analysis of the results and their statistical significance, including a brief discussion of the outcomes. The results are separated into three sections according to the number of syllables in the word: disyllabic, trisyllabic and quadrisyllabic.

4. 1. Disyllabic words

For disyllabic words, we first conducted a single-factor ANOVA to analyze the effect of stress on vowel duration, regardless of the position of the syllable. Graph 1 demonstrates the difference between the mean duration of vowels in stressed syllables and the mean duration of vowels in unstressed syllables in disyllabic words. The dependent variable of duration in milliseconds (ms) is on the vertical axis and the independent variable of stress is on the horizontal axis, with the letter **Y** standing for stressed and the letter **N** standing for unstressed syllables. In this and all following graphs, the error bands indicate 95% confidence intervals (95% of the data); the rest of the dispersed data (5%) are outliers.

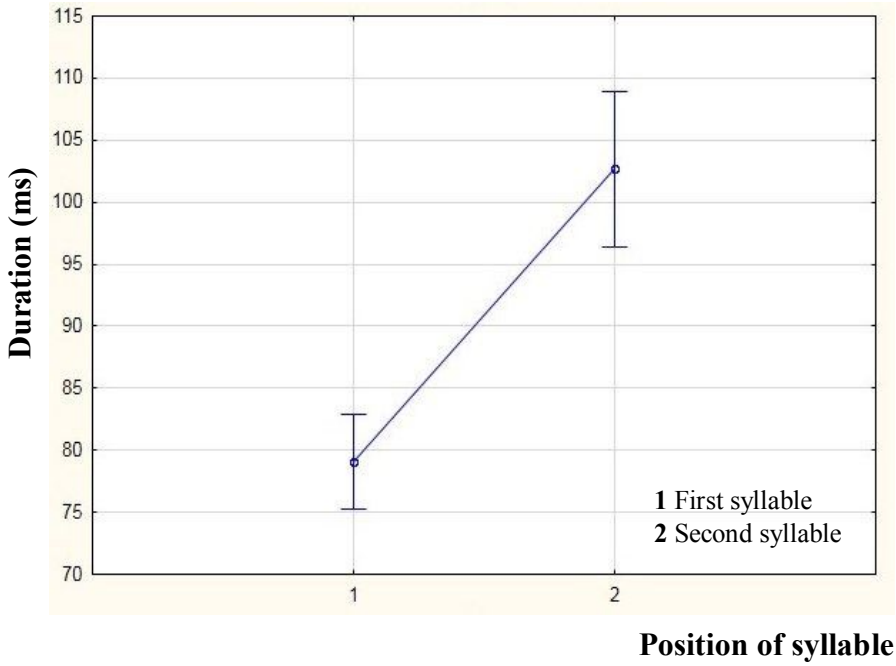


Graph 1: Vowel duration in disyllabic words depending on stress

As can be seen in Graph 1, the vowels in stressed syllables are overall longer in duration than unstressed syllables when the position of the syllable is not regarded. The vowels in stressed syllables reached an approximate mean duration of 104 ms and the vowels in unstressed syllables an approximate mean duration of 77 ms; which gives a difference of

roughly 27 ms. We calculated the statistical significance of this relationship and obtained a value of F(1,372)= 53.058, p<0.001, meaning that the difference between the durations of vowels in stressed and unstressed syllables was highly significant. This outcome proves the hypothesis that duration is an overall cue to stress in Spanish, but the results will need to be specified considering the effect of syllable position (i.e. the difference in vowel durations of oxytone and paroxytone words). A multiple-factor ANOVA analysis that considers both independent variables (stress and syllable position) will be discussed further ahead.

The second relationship we tested was the effect of the position of the syllable on vowel duration, this time regardless of the stress variable. Graph 2 shows the mean vowel duration in the first syllable (marked with the number **1** on the horizontal axis) compared to the mean vowel duration in the second syllable (marked with the number **2**).

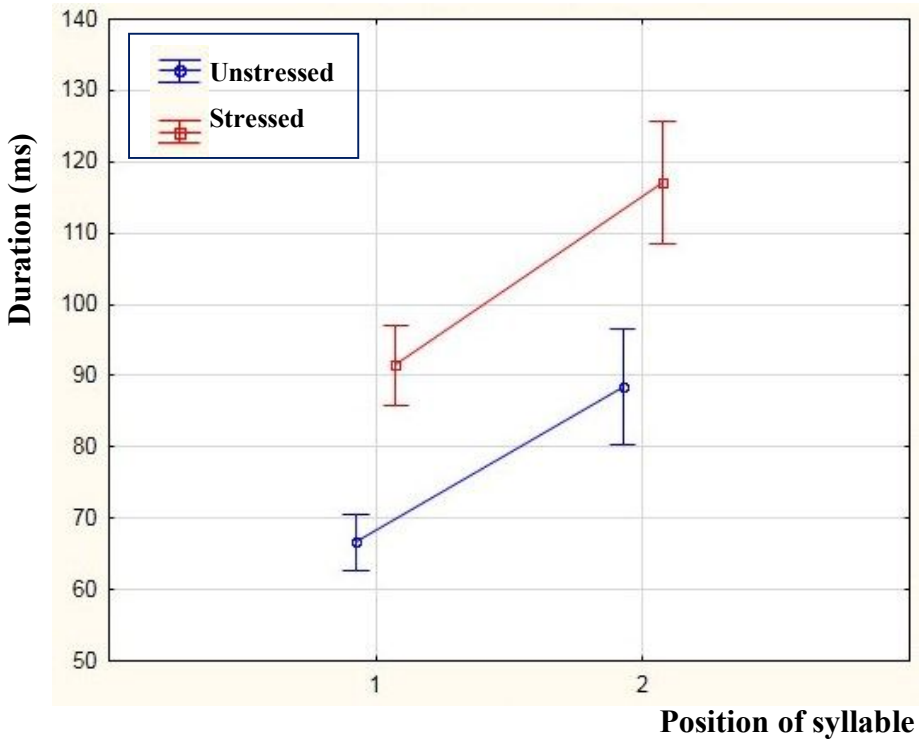


Graph 2: Vowel duration in disyllabic words depending on the position of the syllable

The trend in Graph 2 is similar to that of Graph 1: the mean vowel duration was higher in the second syllable (app. 103 ms) than in the first syllable (app. 79 ms) of disyllabic words. The difference between the mean values of the first and second position was approximately 24 ms. As can be observed, the vowel duration values in the second syllable were slightly more dispersed than the values in the first syllable. The confidence interval in the second position has a span of about 13 ms (95% of the data was between the values of 96 and 109 ms). These differences can be due to other independent factors such as the subjects. Statistical analysis in this test proved a highly significant value of F(1,372)= 40.362, p<0.001, which

indicates that the vowel durations were notably longer in the second syllable in comparison to the first, regardless of stress.

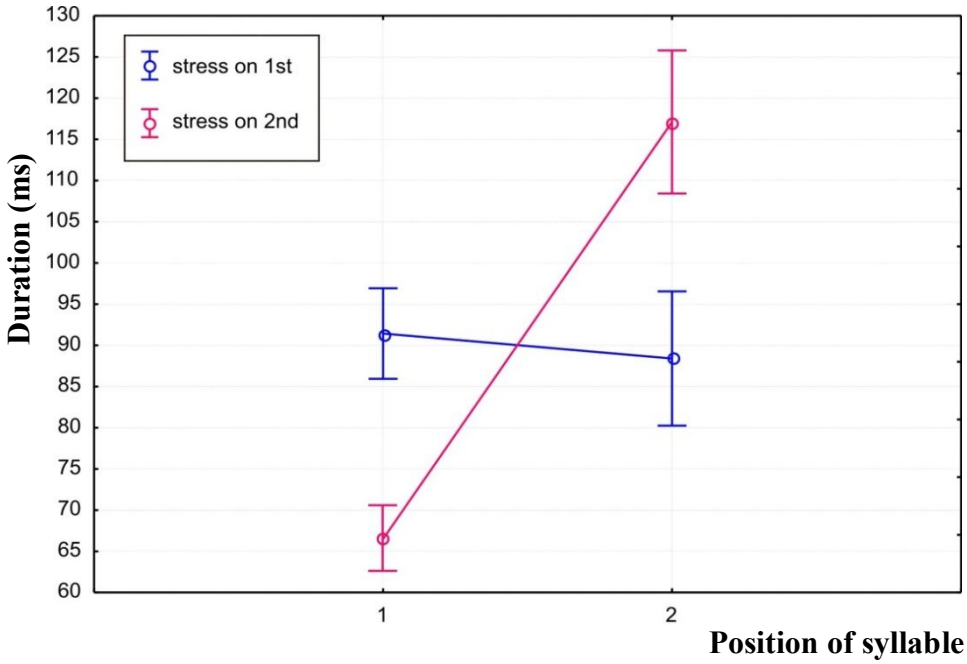
To analyze the vowel duration in disyllabic words with both of the independent variables (stress and the position of the syllable), we performed a multiple-factor ANOVA, a graph of which is shown below (Graph 3).



Graph 3: Vowel duration in disyllabic words depending on stress and the position of the syllable

Like in Graph 2, the position of the syllable is on the horizontal axis (1, 2). The independent stress variable is displayed in the graph with the red figure for stressed and the blue figure for unstressed syllables. The graph demonstrates a large difference (app. 50 ms) between the mean vowel duration in the first unstressed syllable (1, blue; app. 67 ms) and the mean vowel duration in the second stressed syllable (2, red; 117). This difference resulted as highly significant (Tukey: $p<0.001$). In practical terms, this means that in oxytone disyllabic words (words with two syllables, the second of which is stressed, e.g. *según* [se.'gun]), the vowel of the stressed syllable was longer in duration than the vowel of the unstressed syllable. Surprisingly, there was a minimal difference (app. 3 ms) between the mean vowel duration in the first stressed syllable (1, red; app. 91 ms) and the mean vowel duration in the second unstressed syllable (2, blue; app. 88 ms). This difference was statistically not significant (Tukey: $p>0.1$).

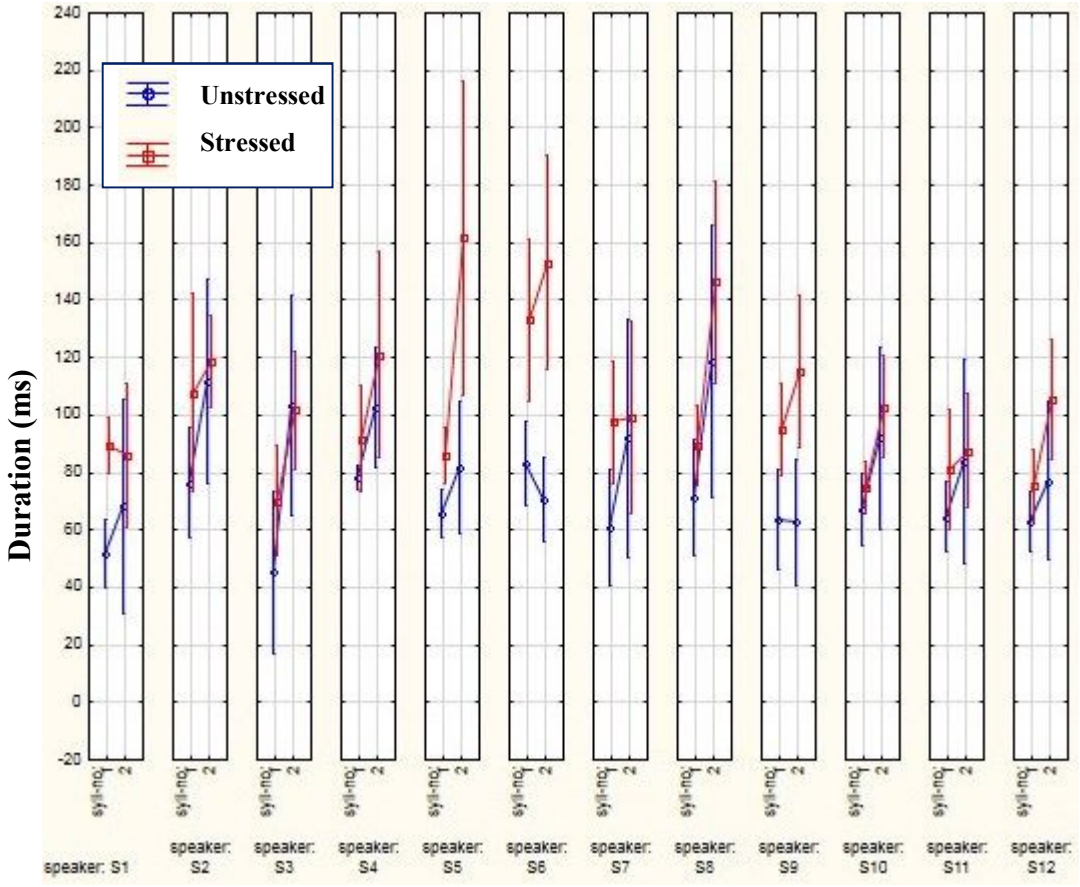
As stated in the method, we ran one test to measure the duration of the vowel expressed in percentage, relative to the duration of the entire word, in disyllabic words. No statistical significance was found in this relative comparison, which is why we continued using only vowel duration measured in milliseconds as a dependent variable. In the next step we performed a correlated comparison of variables, shown in Graph 4. We specifically chose not to use ANOVA for repeated measures, because ANOVA compares whole group-means and not values both among an in between groups. In other words, the correlated comparison provided us with a comparison of values within the same words.



Graph 4: Correlated comparison of vowel duration in disyllabic words depending on stress and the position of the syllable

In Graph 4, the blue figure stands for stress on the first syllable and the red figure stands for stress on the second syllable. The horizontal axis shows the position of the syllable (1, 2). This way, the left-hand mean in the blue figure represents the mean vowel duration in the first syllable of a paroxytone word (e.g. *punto* ['**pun**.to]), and the right-hand mean in the blue figure represents the mean vowel duration in the second syllable in a paroxytone word ('pun.**to**). The left-hand mean in the red figure then represents the mean vowel duration in the first syllable of an oxytone word (e.g. *según* [**se**.'gun]), and the right-hand mean represents the mean vowel duration in the second syllable of an oxytone word (se.**'gún**). The results exposed no new findings (a significant difference was found in oxytone but not paroxytone disyllabic words) so we continued further with the analysis.

The last test we carried out for disyllabic words was one with considering the independent variable of speakers, which is represented in Graph 5. Here all three independent variables are included: stress, position of syllable and speakers.



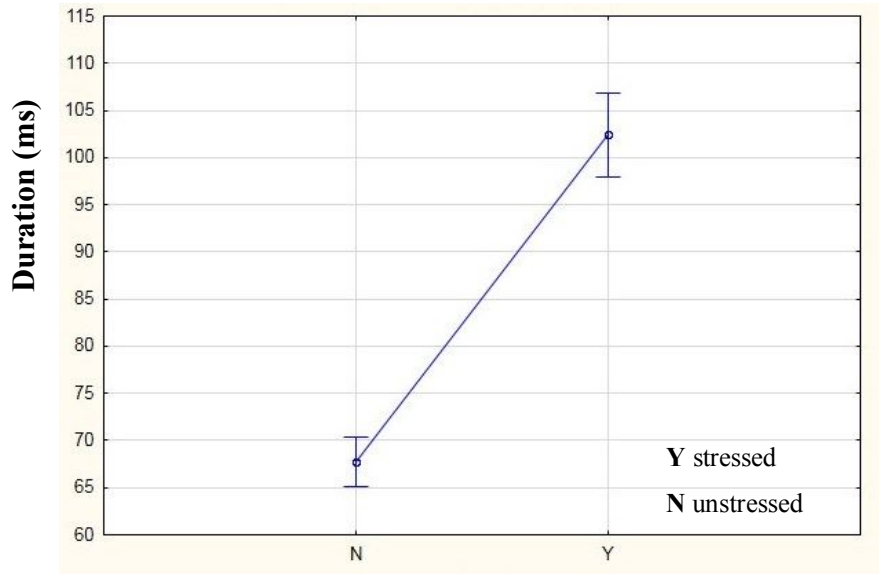
Graph 5: Vowel duration in disyllabic words depending on stress, syllable position and speakers

The visual representation in Graph 5 clearly indicates variation in terms of speakers. For example, speaker S5 (female) produced vowels in stressed syllables of oxytone words with durations varying from app. 107 ms to app. 218 ms, which is a large measurement dispersion. 218 ms is also the maximum vowel duration in stressed syllables among all speakers. The minimal duration of unstressed syllables among all speakers is found in speaker S3 (female), with a value of 18 ms. Within the 95% confidence intervals, the values of stressed syllables in the first position span from 52 to 161 ms, and in the second position from 60 to 218 ms. The values of unstressed syllables in the first position are from 19 to 99 ms, and in the second position from 36 to 165 ms. The highest mean value in stressed syllables in the first position was in speaker S6 (133 ms) and in the second position in speaker S5 (161 ms). The lowest mean value in unstressed syllables in the first position was in speaker S3 (44 ms) and in the second position in speaker S9 (62 ms). Some differences that were found

statistically significant before when the effect of speakers was disregarded were not significant here; equally some differences that were not significant turned to be significant in some speakers. In the chart created by running a post-hoc test, we read the respective *p*-values to test for statistical significance, and found a significant *p*-value in both oxytone and paroxytone words (Tukey: p<0.005). This means that speaker S6 produced vowels in stressed syllables with a longer duration not only in oxytone but also in paroxytone words. On the contrary, speaker S11 for example did not produce the second stressed syllable in oxytone words with a significantly longer duration, which can be deduced from the post-hoc test (Tukey: *p*>0.1). In trisyllabic and quadrisyllabic words, it would be hard to display the independent variable of subjects, so we chose not to work with it further for better transparency in the results.

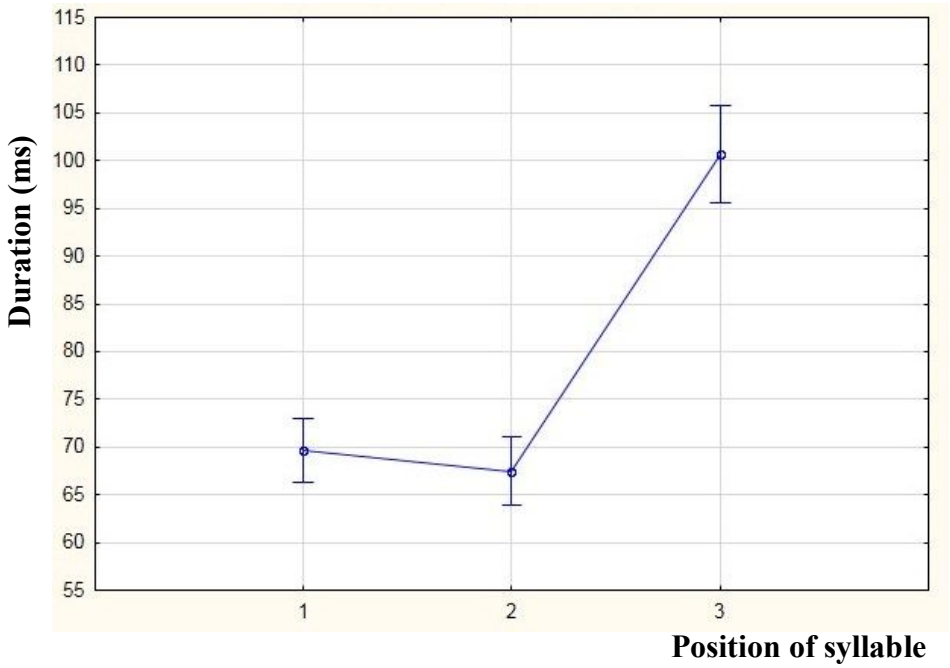
4. 2. Trisyllabic words

In trisyllabic words, we also conducted a single-factor ANOVA to analyze the effect of stress on vowel duration, shown in Graph 6. The trend is similar to that of disyllabic words, with a difference in mean values between stressed and unstressed syllables even more notable- 67 ms for vowels in unstressed syllables and 103 ms for vowels in stressed syllables. The *p*-value was again smaller than 0.001 [F(1,754)=193.88, *p*<0.001], implying that the difference between the duration in stressed and unstressed syllables was highly significant. Like before, this test excludes the independent variable of syllable position, which is why the conclusion that duration is a cue to stress in Spanish in trisyllabic words is only general and further specification is needed for each group (oxytone, paroxytone, proparoxytone).



Graph 6: Vowel duration in trisyllabic words depending on stress

The following graph (7) demonstrates the duration of vowels in trisyllabic words depending on the position of the syllable. As can be seen, the overall duration is longest in the third syllable with a mean of 101 ms. The shortest duration is in the second syllable (66 ms). The *p*-value for this test was smaller than 0.001 [F(2,753)= 80.658, *p*<001), which means that the effect of syllable position was highly significant. What is interesting to note in the graph is the suggested lengthening of the final (third) syllable.



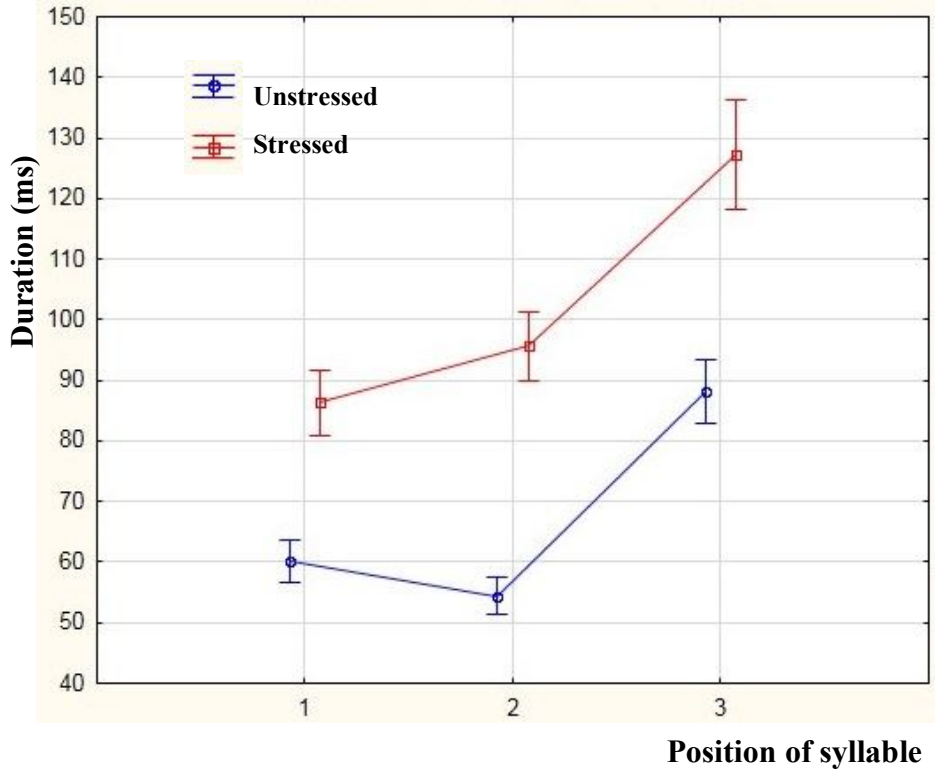
Graph 7: Vowel duration in trisyllabic words depending on the position of the syllable

Graph 8 shows the relationship between duration and the independent variables of stress and syllable position in trisyllabic words. The values were obtained using a multiple-factor ANOVA. The graph compares all syllable position schemes: trisyllabic words with stress on the first (proparoxytone), second (paroxytone) and last (oxytone) syllables. The number of the syllable is on the horizontal axis (1, 2, 3); stressed syllables are represented by the red figure and unstressed syllables by the blue figure. For example, the syllables of a proparoxytone word (*'sá.ba.do*) would be represented as 1 red, 2 blue, 3 blue. A paroxytone word (*du.'ran.te*) would be represented as 1 blue, 2 red and 3 blue. An oxytone word (*co.mi.'te*) would be 1 blue, 2 blue, 3 red.

Interestingly, the vowel in the last syllable has a higher mean duration in comparison to other vowels in the words not only in oxytone words where it is stressed, but also in proparoxytone words where the vowel is not stressed. In paroxytone words, the vowel in the last unstressed syllable was longer than in the first unstressed syllable (but not longer than the

stressed syllable). In words with stress on the first syllable, the second (unstressed) syllable is shorter in duration, but the third (also unstressed) syllable has a greater mean than both the second unstressed and first stressed syllable. This shows a clear tendency of final syllable lengthening.

Statistically, most of the differences were highly significant. In oxytone words, the

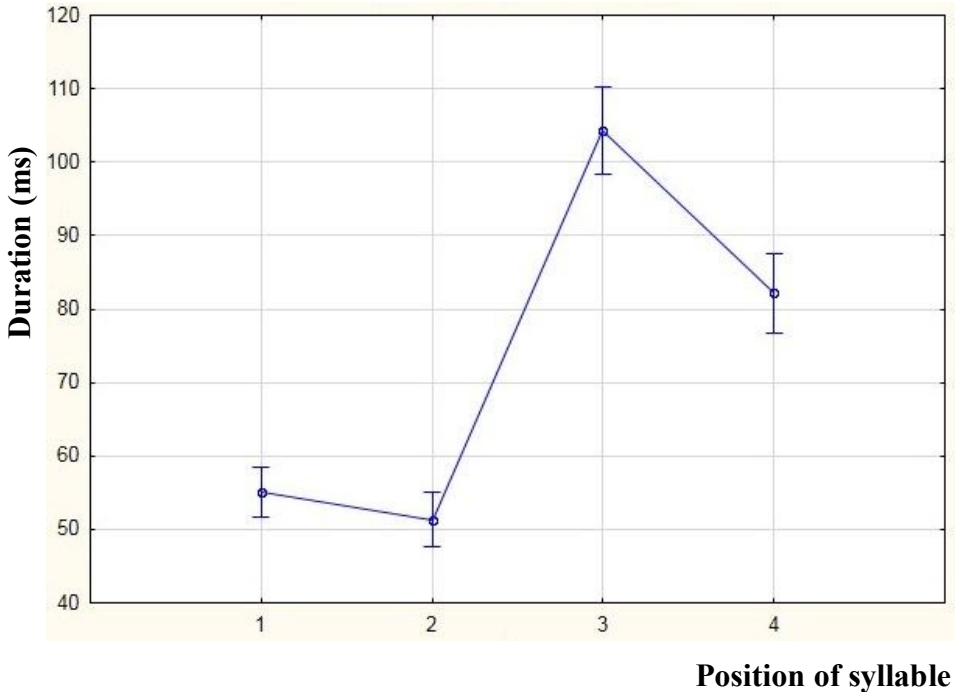


Graph 8: Vowel duration in trisyllabic words depending on stress and the position of the syllable

difference between the stressed syllable and the two unstressed syllables respectively was highly significant (Tukey: $p<0.001$ in both cases), which implies that the vowel in the stressed syllable was longer than in the unstressed syllables. In paroxytone words, there was a highly significant difference between the first unstressed syllable and the second stressed syllable, but not between the second stressed syllable and the third unstressed syllable The *p*-value between the second and third syllable was not significant (Tukey: $p>0.1$). This result indicates the lengthening of the final syllable, which has an effect on vowel duration. A similar scheme occurred in proparoxytone words, where there was a highly significant difference between the first stressed syllable and the second unstressed syllable, but no difference between the first stressed and the third unstressed syllable (Tukey: $p>0.1$)The mean vowel duration of the last syllable in proparoxytone words (where stress is on the first syllable) was not that different from the duration of the vowel in the stressed syllable, which points at final syllable lengthening in trisyllabic words.

4. 3. Quadrisyllabic words

Since our set of quadrisyllabic words included only words with stress on the penultimate syllable (paroxytone), stress became an irrelevant independent variable and we did not need to carry out a multiple-factor ANOVA. The only test we realized was a single-factor ANOVA with syllable position as an independent variable, shown on Graph 9. This way, the statistical analysis was more transparent then for the previous groups. No significant difference was found between the first and second unstressed syllable (Tukey: $p>0.1$). The difference between the third stressed syllable and both unstressed syllables was highly significant (Tukey: $p<0.001$). This implies that the stressed syllables in quadrisyllabic paroxytone words with a mean duration of 104 ms were longer than the unstressed syllables. There was lengthening of the vowel in the final syllable in quadrisyllabic paroxytone words as well, since the last unstressed syllable was longer in duration than the first two unstressed syllables.



Graph 9: Vowel duration in quadrisyllabic words depending on the position of the syllable

5. General discussion

The analyses of durations in disyllabic and trisyllabic words with stress as an independent variable indicated that stressed syllables were longer in duration than unstressed. However, this was not sufficient information to draw a general conclusion that stressed syllables were longer than unstressed. When the variable of syllable position was considered together with the variable of stress, the results clearly indicated differences in durations across individual stress schemes (oxytone, paroxytone, proparoxytone words).

In disyllabic words, the position of the stressed syllable was decisive: the vowel in the stressed syllable in oxytone words was longer in duration than in the unstressed syllable, but in paroxytone words, this trend did not repeat. In the thesis of Zuzana Berkovcová (2014), where a similar effect was found in disyllabic paroxytone words, the author attributes this phenomenon to the frequency of stress schemes in Spanish. The fact that paroxytone words are most frequent in Spanish is a possible reason for a less explicit realization of the stressed syllable (Berkovcová, 2014: 45).

In trisyllabic words, the strongest effect was found in oxytone words, where the vowel in the stressed syllable was longer in duration than the vowel in both unstressed syllables. In trisyllabic paroxytone and proparoxytone words, the vowel in the stressed syllable was also longer, but not as significantly when considered in relation to the other unstressed syllables in the words. In quadrisyllabic words, which were all paroxytone, the vowel in the stressed syllable was longer than the vowels in unstressed syllables. In both trisyllabic and quadrisyllabic words, lengthening of the final syllable was recorded. The fact that the strongest effect overall was in trisyllabic and disyllabic oxytone words is probably influenced by a tendency to prolong the last syllable in English speakers of Spanish.

The variation in the results could have been influenced by several factors. As was explained earlier (viz. 2.6.), the parameters that signal stress are context-sensitive and can vary even within one language, depending on features such as speaking style or intonation, which we did not consider. Various studies (Fry, 1955; Kelm, 1987; Eriksson et al., 2013) emphasize the role of intonation in relation to stress. For example, Fry (1955) observed an interaction between duration cues and sentence intonation, where intonation showed to be an over-riding factor in determining the perception of stress. In other words, fundamental frequency outweighed the duration cue. In this way, despite the efforts of phoneticians to unify opinions, it is difficult to establish one prominent correlate to stress in a specific language.

In summary, apart from a trend of final-syllable lengthening, we could not infer general conclusions except from individual word types and stress schemes. The hypothesis that stress is marked on the basis of longer vowel duration in stressed syllables in the Spanish of English speakers could not be confirmed nor refuted. Therefore, our results do not coincide with the results of phoneticians favored duration as a cue to stress in Spanish (D'Introno et al., 1995; Ortega-Llebaria et al., 2007; Ortega-Llebaria & Prieto, 2011), nor do they support the hypothesis that English speakers would transmit the use of duration as a correlate of stress in L2. Our results (despite not knowing the interaction with other parameters) do go along with the view that there is no one acoustic parameter that would be used to identify a stressed syllable.

6. Conclusion

The aim of the thesis was to investigate the problematics of word stress in Spanish and to carry out research on the acoustic parameter of duration in the Spanish of English speakers. Scholars have presented diverse opinions regarding the topic of acoustic correlates and their relative importance, which points at the complexity of the phenomenon of stress. In earlier works on stress in Spanish, the role of duration was said to be minor due to the absence of a phonetic opposition between long and short vowels. These works focused on fundamental frequency and intensity as the main acoustic correlates. More modern studies have shown that even in some contexts, duration is used to signal stress in Spanish. In English, phoneticians have agreed on the crucial role of duration along with fundamental frequency to signal word stress.

We measured the duration of vowels in stressed and unstressed syllables in recordings of twelve native English speakers of Spanish. In second language acquisition, certain features in the mother tongue may be transferred to the second language, including the phonetic and phonological material. Basing our knowledge on the studies of the two languages and language transfer, we worked with the hypothesis that English speakers would make use of duration to signal word stress in Spanish.

Our results indicated variation across stress schemes and word types. In disyllabic oxytone words, the vowel in the stressed syllable was longer in duration than in the unstressed syllable, but in paroxytone words, the trend was in fact opposite. In trisyllabic words, the strongest effect was found in oxytone words, where the vowel in the stressed syllable was significantly longer in duration than the vowel in both unstressed syllables. In trisyllabic paroxytone and proparoxytone words, the vowel in the stressed syllable was also longer, but not as significantly. In quadrisyllabic words, which were all paroxytone, the vowel in the stressed syllable was longer than the vowels in unstressed syllables. The fact that the strongest effect overall was in trisyllabic and disyllabic oxytone words indicates a tendency to prolong the last syllable in English speakers of Spanish. This strong tendency was found in quadrisyllabic words as well, where the final unstressed syllable was longer in duration than the first two unstressed syllables.

In summary, the speakers produced vowels in stressed syllables with a longer duration to some extent, but not in all cases. We could not draw general conclusions regarding duration except for final-syllable lengthening and trends within word types and stress schemes. Therefore, the hypothesis that English speakers would produce stressed syllables in Spanish

with a longer duration could not be proven but also not refuted. The variation in the results could have been influenced by several factors, e.g. the differences in language proficiency in the speakers, insufficiency of collected data, or missing stress schemes (e.g. oxytone quadrisyllabic words). We can conclude by saying that the acoustic parameters of stress generally work together in signalizing prominence. Stress is not only language specific, but largely depends on context, including the influence of other prosodic features. In this way, there is no one correlate that would signal prominence in a given syllable.

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Resumé

Tato práce se zabývá tématem slovního přízvuku a jeho akustických korelátů, konkrétně parametrem trvání ve španělštině anglických rodilých mluvčích. Na úvod (1.) se předkládá problematika dosavadních studií o přízvuku. Skutečnost, že se názory odborníků k tomuto tématu v posledních desetiletích liší, poukazuje na složitost jevu. Fonetici zatím nesjednotili názor ohledně důležitosti jednotlivých korelátů. Způsob, jakým jsou využívány, se totiž liší od jazyka k jazyku. Přízvuk je také vázán na kontext, jelikož může docházet k interakci s jinými prozodickými prostředky ve větě. Mezi tyto prostředky patří například intonace, rytmus nebo mluvní styl. Řada odborníků poukazuje na vliv intonace na realizaci slovního přízvuku a někteří dokonce tvrdí, že může převážit nad parametrem trvání.

Ve španělštině neexistuje fonologická opozice mezi krátkou a dlouhou samohláskou, jinými slovy, délka samohlásky není fonologicky relevantní. Z toho důvodu dřívější studie předpokládaly, že španělština nevyužívá parametru trvání pro signalizaci slovního přízvuku. Tyto studie se zabývaly spíše parametry základní frekvence a intenzity. Moderní studie věnují korelátu trvání více pozornosti a dokonce ukazují, že v určitých kontextech značí prominenci slabiky. Přesto se mnozí fonetici shodují, že hlavním korelátem přízvuku ve španělštině je základní frekvence. Naopak v angličtině kromě základní frekvence hraje trvání zásadní roli (vokál v přízvučné slabice je zpravidla delší než ve slabice nepřízvučné). Při nauce druhého jazyka mají mluvčí tendenci do cílového jazyka přenést fonetický a fonologický systém ze své mateřštiny. Tento jev se nazývá jazykový transfer, a s ohledem na něj práce zkoumá relativní trvání vokálů v přízvučných a nepřízvučných slabikách ve španělštině anglických mluvčích. Na základě znalostí o přízvuku v obou jazycích a o jazykovém transferu a pracujeme s hypotézou, že budou angličani využívat delšího trvání v přízvučných slabikách i ve španělském jazyce.

Pro tyto účely práce nejdřív rozebírá fonetický a fonologický systém španělštiny a postupně ho srovnává se systémem anglickým. První teoretická část (2.1.) se věnuje samohláskám, jejich definici, akustické a artikulační charakteristice a klasifikaci, včetně diftongů, triftongů i hiátům. Další sekce se zabývá slabikou, její strukturou a klasifikací (2.2.). Poté následuje detailní popis slovního přízvuku ve španělštině (2.3.). Tato část obsahuje jeho základní definici, druhy a přízvuková témata, navíc funkce přízvuku ve španělštině. V závislosti na přízvuku je jedna kapitola věnována již zmíněným prozodickým prostředkům, zejména intonaci a rytmu (2.4). V této sekci je též zmíněna přítomnost větného přízvuku, také přízvučných a nepřízvučných slov. Mezi nepřízvučná slova patří například klitika, která tvoří

přízvukový celek s lexikálním slovem a ve španělštině se mají častý výskyt. Po rozebrání základních vlastností přízvuku následuje popis jednotlivých korelátů (2.5.), a to jak obecně, tak konkrétně ve španělštině. Práce pak předkládá souhrn dosavadních studií o parametru trvání ve španělštině (2.6.). Na tuto sekci navazuje část o jazykovém transferu, který tvoří jeden z hlavních bodů hypotézy (2.7.).

Praktická část (3., 4.) se skládá z analýzy dat získaných z nahrávek dvanácti anglických mluvčích španělštiny, pořízených na Oxfordské univerzitě. Mluvčí ve věku mezi osmnácti až pětadvaceti lety byli požádáni o přečtění dvou textů o délce jedné stránky. Tyto texty byly zprávy z archivu španělské sekce *Radia Praha* a skládaly se z několika krátkých sekcí na různá témata. Požadavkem bylo, aby mluvčí byli schopni přečíst zprávy plynule a bez větších pauz. Přesto se ale úroveň španělštiny u mluvčích lišila, včetně jejich naučené výslovnosti (někteří mluvili se španělskou, jiní s jihoamerickou výslovností). Z textů se vybrala jednotlivá slova pro analýzu- dvojslabičná, trojslabičná a čtyřslabičná slova s různou pozicí přízvuku (oxytona, paroxytona, proparoxytona). Finální selekce slov obsahovala šestnáct dvojslabičných (osm s přízvukem na první, 8 s přízvukem na druhé slabice), dvacet dva trojslabičných (osm s přízvukem na třetí od konce, 7 s přízvukem na druhé od konce a 7 s přízvukem na poslední slabice) a deset čtyřslabičných slov (všechna s přízvukem na předposlední slabice). Nahrávky pak byly zpracovány v počítačovém programu pro editaci zvuku *Praat* a pomocí skriptu byla změřena trvání vokálů ve všech slabikách cílových slov. Pro statistickou analýzu významnosti byl použit program ANOVA od firmy StatSoft.

Následně se předkládají výsledky výzkumu a diskuze (4., 5.). V dvojslabičných a trojslabičných oxytonech byly samohlásky v přízvučné slabice významně delší než ve slabice nepřízvučné. V trojslabičných paroxytonech a proparoxytonech byly vokály v přízvučné slabice také delší, ale ne významně v porovnání se všemi nepřízvučnými slabikami. Ve čtyřslabičných paroxytonech byly vokály v přízvučné slabice delší. Naopak v dvojslabičných paroxytonech nebyl nalezen žádný rozdíl mezi trváním vokálu v přízvučné a nepřízvučné slabice. Výsledky obecně indikují tendenci k prodlužování poslední slabiky ve slově.

Na závěr (6.) se podotýká, že určitá variace ve výsledcích mohla být dána několika faktory. Kromě již zmíněných ostatních prozodických prostředků mohl ovlivnit výsledky například nedostatek dat nebo různá úroveň španělštiny u anglických mluvčích. Pokud bychom brali v potaz výsledky jako celek a ne jednotlivé druhy slov a přízvuková schémata, nelze úvodní hypotézu vyvrátit ani popřít. V tomto smyslu lze zakončit prohlášením, že závisí na kontextu a neexistuje jediný korelát, který by v daném jazyce značil slovní přízvuk.

Appendix

Appendix 1: Text A

Radio Praga, noticias.
Las condiciones en las cárceles de prisión preventiva en Chequia son muy malas. Así se afirma en un reciente informe del Comité de Helsinki checo. El documento surgió a raíz de una inspección realizada por un grupo de miembros de esa entidad en seis cárceles durante las últimas semanas, e indica que las celdas son demasiado pequeñas y los inculpados no disponen de condiciones aceptables para su limpieza personal, entre otras cuestiones. La ex presidenta del Comité, Anna Ivanova, insistió que los resultados de la inspección confirmaron que en Chequia no se respetan los derechos humanos de los detenidos en prisión preventiva.
Se incrementó el precio del vino de producción nacional en el mercado checo. Según los economistas, esto se debe a la mala cosecha de uvas el año pasado, causada por las heladas que afectaron los viñedos en el mes de mayo. La misma situación se registra también en otros países de Europa.
Una mujer ha sido ingresada en un hospital al sufrir envenenamiento con metanol este viernes, lo que constituye el segundo caso similar esta semana. De momento más de cuarenta personas han muerto desde el estallido de la crisis del alcohol adulterado del pasado septiembre. La Policía ha acusado de momento a cinco personas más por la venta de bebidas alcohólicas en el mercado negro. La Inspección Sanitaria del país advierte a la población que se abstenga de beber destilados de origen desconocido.
La Casa del Arte de Berno expone estos días una muestra dedicada al destino de las ciudades construidas por el magnate checo del calzado Tomás Batia. El imperio del empresario con sede en Zelen llegó a contar con decenas de ciudades repartidas por todo el mundo. Batia instalaba factorías en los países donde quería vender sus productos, y buscaba para ellos poblaciones bien comunicadas. Luego construía no solo las fábricas y almacenes, sino también las viviendas de los obreros, todo siguiendo un plan arquitectónico y urbanístico de tipo funcionalista.
Un hombre de negocios checo, Tomás Vela, de setenta y dos años, ha sido secuestrado a principios de marzo en el sur de Francia. La policía ha conseguido arrestar esta semana a cuatro personas relacionadas con la desaparición. Una de ellas es un hombre que se reunió con Vela en el aeropuerto de Niza el siete de marzo. El checo nunca llegó al hotel. Otro empresario checo desapareció en Francia en circunstancias similares en dos mil ocho y no se ha vuelto a saber nada de él desde entonces.
El tenista checo Tomás Berdych ha sido derrotado en los cuartos de final del torneo de la serie Masters de Miami. El checo no pudo contra el francés Richard Gasquet, ante el que perdió tres seis y tres seis en un partido de hora y cuarto. A pesar de su relativamente rápida salida del torneo, Berdych ha comenzado muy fuerte la temporada, al quedar finalista dos veces consecutivas en otros torneos internacionales.
Este sábado se esperan cielos cubiertos y nubosos, con precipitaciones de nieve o aguanieve. Las temperaturas oscilarán entre los tres grados y los siete grados.
Y eso es todo del momento en las noticias de Radio Praga. Han estado con Carlos Ferrer.

Appendix 2: Text B

Radio Praga, noticias.
La Cámara Baja aprobó en segunda lectura en la noche de este miércoles el proyecto de restituciones a las iglesias de los bienes que les fueron confiscados durante el comunismo. El borrador fue aprobado a pesar del veto del Senado y al rechazo de la oposición que abandonó la sala de sesiones durante la votación. A favor del proyecto votaron ciento y dos diputados de los ciento y tres presentes. Para entrar el proyecto en vigor, debe ser aprobado todavía por el presidente de la República. Las Iglesias entienden el plan del Gobierno, por el que tendrán que pagar el impuesto sobre la renta de las propiedades. Así lo explicó este jueves el primer ministro. En la ley de restituciones existía un criticado punto que eximía del pago del impuesto sobre la renta y del impuesto de traspaso de inmuebles en la primera venta de dichos bienes. Finalmente parece que se dejará el privilegio de no tener que abonar el impuesto de traspaso de inmuebles pero sí el impuesto sobre la renta.
Los niños gitanos siguen sufriendo discriminación en el sistema educativo checo según Amnistía Internacional. Este jueves, la organización, que durante años alerta sobre esa cuestión, junto al Centro Europeo para los Derechos de los Gitanos ha organizado un evento frente al Ministerio de Educación bajo el nombre "El Tiempo se Acaba: Abran los Libros a Todos los Niños", para seguir intentando mejorar la situación de estos menores.
A la edad de setenta y cuatro años falleció el animador e ilustrador Vladimir Iranek. Famosas eran en Chequia sus viñetas cómicas en los diarios, pero también sus dibujos de los conejos Bob y Bobek o la serie de animación de los dos chapuzas Pat y Mat, conocida incluso fuera de la República Checa.
La manipulación, el poder y la locura, son los tres temas centrales del festival de cine Mezipatra sobre minorías sexuales, que comienza este jueves en Praga. Según indicó el director de la actividad, cada individuo, independientemente de su orientación sexual, se ve expuesto a veces a la manipulación por parte de alguna institución u otra persona y esto puede provocarle problemas psíquicos. La edición trece de Mezipatra ofrecerá alrededor de un centenar de filmes.
El tenista Radek Stepanek jugará en su primera participación la semifinal del Masters de Londres en dobles, al conseguir la clasificación junto con su pareja, el indio Leander Paes. Este jueves batieron a la dupla española formada por Marcel Granollers y Marc López por siete cinco y seis cuatro, la que es su segunda victoria en la competición y con la que se clasificaban como una de las cuatro parejas más fuertes del torneo.
Para este viernes se esperan cielos nublados y cubiertos, con lluvias esporádicas en las montañas del norte y noreste, y débiles y aisladas en el resto del territorio. Las precipitaciones serán de nieve por encima de los mil metros sobre el nivel del mar. A lo largo del día los cielos se irán despejando. Las temperaturas máximas se situarán entre los seis grados y los diez grados.
Estas han sido las noticias de Radio Praga ofrecidas por Daniel Ordóñez.

Appendix 3: Selection of words for analysis

	Oxytone	Paroxytone	Proparoxytone
Disyllabic	Según Mujer Vender Tendrán Pagar Tener Seguir Serán	Caso Veces Punto Venta Siguen Abran Trece Metros	-
Trisyllabic	Comité Hospital Similar Borrador Mejorar Director Centenar	Durante Pequeñas Disponen Cosecha Gitanos Alerta Famosas	Cárceles Últimas Fábricas Rápida Sábado Cámara Cómicas Máximas
Quadrisyllabic	-	Documento Aceptables Presidenta Resultados Confirmaron Confiscados Comunismo Diputados Criticado Finalmente	-