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Perception of English Lexical Stress by Native Speakers of Spanish

(Bakalářská práce)

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Prohlašuji, že jsem tuto bakalářskou práci vypracovala samostatně a uvedla plný seznam citované a použité literatury

V Olomouci dne 3.9.2020 ……

podpis

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Contents

1. Introduction

The aim of this bachelor's thesis is to examine the abilities of native speakers of Spanish to correctly perceive lexical stress in a non-native language, specifically in English. Stress is a suprasegmental feature, which has various important functions in different languages. It differentiates stressed and unstressed elements from each other, it can give information about the syntactic category of a word, emphasize a particular word in an utterance, or control the rhythm of utterances. Moreover, stress can also have the function of distinguishing meanings of words. This so-called contrastive function of stress is characteristic of Spanish (Čermák 2015). Another feature typical for Spanish is the unpredictability of the position of stress in its words. Due to the contrastiveness and unpredictability of stress in the language, native speakers of Spanish are assumed to encode stress in their memory together with the phonemes that form each word (Dupoux and Peperkamp 2002; Peperkamp, Vendelin, and Dupoux 2010).

This thesis is based on the studies of Dupoux *et al.* (1997), Dupoux, Peperkamp, and Sebastián-Gallés (2001), Dupoux and Peperkamp (2002), and Peperkamp, Vendelin, and Dupoux (2010), who examined the abilities of speakers of different languages to perceive stress by means of various experiments. They specifically dealt with the phenomenon of stress "deafness", which can be described as an inability of native speakers of languages with fixed predictable stress to correctly perceive stress in a new language, which has unpredictable contrastive stress. From the results of their experiments follows that native speakers of Spanish as a language with contrastive and unpredictable stress do not have difficulties, when their task is to distinguish stress patterns of different words in a new language, unlike e.g. native speakers of French, whose language has predictable stress and its function is not contrastive (Dupoux, Peperkamp, and Sebastián-Gallés 2001; Dupoux and Peperkamp 2002; Peperkamp, Vendelin, and Dupoux 2010). Therefore, stress "deafness" does not seem to pose a problem for native speakers of Spanish, which is attributed to their encoding of the position of stress together with the phonological representation of each word (Dupoux and Peperkamp 2002).

In this bachelor's thesis, I would like to verify, by means of an experiment testing the abilities of native speakers of Spanish to perceive lexical stress in English, that native speakers of Spanish truly do not incline to stress "deafness". I also want to

ascertain, whether their abilities to correctly perceive stress in an L2, namely in English, can be influenced by their proficiency in the L2, and whether they would transfer stress patterns from their native language to English.

The theoretical part of this thesis consists of a literature review. In the second chapter, I define the term stress and also describe in detail the characteristics of stress in general, as well as in English and Spanish. The third chapter focuses on factors that have been shown to affect the perception of lexical stress in an L2. The fourth chapter describes the phenomenon of stress "deafness" and summarizes the findings of previous studies that examined the perception of stress and stress "deafness". Finally, in the fifth chapter, there are described hypotheses regarding the perception of stress by native speakers of Spanish, and research questions are formulated.

The methodological part of this thesis contains a description of the experiment that I conducted with a group of native speakers of Spanish, as well as with one native speaker of English for data control reasons. The experiment had two parts. The first part had the form of an online vocabulary size test called LexTALE, by means of which the participants' proficiency in English was tested. The task of the participants in LexTALE was to read a 'string of letters' (LexTALE, "Instructions") and decide, whether what they see is an existing word in English, or not. In the other part, the participants' task was to perform an AXB discrimination task, by means of which their abilities to accurately perceive stress were tested. The subjects had to listen to three items, which had the form of non-words resembling English, as part of each trial, and decide, whether stress in the second item labeled X is placed on the same syllable as in the first item labeled A, or as in the third item labeled B. The results of the conducted experiment were compared with the results of previous experiments in the ninth chapter, and a conclusion was formulated.

2. Word stress

The term "stress" can be used in 'different and ambiguous ways in phonetics and linguistics' (Cruttenden 2001, 24), which is why there can occur various definitions of the term in different sources. It is a suprasegmental feature that can be described as 'a certain type of prominence which, in some languages, is present upon certain syllables' (*A Dictionary of Phonetics and Phonology*, 1st ed., s.v. "stress."). Hayes (1995) and Selkirk (1980) treat stress as a property of one of the syllables forming a prosodic

constituent called the foot, i.e. a sequence that consists of one strong (stressed) syllable and one weak (unstressed) syllable (as cited in Gussenhoven 2004, 14). According to Hayes (1995), the stressed syllable of a foot 'is both unique and obligatory: additional syllables are (also) unstressed, and a monosyllabic foot has, by definition, a stressed syllable' (as cited in Gussenhoven 2004, 14). On the other hand, in Cruttenden (2001), the use of the word "stress" is avoided. Instead, the term "prominence" is used when referring to 'segments or syllables' (24), while the term "sonority" is reserved for 'the carrying power of individual sounds' (24) and "accent" for 'those syllables which stand out above others' (25). Cutler (2005), on the other hand, defines stress in a simple way as the 'accentuation of syllables within words, or of words within sentences.' What the present thesis specifically deals with is the accentuation of syllables within words, i.e. the lexical stress.

In phonetics, stress can be studied with regard to its production as well as its perception. With regard to the perception, it can be defined 'in terms of something a speaker does in one part of an utterance relative to another' (Ladefoged and Johnson 2014, 119). It is likely that our ability to produce stressed syllables is due to the use of more muscular energy than is used for the production of unstressed syllables. Muscles that have the function of expelling air from our lungs tend to be more active during the production of stressed syllables, which leads to a 'higher subglottal pressure' (Roach 2009, 73). Therefore, stressed syllables are produced by 'pushing more air out of the lungs in one syllable relative to others' (Ladefoged and Johnson 2014, 119). It is also possible that when we produce stressed syllables, there is more pressure in other parts of our vocal apparatus, too (Roach 2009, 73), e.g. the laryngeal activity can be increased (Ladefoged and Johnson 2014, 119).

In addition, there are usually more levels or degrees of prominence present in a word than only two and it is necessary to take in consideration also the intermediate levels. Therefore, the distinction between stressed and unstressed syllables is not always sufficient for stress analysis (Roach 2009, 74).

2.1. Stress in English

2.1.1. Phonetic correlates of stress

There exist different sound characteristics, or correlates, regarding stress perception that allow us to recognize that a syllable is stressed. In English, there are four such correlates. One of these characteristics, which is common for all stressed syllables, is prominence. In English, a syllable is recognized as prominent owing to four different factors or correlates involved. The first of these factors is loudness. If there is a sequence of identical syllables, the syllable that is louder than the other syllables will be perceived as stressed (Roach 2009, 74). Another factor that helps us to recognize a stressed syllable is length. Longer syllables tend to be heard as stressed. The third important factor is pitch, which can be defined as 'the perceptual correlate of the frequency of a sound—in speech, of the fundamental frequency of the vocal folds' (*A Dictionary of Phonetics and Phonology*, 1st ed., s.v. "pitch."). When one syllable is said with a different pitch (e.g. with lower pitch) than the rest of the syllables (that have e.g. high pitch), it will make the low-pitched syllable prominent. Certain movement of pitch, like rising or falling, placed on a syllable has even greater effect on the prominence of that syllable. The fourth and last factor responsible for the prominence of a syllable in English is quality. When a syllable contains a vowel, quality of which is different from vowels in other syllables, that particular syllable will become prominent and, consequently, will be perceived as stressed. Syllables can be made prominent by combining the different factors, or by using only one or two of them. What is more, the four factors are not equally powerful; pitch and length have the strongest effect, while the effect of loudness and quality is weaker (Roach 2009, 74). In general, when a syllable is stressed, it is often louder than an unstressed syllable and its vowel is usually longer than vowels in unstressed syllables (Ladefoged and Johnson 2014, 119).

2.1.2. Levels of prominence

Syllables vary with respect to their degree of prominence. Those that are more prominent are called stressed, while the less prominent ones are called unstressed. Ladefoged and Johnson (2014) describe in total four levels of prominence of syllables in English (122).

Syllables that are stressed can be further divided with respect to whether they carry the tonic accent, i.e. carry 'the major pitch changes in a phrase' (Ladefoged and Johnson 2014, 122), or not. Syllables that carry the tonic accent are the most prominent ones due to accompanying 'the final peak in the intonation' (Ladefoged and Johnson 2014, 122). Cruttenden (2001) and Roach (2009) designate the tonic stress by the term primary stress or accent, while secondary stress or accent is used for the lower prominence of syllables that are stressed but do not carry the tonic accent.

In the case of unstressed syllables, no pitch changes happen during their pronunciation (Cruttenden 2001, 224). However, a syllable can become prominent not only because it is stressed, but also because it contains a full vowel. Therefore, unstressed syllables can be further divided according to whether they contain a full vowel or not (whether their vowel is reduced). When a syllable contains a full vowel, it results in a minor prominence of such a syllable because it is longer than an unstressed syllable (Cruttenden 2001, 224; Roach 2009, 75; Ladefoged and Johnson 2014, 122).

2.1.3. Stress placement

Some languages can be categorized as having fixed or predictable stress (primary stress always falls on one particular syllable and rules of stress placement are easily learned by children) and other languages as having free or unpredictable stress (primary stress can fall on different syllables in different words and the position of stress needs to be memorized as part of every individual word). English, on the other hand, 'does not fall fully within either class: it is neither a wholly fixed-stress, nor a wholly free-stress language' (McMahon 2002, 119-120) due to mixing the Germanic and Romance stress systems. First, English inherited Germanic fixed stress system, in which stress is always assigned to the first syllable of the stem. Nevertheless, Romance languages like Latin or French, from which English borrowed a large number of words, later also influenced the language (McMahon 2002, 120).

In English, stress can be assigned only to lexical words and not to the grammatical ones (Giegerich 1992, 190). According to the so-called three-syllable window principle, primary stress in English is placed on one of the last three syllables of a word – on the final syllable, the penultimate syllable, or the antepenultimate syllable (Domahs *et al.* 2014, 3). Moreover, there exist rules, according to which it is possible to predict the stress assignment in some of the English words:

(1) Verbs are stressed on the final syllable if heavy, and if the final syllable is light, the penultimate one is stressed (McMahon 2002, 120; Roach 2009, 78).
(2) Nouns are stressed on the penultimate syllable if heavy, and if the penultimate syllable is light, the antepenultimate one is stressed (Giegerich 1992, 187; McMahon 2002, 120).
(3) Adjectives are stressed on the final syllable if heavy. If the final syllable is light, the penultimate one is stressed, and if the penultimate syllable is also light, the antepenultimate one is stressed (Cruttenden 2001, 225).

On the other hand, Kiparsky (1982, 1985) and Booij and Rubach (1992) assume that 'only the default stress pattern is derived by a stress rule' (as cited in Domahs *et al.* 2014, 7), specifically the so-called "English Stress Rule". According to the rule, as Hayes (1982) describes, there should be built a trochaic foot over the last two syllables in English words, leading to the penultimate stress. Stress placed on any other syllable 'is considered to be lexically specified' (as cited in Domahs *et al.* 2014, 7).

As mentioned above, the first of the possible positions, to which stress in English words can be assigned, is the final syllable. This position is common for verbs as well as for adjectives (e.g. *o'bey* or *se'cure)* but nouns stressed on the final syllable are rather rare. These are usually uncommon loan words (e.g. *ga'zette*, *du'ress*, or *ri'poste*) (Giegerich 1992 183-184).

Words with final stress need to comply with a condition, according to which their final syllable is heavy and not light (Giegerich 1992, 184). It is so because a stressed syllable must be heavy in English (Giegerich 1992; Roach 2009; McMahon 2002), which according to Giegerich (1992) means that such a syllable has a complex rhyme, i.e. a rhyme that contains more than one X-position (182). By X-positions, Giegerich (1992) refers to the positions in different parts of a syllable (onset, rhyme, coda) occupied by different phonemes. While consonant phonemes and lax vowel phonemes can always occupy only one X-position, tense vowel phonemes and diphthongs occupy two X-positions (Giegerich 1992, 139-141). A syllable is stressed, when it meets the criterion that a tense vowel or a diphthong occurs in its rhyme. Therefore, no word with the final stress can end in a syllable, the rhyme of which contains a lax vowel.

There can occur secondary stress on the first syllable of words with final stress, e.g. in *ˌar'cade*, *ˌcham'pagne*, *ˌinter'vene*, or *ˌsuper'sede*. The first syllable of these words, however, also needs to be heavy (Giegerich 1992, 184). Moreover, the secondary stress is more common for nouns with the final stress and heavy first syllable than for such verbs or adjectives (Giegerich 1992, 184-185).

In some dialects of English, as well as in colloquial speech or individual variations, the order of the primary and secondary stress can be changed. Therefore, words with two heavy syllables can have the stress pattern secondary-primary, or primary-secondary, which is why e.g. *ˌar'cade* alternates with *'arˌcade.* Such a stress shift can also happen when these words are said in connected speech, namely when they are followed by another syllable that is strongly stressed. The result of these stress shifts is that many nouns become members of a more common class of nouns, the stress pattern of which is always primary-secondary (Giegerich 1992, 185). Since the final stress is more common for nouns than for verbs, there exist noun-verb pairs in English, whose members differ from each other only in the placement of stress (e.g the noun *'conˌvict* and the verb *con'vict*) (Giegerich 1992, 186).

When a word does not have the final stress, it is assigned either to the penultimate, or the antepenultimate syllable. Words stressed on these syllables are quite common in English (Giegerich 1992, 186), e.g. *'discipline*, *po'tato, 'opportune,* or *de'termine*.

Regarding nouns, the above-mentioned rule of stress assignment in them implies that stress cannot be placed further back in the word than on the antepenultimate syllable. Therefore, in nouns that do not contain enough syllables (e.g. *'apple)*, or in nouns whose penultimate as well as antepenultimate syllable is light (e.g. *A'merica*), the light syllable needs to become heavy, so that it could take the stress (Giegerich 1992, 188). However, there also exist exceptions to the rule. For example, the word *'badminton* is stressed on the first (antepenultimate) syllable, even though it should be stressed on the heavy penultimate syllable. The word *va'nilla*, on the other hand, has stress placed on the penultimate syllable, even though this syllable is light and the antepenultimate one is heavy (Giegerich 1992, 188-189).

2.1.3.1. Morphology

Morphological structure has also an influence on the placement of stress in English words. While prefixes are stress-neutral, some suffixes can cause a change of

the stress pattern of a word (Cruttenden 2001, 226; Giegerich 1992, 190-191). Some can attract stress themselves, while others can cause that the stress shifts to a particular syllable of the stem (to the final syllable or the penultimate syllable) (Cruttenden 2001, 226).

All inflectional suffixes, as well as many derivational suffixes, are stress-neutral. Most derivational suffixes ending in *-y/-ie* belong to this category *(-ary*, *-ery, -ory*, *-cy*, *-acy*, *-ty*, diminutive *-y*, adjectival *-y*, adverbial *-ly*). Other suffixes belonging to this category are: *-ish*, *-ism*, *-ist*, *-ise*, *-ment*, agentive *-er*, and female *-ess.* All of these derivational suffixes, however, need to be added to stems that are free morphemes in order to be stress-neutral (Cruttenden 2001, 226-227).

Derivational suffixes that attract stress are for example *-ade*, *-eer*, *-esque*, *-ette*, and *-ation*. Verbal derivational suffix *-ate* in the case of disyllabic words also belongs to this category (Cruttenden 2001, 227).

Derivational suffixes that cause stress to shift to the penultimate syllable of the stem are namely *-ic*, *-ion*, and *-ity*. However, *--ion* and *-ity* cause the stress shift only in some cases (Cruttenden 2001, 227; Giegerich 1992, 192). The suffix *-ion* does not cause any shift of stress when it is added to free-form disyllabic verbal stems accented on the second syllable (Cruttenden 2001, 227). The suffix *-ity* causes the stress-shift for example in the word *so'lemnity* (*'solemn*), but not in *di'vinity* (*di'vine*) (Giegerich 1992, 192).

Only one derivational suffix causes the stress to shift to the penultimate syllable of the stem, namely the suffix -ate. This suffix causes the stress shift in some words with more than two syllables (Cruttenden 2001, 227).

The last group of stress-shifting derivational suffixes is the one whose members cause stress to shift to the final or penultimate syllable of the root according to the syllable weight, namely *-ative* added to bound forms of verbs, *-ency*, and adjectival *-al* (Cruttenden 2001, 227). If the final syllable of the root contains a short vowel in an open position or a short vowel followed by one consonant, then the stress shifts to the penultimate syllable of the root (e.g *'operate* → *'operative*). On the other hand, when the final syllable of the root contains a long vowel or a short vowel followed by two consonants, the stress shifts to the final syllable of the root (*'represent* → *repre'sentative*) (Cruttenden 2001, 226-227).

2.1.4. Functions of stress

Stress has different functions in English. Firstly, it can be used to create contrast between different words (Ladefoged and Johnson 2014, 120), since primary stress in this language is not fixed to a particular position and, therefore, the change of its position in the same word can result in a change of meaning of the word (as cited in Altmann 2006, 23). Therefore, stress in English can be also described as contrastive. Secondly, it can be used to emphasize a certain word in a sentence. Stress can also serve as an indicator of the syntactic category in the case of some noun-verb oppositions. It can e.g. indicate that *an 'insult* is a noun and *to in'sult* is a verb. Finally, stress can be used to indicate that a two-word phrase is a compound, e.g. to indicate that *a 'pushover* is a compound, while *to 'push 'over* is a verb (Ladefoged and Johnson 2014, 120).

In addition, stress in English has an important role also with regard to the rhythm of utterances, since English, together with e.g. Russian, or Modern Greek, is said to be a stress-timed or isochronic language (Skandera and Burleigh 2005, 87). In such languages, stressed syllables are the ones that control the rhythm of utterances and there is always approximately the same time interval 'between each two stressed syllables and between the last stressed syllable and the end of the utterance' (Cruttenden 2001, 250). By contrast, the items that have a weaker stress are pronounced faster with the aim of fitting them into the time interval available (Skandera and Burleigh 2005, 87). However, Cruttenden (2001) suggests that it is not stress but rather full vowels what predicts English rhythm, and even in a more useful way than stress (251). Because of that, it is possible to form the so-called borrowing rule of English rhythm, which says that syllables with reduced vowel "borrow time" from syllables with full vowel that directly precede them (Cruttenden 2001, 251). Therefore, it is likely that syllables with full vowel are the elements that decide about the rhythm of English.

2.2. Stress in Spanish

2.2.1. Phonetic correlates of stress

While there are four correlates of stress found in English, Spanish recognizes only three of them, namely duration (stressed syllables are longer), higher fundamental frequency (higher pitch), and intensity (higher amplitude in the stressed syllables) (Schwab and Llisteri 2015, 350; Prieto and Roseano 2018, 215). On the other hand, stressed syllables in Spanish are not qualitatively different from the ones that are stressed (Čermák 2015, 164). Therefore, in Spanish, unlike in English, quality is not a correlate of stress. Moreover, according to Čermák (2015), the correlate of stress that listeners perceive as the most prominent one is the variation of fundamental frequency. However, in some regional variations of Spanish, the most prominent feature can be duration (164).

2.2.2. Levels of prominence

There exists only one basic stress, the primary stress, in Spanish words, which has the highest prominence. There can, however, also occur the secondary, less prominent stress, in some Spanish words. The secondary stress is usually placed before the primary stress, but it can occur also after the primary stress in some words. This often happens in the case of clitics, e.g. in words like *cómetelo,* transcribed as ['komete ˌlo], where *lo* is a pronoun connected to the verb and this pronoun receives the secondary stress (Čermák 2015, 164-165).

2.2.3. Stress placement

Since Spanish is a Romance language, the position of stress in Spanish words is related to the position of stress in Latin, and so it is also predominantly assigned to the same syllable as in Latin (Čermák 2015, 166). In general, stress in Spanish is assigned to one of the last three syllables of a word (Čermák 2015, 166; Prieto and Roseano 2018, 214), according to the so-called three-syllable window principle (same as in English). However, there also exist exceptions to this principle, since stress in Spanish can be described as free or unpredictable. More precisely, according to Peperkamp, Vendelin, and Dupoux (2010), stress in Spanish is predictable with as much as 17% of lexical exceptions (424). In such languages, stress can fall on different syllables in different

words and its position needs to be memorized as part of every individual word (McMahon 2002, 120), i.e. stress needs to be kept in the phonological representation (Dupoux and Peperkamp 2002, 4). Therefore, stress can be assigned also to other syllables than to the last three syllables in a word.

Traditionally, Spanish words have been divided into four groups according to the position of stress. Words with stress placed on their last syllable, like *pa'pel*, are called oxytone. Contrarily, words with stress on their penultimate syllable, like *'casa*, are called paroxytone. What is more, the penultimate position of stress is also considered to be the unmarked position. The designation for words with stress placed on the antepenultimate syllable is proparoxytone. Finally, "superproparoxítonas" is the Spanish designation for words with stress placed on the fourth syllable from the end, or on any other position than on the first three syllables from the end (Čermák 2015, 166).

According to Eddington (2000), stress on the penultimate syllable is the norm for words ending in a vowel, while the final stress is regarded regular for words ending in a consonant. On the other hand, antepenultimate stress is always considered irregular (96). Moreover, Núñez Cedeño, Colina, and Bradley (2014) state that 64% of all Spanish words are stressed on the penultimate syllable, 28% on the final syllable, and 8% on the antepenultimate syllable (as cited in Shelton, Gerfen, and Gutiérrez Palma 2019, 230).

The category of a word also influences the assignment of stress (Čermák 2015, 166). In general, lexical words in Spanish tend to be stressed, while grammatical words, like articles, prepositions, and conjunctions, tend to be unstressed (Čermák 2015, 167). Concerning different word classes, there exist 'clear tendencies in stress placement which work differently for the nominal and verbal paradigms' (Prieto and Roseano 2018, 214).

Considering nouns, the position of stress typical for those that are singular and end in a vowel is penultimate (e.g. *cása*). Contrarily, stress placed on the antepenultimate syllable (e.g. *bo.lí.gra.fo*) or final syllable (e.g. *do.mi.nó*) in such nouns is the marked position. On the other hand, the typical position of stress for singular nouns ending in a consonant is the final syllable (e.g. *ca.mión*), while the marked position of stress for such nouns is the penultimate syllable (e.g. *lá.piz*) and the antepenultimate syllable (e.g. *a.ná.li.sis*) (Prieto and Roseano 2018, 214). With regard to Spanish verbs, the assignment of stress depends on the tense of the verb. In

the present tense, stress is placed either on the penultimate syllable (e.g. *ca.mí.no*), or the final syllable (e.g. *ca.mi.náis*). In the case of other tenses, morphology is what influences the position of stress. It can be placed on the syllable that contains the conjugation of a verb or the theme vowel (e.g. *ca.mi.ná.ba*), or on the tense morpheme (e.g. *ca.mi.na.ré*) (Prieto and Roseano 2018, 214).

2.2.3.1. Morphology

Concerning inflectional morphology, the formation of plural can cause stress to shift in some Spanish nouns. The plural of words ending in the consonant *-d, -j, -l, -n, -r, -y,* or *-z* (e.g. *relój*), of words with the final stress ending in *-s* and *-x* (e.g. *anís*), or of some words ending in *-í* and *-ú* (e.g. *esquí*), is formed by the addition of the inflectional morpheme *-es* to the root, except for some Latinisms and recent loan words. Such words normally keep stress on the same position as before the inflection, after the morpheme *-ed* is added to their roots (Torrego 2016, 82). However, if a word that ends in an above-mentioned consonant is stressed on the antepenultimate syllable (e.g. *régimen*), it is necessary to shift the stress to a different syllable, so that the rule of the three-syllable window would not be violated. After the inflection, the stress is moved one or two syllables to the right in the word, which ensures that the position of the stress is kept on one of the last three syllables: *régimen → regímenes, ómicron → omícrones / omicrónes* (Ohannesian 2005, 91-92).

Regarding derivational morphology, prefixes do not influence the assignment of stress in Spanish (same as in English) (Ohannesian 2005, 111). Suffixes, on the other hand, can cause stress to shift to a different syllable than before the derivation.

The first group of the derivational morphemes, which cause stress to shift, is formed by suffixes, the 'prominence [of which] is not lexically marked' (Ohannesian 2005, 113). The suffixes belonging to this group cause the stress to move from the root of the word to the particular suffix. The following examples of such suffixes require the addition of a theme vowel: *-éd+a* (*arboléda*), *-ér+o/-a* (*cajéro*/*-a*), *-ísm+o* (*marxísmo*), *-íst+a* (*socialísta*), *úr+a* (*blancúra*), *búnd+o/-a* (*meditabúndo*/*-a*), *ós+o/-a* (*ceremonióso*/*-a*), *ésc+o/-a* (*trovadorésco*/*-a*). On the other hand, these examples do not require the addition of a theme vowel: *-able* (*mejorable*), *-ción* (*preocupación*), *-sión* (*alusión*), *-dád* (*bondád*), *-ál* (*rosál*), *-í* (ceutí) (Ohannesian 2005, 113).

Another group of Spanish suffixes is formed by derivational morphemes that also remove stress from the domain to which they are attached, but they are lexically

marked. Apart from some exceptions, all of them require the addition of a theme vowel: *-áce+o/-a* (*sebáceo*/*-a*), *-ésim+o*/*-a* (*centésimo*/*-a*), *-ísim+o*/*-a* (*altísimo*/*-a*).

To the last group of derivational suffixes belong those that are pre-accented, i.e cause that stress moves to the syllable that precedes them. Same as in the preceding group, the majority of them requires the theme vowel: *-id+o* (*fétido*), *-ul+o*/*-a* (*crédulo*/*-a*), *-e+o*/*-a* (*férreo*/*-a*), *-im+o*/*-a* (*décimo*/*-a*), *-ic+o*/*-a* (*histórico*). The last of these suffixes is also the most productive one (Ohannesian 2005, 114). Moreover, Ohannesian (2005) adds to this group also Greco-Latin suffixes like *-dromo* (*aeródromo*) or *-logo* (*filólogo*) (114).

In addition, one of the commonly used morphemes that has not been mentioned, yet, is the morpheme *-ménte*, which has the function of creating adverbs from adjectives. It is a special case in terms of stress assignment because adverbs formed by the use of this suffix carry two stresses (Ohannesian 2005, 80). The first stress is located on the same position as in the adjective, and the other one on the first syllable of the suffix: *cláro* → *cláraménte*.

2.2.3.2. Influence of the origin of a word

The assignment of stress also depends on the origin of a word. Spanish words of foreign origin often keep stress on the original position. Even though there are not many Spanish words with stress placed on the antepenultimate syllable, it is a common feature for words of foreign origin. Therefore, many Spanish words of e.g. Latin or Greek origin are proparoxytone (e.g. *cá.li.do*, *pe.lí.cu.la*, *rá.pi.do*). On the other hand, words of e.g. French, Hebrew, or Arabic origin tend to be oxytone (e.g. *bis.tu.rí*, *so.fá, al.ma.cén*) (Čermák 2015, 166).

2.2.3.3. Predictability of stress from orthography

Stress in Spanish can be predicted from the orthography. Some stressed syllables are marked by an acute accent, in Spanish called "tilde" (Čermák 2015, 219), placed above the vowel of the stressed syllable (e.g. *pá.ja.ro*). However, the majority of stressed syllables is not marked by the "tilde", because it can be predicted according to the rule, which says that the stressed syllable in a word is always the penultimate one, except when the word ends in a different consonant than *n* or *s.* When a word ends in *n* or *s*, the stress is final and it is marked by the acute accent (e.g. *ca.jón*) (Gutiérrez-Palma and Palma-Reyes 2008, 649).

2.2.4. Functions of stress

Stress in Spanish has various functions. According to Čermák (2015), the primary function of stress in Spanish is to differentiate the stressed and unstressed elements. Same as in English, stress in Spanish has a contrastive function, so it can be used to distinguish meanings of different words. Another function of stress in Spanish is the distinctive function, which allows us to differentiate units with different meaning within the same paradigm, e.g. the first person singular form of the verb *to sing* is *canto* in the present tense in Spanish, while the third person singular form of the same verb in the past tense is *cantó*. The last function of stress in Spanish is the culminative function, which describes the ability of stress to mark the presence of an accentual unit, even though it does not mark the exact boundaries of that unit (Čermák 2015, 162-163; Navarro and Merín 2012, 261-262).

What is more, stress in Spanish is not stress-timed like in English, so it does not have the function of controlling the rhythm of utterances. The interval of time needed to pronounce stressed as well as unstressed syllables in Spanish is approximately the same, i.e. 'no syllables or words are pronounced faster than others' (Skandera and Burleigh 2005, 88). Spanish is a syllable-timed or isosyllabic language because 'the prominent elements that determine the rhythm […] are syllables' (Skandera and Burleigh 2005, 88), and so no "compression" of syllables happens in the language (Skandera and Burleigh 2005, 88). Moreover, in Spanish, there is a stronger perception of equal prosodic prominence across syllables, when compared with English and other stress-timed languages, because the stressed syllables are not significantly longer than the unstressed ones in syllable-timed languages (Prieto and Roseano 2018, 216).

3. Factors that affect the perception of lexical stress in an L2

3.1. Language background

Except for the fact that different languages use different phonemes, they also differ with respect to their suprasegmental properties. Even though there exist languages, in which suprasegmental features do not have a contrastive function, the majority of them use at least one suprasegmental feature for that purpose. In some languages, duration can be used to distinguish meanings of words (Finnish), while in other languages, it

can be for example pitch accent (Japanese and Norwegian), or tones (Mandarin) (Yu & Andruski 2009, 324). Different studies that had been conducted have shown that the native language of a listener has an influence on their perception of nonnative suprasegmental features.

Lehiste & Fox (1992) studied the perception of prominence by native speakers of Estonian and English. They conducted two experiments with the aim of finding out, whether the listener's linguistic background has an influence on their 'perception of suprasegmental cues in the speech signal' (420). Specifically, they wanted to 'establish the differences (if any) in the relative contribution of the two acoustic dimensions of duration and amplitude in the perception of acoustic signals by listeners with differing language backgrounds' (Lehiste & Fox 1992, 422). Estonian differs from English in the use of duration. While in Estonian, duration has a contrastive function, i.e. is 'significantly employed in signaling phonological oppositions' (Lehiste & Fox 1992, 420), in English, duration is only one of the phonetic characteristics of a stressed syllable and it does not distinguish meanings of words independently (Lehiste & Fox 1992, 421). Therefore, native speakers of Estonian, for whom duration has a contrastive function, were assumed by Lehiste & Fox (1992) to be 'more sensitive to durational differences' (421) than native speakers of English. The participants in the experiments listened to different tokens that resembled monosyllabic words with a CV structure and that differed in their length and amplitude. Moreover, they also listened to noise versions of the tokens (Lehiste & Fox 1992, 422). The task of the participants was to decide, which of the tokens they heard as more prominent (Lehiste & Fox 1992, 421-422).

The first important finding of the study of Lehiste & Fox (1992) was that native speakers of Estonian are more sensitive to durational differences in prominence than native speakers of English since Estonian participants perceived longer tokens as prominent more often than English participants (431-432). Moreover, the results of the experiments have also shown that language background influences the listeners' perception of the tokens resembling words as well as of the tokens in the form of noise. The results suggest that the native language of Estonian listeners influences their perception of prominence in an L2. It seems that 'speech experience has an effect on general auditory perception' (Lehiste & Fox 1992, 432).

Same as Lehiste & Fox, Yu and Andruski also focused on the effect of language background on the perception of suprasegmental properties in their study from the year

2009. However, they focused specifically on the perception of stress patterns in English real words, pseudowords, and hums by native and nonnative speakers of English. They examined the abilities of native speakers of American English and Mandarin Chinese to distinguish different stress patterns. Native speakers of the two languages differ in the use of the cues to identify stressed syllables. While native speakers of English use several of the cues (pitch, duration, loudness, and vowel quality), for native speakers of Chinese, pitch is the primary cue to the tone (rather than stress). Moreover, English speakers were expected to be particularly sensitive to the stimuli with trochaic stress pattern due to the fact that the majority of two-syllable words in their native language are stressed on the first syllable (Yu & Andruski 2009, 326).

The data obtained by the experiments of Yu & Andruski (2009) suggest that 'the difference in acoustic cue is related to language background' (338). While English speakers relied on stress pattern and the type of stimuli, Chinese speakers relied on pitch and only in the case of some stimuli, duration was a secondary cue for the speakers of Chinese. In addition, native speakers of English reacted faster to trochaic stress pattern in the experiments than native speakers of Chinese, which indicates that 'English speakers recognize trochaic stress patterns faster than iambic stress patterns even when lexical or segmental information is not present' (Yu & Andruski 2009, 337). Native speakers of Chinese, on the other hand, were able to identify iambic stress pattern more quickly than the trochaic pattern, which suggests that Chinese speakers are more sensitive to iambic stress pattern (Yu & Andruski 2009, 337). Therefore, the language background of a listener seems to influence their sensitivity to particular cues to stress (and tone) as well as their sensitivity to a particular stress pattern in words.

Considering the perception of lexical stress, Dupoux and his colleagues conducted several experiments as part of their studies from the years 1997, 2001, 2002, 2010 (described in detail as part of the chapter Stress "Deafness"), in which they studied the phenomenon called stress "deafness". The data obtained by all their studies suggest that native speakers of languages with predictable stress have difficulties with discrimination of minimal pairs that differ in the placement of stress, compared to their abilities to discriminate minimal phonemic pairs. In the studies, native speakers of Spanish were expected not to exhibit stress "deafness" due to the fact that stress in their L1 is contrastive (Dupoux, Peperkamp, & Sebastián-Gallés 2001; Dupoux and Peperkamp 2002) and unpredictable, i.e. there is a large amount of lexical exceptions

in the language (Peperkamp, Vendelin, and Dupoux 2010). On the other hand, native speakers of French and Finnish, whose L1 has predictable stress, were expected to exhibit a high degree of stress "deafness" (Dupoux, Peperkamp, & Sebastián-Gallés 2001; Dupoux and Peperkamp 2002; Peperkamp, Vendelin, and Dupoux 2010). The results of experiments conducted as part of the the studies of Dupoux and his colleagues confirmed the above assumptions. Therefore, according to the results, L1 seems to influence the listener's perception of lexical stress in an L2.

Moreover, Peperkamp, Vendelin, and Dupoux (2010) in their study also focused on suprasegmental features that are cues to stress. They were specifically interested in how the use of such cues in different languages could be related to stress "deafness" effect in native speakers of some languages. Peperkamp, Vendelin, and Dupoux (2010) assumed that listeners who do not use stress cues in their native language on the lexical level, i.e. native speakers of languages that 'do not make lexical use of length, tone, or pitch accent' (423), would exhibit stronger stress "deafness" effect than native speakers of languages, in which at least some of the suprasegmental features are cues to stress.

Based on this presumption, native speakers of Standard French, Southeastern French, and Polish, who use no stress cues lexically, were expected to exhibit strong stress "deafness". Polish and Finnish native speakers, who use duration on the lexical level to discriminate vowel length contrasts, were expected to exhibit a weaker stress "deafness". Finally, native speakers of Spanish – a language with contrastive stress – were expected to exhibit no stress "deafness" due to the lexical use of duration, F0, and intensity in their language (Peperkamp, Vendelin, and Dupoux 2010, 423). Peperkamp, Vendelin, and Dupoux (2010) also predicted that native speakers of languages that use certain correlates of stress lexically (Finnish, Hungarian, Spanish) should have a poorer performance in the discrimination of stress contrasts than native speakers of languages who use no such cues lexically (Standard French, Southeastern French, Polish), when one of the lexically-used correlates is missing. They specifically tested it on the durational cue to stress (423). Their assumption, however, was not confirmed, since the performance of all speakers, regardless of their native language, was better when the durational cue was present than when it was absent (Peperkamp, Vendelin, and Dupoux 2010, 427). Therefore, it does not follow from the experiment of Peperkamp, Vendelin, and Dupoux (2010) that the listener's experience with an L1,

in which certain correlates of stress are used lexically, would influence their ability to perceive stress in an L2, which uses only a limited amount of such correlates lexically.

3.2. L2 proficiency

According to Schwab & Llisteri (2015), the perception of lexical stress may be affected, in certain cases, by the listener's level of proficiency in an L2. Their claim can be supported by Schwab *et al.* (2009) who conducted an experiment testing the abilities of native speakers of French with different levels of proficiency in Spanish to identify stressed syllables in Spanish words. The task of the participants was to listen to a Spanish word (e.g. *médico*), and decide, whether the stress pattern of the word is oxytone (*medicó*), paroxytone (*medíco*), or proparoxytone (*médico*) (Schwab *et al.* 2009, 5). Their results have shown that the rate of correct responses by French learners of Spanish was higher than the rate of native speakers of French with no knowledge of Spanish (Schwab *et al.* 2009, 7-8). Therefore, native speakers of French with some knowledge of Spanish seem to be more sensitive to lexical stress in Spanish than those without any knowledge of the language.

Schwab *et al.* (2009) conducted the same experiment also on native speakers of Italian. Their task was to identify the stressed syllable in Spanish words, the same as in the experiment with French speakers. However, in the case of Italian participants, no difference was found between the results of different groups of participants in terms of their proficiency in Spanish. According to Schwab *et al*. (2009), the explanation for such results could be the fact that the task was not difficult for native speakers of Italian, since Italian is a language with free stress, same as Spanish (7).

Schwab & Llisteri (2015) also mention a study by Muñoz García, Panissal, Billières, and Baqué (2009), who also tested native speakers of French of different levels of proficiency in Spanish and their performance in stress identification task, in which the participants listened to Spanish words in isolation as well as in sentences. Advanced learners of Spanish who participated in the experiment were reported to perform better than participants with basic or intermediate level of knowledge of Spanish.

3.3. The type of task performed

The last important factor that has an effect on the perception of stress in an L2 is the type of task that participants in an experiment are asked to perform, as Schwab & Llisteri (2015) mention. For instance, in the experiments of Dupoux *et al.* (1997), which tested the abilities of Spanish and French subjects to identify and ignore stress contrasts by AXB and AX discrimination tasks, French subjects had difficulties in discrimination of stress contrasts, when three stimuli that differed in tone were involved. On the other hand, when they were tested by means of a simpler task, involving only two contrasts that did not differ in tone, the performance of the French subjects was better and they made only few errors (Dupoux *et al.* 1997, 9). Therefore, French subjects were shown not to be 'altogether insensitive to differences in lexical stress, in that, under appropriate circumstances, they can detect the acoustic correlates of accent […]' (Dupoux *et al.* 1997, 9).

Moreover, Schwab & Llisteri (2015) studied the role of different acoustic cues that are necessary for distinguishing stress contrasts in Spanish. Their subjects were native speakers of French, divided into two groups – one including French speakers with advanced knowledge of Spanish and the other one including French speakers with no knowledge of Spanish. In the experiment, the participants performed an AX discrimination task, in which they listened to triplets of words differing in the position of stress. The stress could be paroxytone (e.g. *válido*), proparoxytone (e.g. *valido*), or oxytone (e.g. *validó*). Moreover, the different acoustic cues (intensity, duration, and F0) were manipulated in the experiment, so the values of the acoustic cues of vowels in a paroxytone word were replaced by the values of the vowels of the corresponding oxytone word (P>O). In the same way, vowels of a proparoxytone word received the values of vowels of a paroxytone word (PP>P). This manipulation 'resulted in a shift to the right of the accentual information […]' (Schwab & Llisteri 2015, 303).

The results of their experiment have shown that F0 has an important role in the perception of a stress shift. In addition, French speakers without any knowledge of Spanish were shown to be more sensitive to duration in the case of PP>P manipulated stimuli, while in the case of P>O manipulated stimuli, they were less sensitive to duration than the advanced learners of Spanish. This finding may be explained by the 'expectations that the participants with no knowledge might have from the French accentuation' (Schwab & Llisteri 2015, 313). Therefore, it seems that 'the perception

of an accentual difference depends on the acoustic parameters used in the realization of the stress shift' (Schwab & Llisteri 2015, 314), but also on the listeners' proficiency in the L2.

Same as the studies of Llisteri and his collegues (2009, 2015), the present thesis tries to find out, whether a listener's proficiency in an L2 has an influence on their perception of lexical stress in the L2. Concretely, Spanish learners of English with varied level of proficiency in English are tested by means of an AXB discrimination task, with the aim of finding out, whether their level of proficiency in English has an influence on their perception of lexical stress in the same language. Moreover, the results of the experiment could also serve as evidence confirming or disproving the findings of previous experiments, in which native speakers of Spanish were shown to exhibit no stress "deafness".

4. Stress "deafness"

Deafness can be defined as 'the effect of listeners having difficulties in discriminating non-words that form a minimal pair in terms of certain non-native phonological contrasts, be it segmental or suprasegmental' (Dupoux and Peperkamp 2002, 2). Both segmental and suprasegmental deafness are said to arise early during language development, specifically during infancy (Dupoux and Peperkamp 2002, 2). Stress "deafness", which is the focus of this thesis, manifests itself as poor ability of a listener to discriminate 'minimal stress pairs' (Altmann 2006, 27). Peperkamp and Dupoux, who studied the perception of stress in various languages, suggest in their study from the year 2002 that the more predictable the stress in a language is, the less able the speakers of that language are to discriminate minimal pairs which differ in placement of stress, compared to their abilities to discriminate minimal phonemic pairs (Altmann 2006, 27).

4.1. Stress parameter

The emergence of stress "deafness". is related to setting of the so-called Stress Parameter, by which Peperkamp and Dupoux refer to the 'binary option' (2002, 4) of contrastive or non-contrastive stress in a language. Children need to set the Stress Parameter while acquiring L1, during their first two years of life (Dupoux and Peperkamp 2002, 4). To set the Stress Parameter correctly, children need to find out,

whether there is some regularity in stress placement or not. In the case of languages with contrastive stress, children will not be able to notice any regularity. Consequently, stress will be kept in their phonological representation (Dupoux and Peperkamp 2002, 4). For languages with non-contrastive stress, there are two options of Stress Parameter setting. If children deduce that stress is regular in their language before the Stress Parameter is set, they will not keep stress in the phonological representation. On the contrary, when they are unable to observe any regularity, it will be kept in their phonological representation, same as in the case of contrastive stress (Peperkamp and Dupoux 2002, 4). Peperkamp and Dupoux suggest that when infants try to deduce, whether there is some regularity or not, they 'rely on cues concerning the distribution of stresses at utterance boundaries' (2002, 4) because the regularity of lexical stress is always noticeable at the beginning or at the end of an utterance (Dupoux and Peperkamp 2002, 4). If infants deduce, before the Stress Parameter is set, that stress in their language does not need to be encoded in the phonological representation, it leads to stress "deafness", which will be present also in their adult life (Dupoux and Peperkamp 2002, 4).

4.2. Typology of languages according to the function of stress

Peperkamp and Dupoux created a typology of different languages, in Altmann (2006) designated by the term "Stress Deafness" Model. It is based on the hypothesis that infants set the Stress Parameter based on their observations of stress patterns on the edges of utterances (Peperkamp and Dupoux 2002, 5). The typology classifies languages hierarchically according to how regular or predictable the stress is at utterance boundaries in those languages (Altmann 2006, 27-28). This typology implies that the predictability of stress should 'affect native speakers' general ability to perceive stress' (Altmann 2006, 28). "Stress Deafness" Model divides languages that follow a certain phonological stress rule into four classes that correspond to 'four types of information that are needed to correctly set the Stress Parameter' (Dupoux and Peperkamp 2002, 6). Native speakers of languages belonging to Class I need only 'universal phonetic representation' (Dupoux and Peperkamp 2002, 6) to acquire the stress rule. Speakers of languages belonging to Class II can acquire the rule 'once language-specific phonological information has been extracted' (6). For speakers of Class III and IV languages, the rule 'can be acquired only after all function words and

all content words, respectively, can be segmented out of the speech stream' (6). Languages, in which there are no stress patterns observable on the edges of utterance boundaries, i.e. their stress is unpredictable, do not follow any phonological stress rule and they belong to the last class termed "Contrastive stress".

In Dupoux's and Peperkamp's typology, languages with stress that is always regular at utterance boundaries, like Finnish or French, belong to Class I (Altmann 2006, 28). Listeners of languages belonging to this class 'yield a higher degree of "stress deafness" than [speakers of languages belonging to Class II, III and IV of the typology]' (Altmann 2006, 28-29). In French, for example, all utterances have stress on their final vowel (Dupoux and Peperkamp 2002, 7). Stress in this language is completely predictable and, therefore, it belongs to Class 1. Polish, on the other hand, is a language where the rules for primary stress placement in utterances are more complex. Native speakers of Polish put stress on the final syllable when there is a monosyllabic word at the end of an utterance, but in all other cases, the penultimate syllable in an utterance is the stressed one (Dupoux and Peperkamp 2002, 9). Polish is a language belonging to Class IV of the typology and its speakers need to be aware of 'content word boundaries' (Altmann 2006, 29) to set the stress rule.

An example of language belonging to Class II is Fijian, where 'word stress falls on the final syllable if it is heavy; otherwise stress is penultimate' (Dupoux and Peperkamp 2002, 8). Moreover, function words at the end of phrases are always stressed. (Dupoux and Peperkamp 2002, 8). The regularity of stress in this language is 'based on syllable weight' (Altmann 2006, 28). Thus, learning the stress rules of Fijian requires the speakers of this language to have 'knowledge about syllable weight' (Altmann 2006, 29).

Hungarian is categorized as Class III language. Stress falls always on the first syllable in an utterance. However, utterances that begin with a function word are an exception, because function words are always unstressed in this language. Therefore, when an utterance has a function word at its beginning, it is stressed on the second syllable (Dupoux and Peperkamp 2002, 9). Speakers of Hungarian need to adopt 'the ability to distinguish between function and content words' (Altmann 2006, 29) to acquire the stress rule.

4.3. Experiments conducted by Dupoux *et al.* (1997)

Four experiments with native speakers of French (language with non-contrastive stress) and Spanish (language with contrastive stress) were conducted as part of study by Dupoux *and colleagues* (1997). Experiments number 1 and 3 tested the abilities of speakers of these two languages to detect stress differences, while experiment number 2 tested their abilities to ignore these differences. These three experiments had the form of AXB discrimination task. By means of experiment number 4, Dupoux *et al.* wanted to find out at which level of processing the differences in performance of Spanish and French speakers may emerge (1997, 2).

Native speakers of French were shown to struggle when 'making discriminations based on stress as indicated by slow reaction times and numerous errors (Experiment 1)' (Dupoux *et al.* 1997, 9). On the other hand, Spanish participants were able to 'readily discriminate among accent patterns' (Dupoux *et al.* 1997, 9) in the same experiment. What is more, speakers of Spanish were able to extract and represent that kind of information automatically, even when their task was to pay attention only to segmental information. However, Spanish subjects performed worse than the French ones when their task was to focus on differences in phonemes only, i.e. they had to ignore stress differences, as the results of Experiment 2 have shown (Dupoux *et al*.1997, 9). From Experiment 3 follows that stress is an important aspect of phonological information in Spanish, which cannot be detached from it. On the contrary, speakers of French seem to use stress at a different level, 'e.g., for finding word or phonological phrase boundaries' (Dupoux *et al.* 1997, 9). Nevertheless, even French participants were able to determine differences in lexical stress when appropriate circumstances were created for them (Dupoux *et al.* 1997, 9). This was tested by Experiment 4, which had the form of AX discrimination task and French participants had to focus either on contrast in accent, or on contrast in phoneme in the experiment. Results of this task have shown that French participants were able to discriminate accent contrasts with only few errors (Dupoux *et al*. 1997, 9).

4.4. Experiments based on the "short-term memory sequence repetition task"

Dupoux, Peperkamp, & Sebastián-Gallés (2001) and Dupoux and Peperkamp (2002) conducted several experiments on native speakers of different languages with contrastive and non-contrastive stress, namely French, Spanish, Finnish, Hungarian, and Polish, using a 'more robust paradigm based on a short-term memory sequence repetition task' (2001, 1606), which differed from Dupoux *et al.* (1997)'s method to test different languages in terms of stress deafness that had the form of 'speeded ABX' (2001, 1606). Experiments conducted by Dupoux *et al.* (1997) have shown that 'French participants, as opposed to Spanish participants, have difficulties in distinguishing nonwords that differ only in the location of stress' (Dupoux, Peperkamp, & Sebastián-Gallés 2001, 1606), and that French subjects exhibit stress deafness when their task is to distinguish stress contrasts due to the non-contrastiveness of stress in their language (2001, 1606). Nevertheless, results obtained by Dupoux *et al.* (1997)'s method could not be used to classify individuals according to stress deafness. Therefore, the new method was proposed (Dupoux, Peperkamp, & Sebastián-Gallés 2001, 1606).

Native speakers of the five languages, who were tested by the 'short-term memory sequence repetition task' (Dupoux, Peperkamp, & Sebastián-Gallés 2001, 1606), were asked to remember two CVCV non-words forming a minimal pair, whose members differed either in place of articulation of the second consonant, i.e CVC_1V vs. CVC_2V (first part of each experiment) or in the location of stress, i.e. C′VCV vs. CVC′V (second part of each experiment), and associate every non-word with its corresponding transcription by pressing the key [1] or [2] of a computer keyboard. After that, they listened to sequences of these non-words, while their length was gradually increasing, from 2 to 6 non-words per sequence. The participants' task was the same as before – to associate the non-words with the corresponding key, i.e. type numeral sequences such as 1211 for a 4-non-word sequence.

Twelve native speakers of Spanish and twelve of French were the first subjects to be tested by the new method. Five experiments were conducted with each group of speakers, all of them using the short memory sequence repetition task with some variations in the individual experiments. French subjects were shown to exhibit stress-deafness effect, i.e. 'the difference in performance between the stress and the phoneme

condition' (Dupoux, Peperkamp, & Sebastián-Gallés 2001, 1611), in four out of the five conducted experiments, while Spanish subjects did not exhibit this effect in any of the experiments. Experiment 5, in which subjects of none of the two tested languages exhibited stress deafness, is different from the other four experiments in the way that there is 'no phonetic variability at all' (Dupoux, Peperkamp, & Sebastián-Gallés 2001, 1614). That was achieved by using only one token for every test item. Therefore, 'with no phonetic variability, no stress ''deafness'' emerges in the French participants' (Dupoux, Peperkamp, & Sebastián-Gallés 2001, 1614). What is more, findings of Dupoux, Peperkamp, & Sebastián-Gallés correspond with findings of Dupoux et al. (1997), who created no phonetic variability in their Experiment 4 using an AX discrimination task (2001, 1615). French participants were indeed able to discriminate stress contrasts in the experiment, as mentioned above. Therefore, it was proven that 'the lack of phonetic variability is sufficient to make the stress deafness effect disappear' (Dupoux, Peperkamp, & Sebastián-Gallés 2001, 1615).

Nevertheless, data obtained by this experiment show that the error rate with stress contrast for French subjects is still higher than the error rate for Spanish subjects, as is the case in all other experiments conducted by Dupoux, Peperkamp, & Sebastián-Gallés (2001).

In 2002, Dupoux and Peperkamp extended the study of Dupoux, Peperkamp, & Sebastián-Gallés (2001). In this study, experiments were conducted on three additional languages, namely Finnish, Hungarian, and Polish, using the short-term memory sequence repetition task.

Experiment number 1 was conducted on twelve native speakers of Finnish. As mentioned earlier, their language belongs to Class 1 of Peperkamp and Dupoux's "Stress Deafness" Model, together with French. The stimuli used for this experiment had the form of non-existent but possible words in Finnish, i.e. they were words formed by phonemes existing in the language, which were combined according to the phonotactics of the language (Dupoux and Peperkamp 2002, 11). It was shown by the experiment that Finnish participants make 'significantly more errors with stress contrast than with the phonemic contrast' (Dupoux and Peperkamp 2002, 12). Therefore, Finnish language was proven to 'yield stress deafness' (Dupoux and Peperkamp 2002, 13), which also confirmed the hypothesis that Class I languages, in general, possess this particular quality (2002, 13). Nevertheless, native speakers of

French, who were in previous experiments proven to exhibit stress deafness, too, seem to be affected by this phenomenon to a greater extent than Finnish natives (Dupoux and Peperkamp 2002, 13). This could be related to the fact that vowel length is contrastive in Finnish, but non-contrastive in French, which means that some Finnish participants 'might encode stressed vowels as long vowels, and hence rely on the lexically distinctive property of vowel length to do the task' (Dupoux and Peperkamp 2002, 13).

The second experiment conducted by Dupoux and Peperkamp tested ten native speakers of Hungarian (as a language belonging to Class III of the "Stress Deafness" Model) and ten native speakers of Polish (as a language belonging to Class IV). Even though the stimuli used for this experiment are not the same as the ones in the previous experiment, they have the same form, i.e. the non-words created for this experiment contain phonemes existing in both of the tested languages (Dupoux and Pepekamp 2002, 13). Another difference is that Dupoux and Peperkamp used for this experiment only sequence of the length 2, 4 and 6 words. In order to shorten the experiment, sequences of the length 3 and 5 words were taken out (2002, 15). Results of Experiment 2 have shown that Hungarian subjects exhibit stress deafness due to making 'significantly more errors with the stress contrast than with the phonemic contrast' (Dupoux and Peperkamp 2002, 16). On the other hand, Polish participants in the experiment, who 'did not make significantly more errors with the stress contrast than with the phonemic contrast' (Dupoux and Peperkamp 2002, 16), are not stress deaf.

4.4.1. Cross-linguistic comparison of languages

The aim of Dupoux and Peperkamp's experiments was to compare native speakers of Finnish, Polish, Hungarian, French, and Spanish language with each other in terms of stress deafness. Nevertheless, it was a difficult task because of the fact that the stimuli used in the conducted experiments were not the same. Dupoux and Peperkamp had to take into account vowel length, which is a contrastive feature in some of the tested languages. Therefore, they had to create two sets of stimuli; set 1 contains non-words with longer stressed vowels, while stressed vowels in set 2 are shorter. Speakers of languages, in which vowel length is not a contrastive feature, 'use duration as a stress cue and are thus best tested with set 1' (Dupoux and Peperkamp 2002, 17). On the other hand, for speakers of languages with contrastive vowel length, set 2 is the more

appropriate one, because ‘materials in set 1 might induce them to perceive a lexical vowel length contrast’ (Dupoux and Peperkamp 2002, 17). However, Finnish and Polish participants in the experiment were tested with the non-optimal set – Finnish subjects, as speakers of a language with contrastive vowel length, were tested with set 1, and Polish subjects, as speakers of a language with non-contrastive vowel length, were tested with set 2. That is the reason, why stress deafness ‘might be underestimated in Finnish subjects and overestimated in Polish subjects’ (Dupoux and Peperkamp 2002, 17).

In order to compare the five languages, in spite of the fact that the speakers of these languages were not tested with the same set of stimuli, Dupoux and Peperkamp created a so-called stress “deafness” index. The index for every tested language was counted by subtracting ‘the mean percentage of errors made with the phonemic contrast [from] the mean percentage of errors made with the stress contrast’ (Dupoux and Peperkamp 2002, 17).

language	stress ‘deafness’ index	Class	vowel length	stimuli
French	38.1	I	non-contrastive	set 1
Finnish	24.0	II	contrastive	set 1
Hungarian	23.7	III	contrastive	set 2
Polish	11.6	IV	non-contrastive	set 2
Spanish	- 4.4	control	non-contrastive	set 1

Table 1: Stress ‘deafness’ indexes of five languages belonging to five different classes together with their contrastive or non-contrastive vowel length and the set of stimuli used in experiments conducted by Dupoux, Peperkamp, & Sebastián-Gallés (2001) and Dupoux and Peperkamp (2002)
Source: Dupoux and Peperkamp (2002, 17)

As evident from Table 1, the highest index was measured among French subjects, whose language also belongs to Class I of Dupoux’s and Peperkamp’s typology. This group exhibits ‘the strongest deafness effect’ (Dupoux and Peperkamp, 2002, 17). French speakers are followed by speakers of Finnish, Hungarian, and speakers of Polish, whose language is categorized as Class IV, at last. Polish subjects exhibit ‘the weakest deafness effect’ (Dupoux and Peperkamp 2002, 17). These results show that ‘the gradual nature of the “deafness” effect goes in the direction of [Dupoux’s and Peperkamp’s] language typology’ (2002, 17). It

seems that 'the size of the "deafness" effect correlates with the ease with which the stress regularity can be acquired by infants' (Dupoux and Peperkamp 2002, 18).

4.5. Causes of stress "deafness": the study of Peperkamp, Vendelin, and Dupoux (2010)

In 2010, Peperkamp, Vendelin, and Dupoux conducted an experiment on six different languages, specifically on Standard French, Southeastern French, Finnish, Hungarian, Polish, and Spanish, with the aim of finding out, what exactly causes that stress deafness emerges in speakers of some languages, specifically what factors are responsible for that (2010, 423).

Peperkamp, Vendelin, and Dupoux mention in their study two types of accounts – functional role accounts and lexical statistics accounts – that concern 'language specific effects in the perceptual processing of consonants and vowels' (2010, 422). In functional role accounts, dimensions, namely acoustic or phonetic cues, that have a functional role in the language, are intensified, and dimensions that do not have functional role are reduced. The result of that is 'good perception of the former and poor perception of the latter' (Peperkamp, Vendelin, and Dupoux 2010, 422). Stress in a language is represented by three phonetic cues, namely duration, F0 and intensity, which can signal not only lexical stress, but also 'prosodic constituent boundaries and grammatical functions' (Peperkamp, Vendelin, and Dupoux 2010, 423). These levels, however, are not included in the definition of functional role (Peperkamp, Vendelin, and Dupoux 2010, 423).

There are two factors, within Peperkamp, Vendelin, and Dupoux's (2010) definition of functional role, that may contribute to the emergence of stress deafness. The first factor is related to the domain of stress assignment. Stress is usually 'a word-level property' (Peperkamp, Vendelin, and Dupoux 2010, 423). In Spanish, Finnish, Hungarian, and Polish, there is one main stress possessed by every content word. On the contrary, the stress in French is 'argued to be assigned at the phrase level' (Peperkamp, Vendelin, and Dupoux 2010, 423). This could be the reason, why native speakers of French, as well as speakers of its Southeastern variety, 'can completely ignore stress for the purposes of word recognition' (Peperkamp, Vendelin, and Dupoux 2010, 423), and consequently be affected by stress deafness. On the other hand, Spanish, Finnish, Polish, and Hungarian native speakers with stress assigned on the

lexical level should not exhibit stress deafness (Peperkamp, Vendelin, and Dupoux 2010, 423). The second one of the factors 'concerns the lexical use of one or more phonetic correlates of stress' (Peperkamp, Vendelin, and Dupoux 2010, 423), specifically of duration and F0, which have, apart from being correlates of stress, also other function: duration as the phonetic correlate of contrastive length and F0 as the correlate of tone and pitch accent. Peperkamp, Vendelin, and Dupoux assume that speakers of languages, in which duration, F0, or pitch accent have importance also on the lexical level, should exhibit weaker stress deafness effect than speakers of languages in which none of these stress cues is used lexically (2010, 423).

The lexical statistics accounts assume that 'phonological grammar emerges from generalizations about phonological regularities across the lexicon' (Peperkamp, Vendelin, and Dupoux 2010, 422). Therefore, 'the more regular or predictable a pattern is, the less it needs to be specified in the lexical representation' (Peperkamp, Vendelin, and Dupoux 2010, 422). This implies that when e.g. vowel nasality or stress is fully predictable, 'it does not need to be specified lexically' (Peperkamp, Vendelin, and Dupoux 2010, 422). In other words, these accounts 'focus on the existence of phonological distributional regularities across lexical items, with more regular patterns being encoded less precisely' (Peperkamp, Vendelin, and Dupoux 2010, 423).

Peperkamp, Vendelin, and Dupoux (2010) mention also two factors within lexical statistics accounts, that could be involved in the emergence of stress deafness. The first of them is the variability in the position of stress. Speakers of languages with the least variable position of stress, i.e. those that have this position fixed, are assumed to yield stress deafness (Peperkamp, Vendelin, and Dupoux 2010, 423). The second factor is the presence of lexical exceptions, which is supposed to be responsible for the reduction of stress deafness effect. Therefore, the more lexical exceptions there are present in a language, the less "stress-deaf" speakers of that language should be.

There was conducted one experiment on the above mentioned languages by Peperkamp, Vendelin, and Dupoux (2010), which had, same as experiments conducted by Dupoux, Peperkamp, & Sebastián-Gallés (2001) and Dupoux and Peperkamp (2002), the form of short-term memory sequence repetition task. In this case, however, only a single set of stimuli was used to test all languages. The task has three parts, with the first one focused on phonemic contrast and the second and the third part testing stress contrast. In the two parts of the experiment that tested stress contrast, there was used the same set of stimuli, but different tokens for the different parts. Duration, F0

and intensity are the stress cues in one of them, while duration is omitted as a stress cue in the other one. (Peperkamp, Vendelin, and Dupoux 2010, 425).

Results of the short-term memory sequence repetition task have shown that 'speakers of four languages with predictable stress, namely, Standard French, Southeastern French, Finnish and Hungarian, exhibit strong stress "deafness"' (Peperkamp, Vendelin, and Dupoux 2010, 428). What is more, 'the "deafness" effect is numerically large and does not differ among the languages' (Peperkamp, Vendelin, and Dupoux 2010, 428). Polish speakers, on the other hand, 'exhibit an intermediate pattern' (Peperkamp, Vendelin, and Dupoux 2010, 428). They are less "stress-deaf" than speakers of languages with predictable stress, but the effect in them is still significant, and they are also more "stress-deaf" than Spanish subjects. Therefore, Polish was proven to be an 'intermediate case between French and Spanish' (Peperkamp, Vendelin, and Dupoux 2010, 428).

Based on the results of the conducted experiment, from the four factors described by Peperkamp, Vendelin, and Dupoux (2010), only one seems to contribute to the emergence of stress deafness, namely lexical exceptions. Native speakers of Polish, who have 'small number of lexical exceptions' (Peperkamp, Vendelin, and Dupoux 2010, 428) were shown to 'perform better than speakers of the other languages with predictable stress' (Peperkamp, Vendelin, and Dupoux 2010, 428) in the experiment. Their performance was, however, worse than Spanish native speakers' performance. The presence of lexical exceptions in a language seems to reduce the stress deafness effect. Therefore, speakers of languages with predictable stress and no lexical exceptions, like Hungarian, Finnish, and French, exhibit strong stress deafness, while speakers of languages with unpredictable stress and a large number of lexical exceptions, like Spanish, exhibit no deafness. Languages with predictable stress and small number of lexical exceptions, like Polish, are an intermediate case and they exhibit low stress deafness (Peperkamp, Vendelin, and Dupoux 2010, 428).

5. Research questions

Previous research (Dupoux and Peperkamp 2002; Peperkamp, Vendelin, and Dupoux 2010) has shown that the unpredictability of stress in a language, as well as the presence of a higher number of lexical exceptions in the same language, causes that the stress-deafness effect in the case of native speakers of such language is reduced. In

some languages, stress has a contrastive function. Consequently, the stress in such languages is also completely unpredictable, i.e. there is no regularity in stress observable at the end of utterances. Therefore, native speakers of such languages should exhibit no stress deafness effect. Spanish, which is the subject of research in the present thesis, is a language with contrastive stress and native speakers of this language were also shown to exhibit no stress deafness in experiments which had the form of AX discrimination task, AXB discrimination task, and short-term memory sequence repetition task, conducted by Dupoux *et al.* (1997), Dupoux, Peperkamp, & Sebastián-Gallés (2001), and Peperkamp, Vendelin, and Dupoux (2010).

Same as in the previous experiments, native speakers of Spanish tested as part of the present thesis by an AXB discrimination task, are expected to exhibit no stress deafness. Therefore, the percentage of errors made by native speakers of Spanish in the task is presumed to be low.

Stress in Spanish is assigned, the same as in English, to one of the last three syllables in a word (Čermák 2015; Prieto and Roseano 2018), on the basis of the three-syllable window principle. According to Čermák (2015), the penultimate position of stress is considered the unmarked one. Moreover, there exists a rule of stress placement in Spanish, according to which the regular position of stress for words ending in a vowel is the penultimate syllable, while for words ending in a consonant, the regular position of stress is the final syllable, and the antepenultimate stress is always considered irregular (Eddington, 2000).

The stimuli in the AXB discrimination task conducted as part of the present thesis consist of non-words resembling real words in English, which are always formed by three syllables and end in a vowel. Since the penultimate position of stress in Spanish is unmarked and it is also the regular position of stress for words ending in a vowel, the subjects participating in the experiment are expected to transfer stress patterns from their native language to English and, consequently, make no errors in the case of non-words with stress placed on the penultimate syllable. If they make some errors, it is presumed to be rather in the case of non-words with final or antepenultimate stress.

The research of Schwab *et al.* (2009) and Muñoz García, Panissal, Billières, and Baqué (2009) has shown that the ability to perceive lexical stress in an L2 seems to be affected by the listener's level of proficiency in the L2. Schwab *et al.* (2009), as well as Muñoz García, Panissal, Billières, and Baqué (2009) tested the abilities of

native speakers of French to identify stress in Spanish, by means of a stress identification task. It follows from the results of both studies that the higher the French native speakers' proficiency in Spanish was, the better they performed in the task.

Based on the results of the studies mentioned above, Spanish subjects participating in the AXB discrimination task conducted as part of the present thesis, whose level of proficiency in English is advanced, i.e. who have a larger vocabulary size in the language, are expected to perform better than subjects with a lower level of proficiency in English (with a smaller vocabulary size in English).

This thesis asks the following research questions:

1. Will native speakers of Spanish exhibit no stress "deafness" effect, i.e. will they percentage of incorrect responses in the AXB discrimination task be low?
2. Will native speakers of Spanish make more errors in the AXB discrimination task in the case of non-words with final or antepenultimate stress than in the case of non-words with penultimate stress, based on stress placement patterns transferred from their native language to English?
3. Are the abilities of native speakers of Spanish to perceive lexical stress in English influenced by their proficiency in the L2, specifically by their vocabulary size in English?

6. Methodology

The present thesis is a follow-up study of the diploma thesis of Tlolková (2018). In her thesis, she conducted two experiments, which tested the abilities of native speakers of Czech and Spanish to perceive lexical stress in English. One of the experiments was the AXB discrimination task, which I conducted as part of the present thesis, too. What is more, since this thesis is a follow-up study, the AXB discrimination task conducted by me also contains the same stimuli as Tlolková (2018) created for her experiment.

The task of the participants in the experiment was to listen to three tokens in each trial and decide, whether the stress in the second token labeled X is placed on the same syllable as in the first token A, or as in the third token B.

One of the aims of the present thesis was to find out, whether the ability to correctly identify lexical stress in English can be influenced by the listener's proficiency in the language. Because of that, participants in the experiment had to

perform also an online test called LexTALE, which measures the size of vocabulary knowledge in English and 'has also been shown to give a fair indication of general English proficiency' (LexTALE, "What is LexTALE"). The participants performed this test before starting the AXB discrimination task.

6.1. Participants

The experiment was conducted with 20 native speakers of Spanish who differed in their level of proficiency in English. Their age ranged from 19 to 40 years. Some participants were of Spanish origin and others were from Mexico, Peru, Colombia, and Guatemala. 8 subjects were female and 12 were male. Only one of the participants lived in an English-speaking country for a longer period of time, specifically for two years. All participants were instructed in Spanish. I met with 4 of them in person and they performed the tasks on my computer. The rest was sent the instructions via email and used their own computers for the tasks.

The majority of the participants in the experiment use English to communicate with foreigners and they no longer learn the language, i.e. do not attend any English classes. Only four participants still actively learn the language.

The experiment was conducted also with one native speaker of English due to data control reasons. It was a female participant from England, who was sent the instructions via email and performed the task on her own computer.

6.2. Stimuli

The stimuli in the AXB discrimination task consist of three-syllabic word-forms, which do not exist in English. The words, however, follow 'English phonotactic rules' (Tlolková 2018, 49). Moreover, they 'appear to be monomorphemic, without any prefix or suffix' (Tlolková 2018, 50). Only open syllables were used for the creation of the stimuli, i.e. the syllables that the non-words are comprised of never end in 'a consonant segment' (Tlolková 2018, 50). The following table (Table 2) shows the syllabic patterns of the non-words in the AXB discrimination task, originally used by Altmann (2006) in her experiments. The strings of consonants and vowels combined with these patterns included [ˈkoɪ-də-li], [də-ˈkoɪ-li], [koɪ-də-ˈli], [ˈsi-mə-laɪ], [mə-ˈsi-laɪ], [si-mə-ˈlaɪ], [ˈnɛ-tə-ri], [tə-ˈnɛ-ri], [nɛ-tə-ˈri], [ˈdɛ-tə-maɪ], [tə-ˈdɛ-maɪ], [dɛ-tə-ˈmaɪ].

1st syllable stress	2nd syllable stress	3rd syllable stress
CV-Cə-CV	**Cə- CV-CV**	**CV-Cə-CV**
CVG-Cə-CV	**Cə-CVG-CV**	**CVG-Cə-CV**
CV-Cə-CVG	**Cə-CV-CVG**	**CV-Cə-CVG**
CV-Cə-CVG	**Cə-CV-CVG**	**CV-Cə-CVG**

Table 2: Syllabic patterns of the non-words used as stimuli in the AXB discrimination task conducted as part of this thesis
Source: Tlolková (2018, 49)

In the table, CV is the label for syllables with a lax vowel, while syllables containing a tense vowel are labeled CV and those with a diphthong CVG. Finally, Cə indicates that the syllable contains schwa (Tlolková 2018, 50). As Tlolková (2018) explains, based on Altmann (2006), there does not appear more than one schwa and no more than one diphthong in any of the words. The syllabic patterns containing two diphthongs 'were excluded for their unnaturalness and rather low frequency in English' (Tlolková 2018, 50).

The stimuli in the task are formed by 12 different nonwords, which represent three possible stress patterns; they are stressed either on the first syllable, on the second syllable, or the third syllable. Each nonword is produced by three different talkers, and so the task contains 36 different tokens in total.

The stimuli were recorded at a 'sound attenuated room' (Tlolková 2018, 51) at Audi-visual studio in Zbrojnice by three male native speakers of English, one from Canada and two from England. Two of the native speakers were 24 years old and one of them was 55. While pronouncing the non-words, the native speakers were asked to stress them in the same way as in English, but not to exaggerate the pronunciation (Tlolková 2018, 50-51). Moreover, they pronounced the stimuli 'in isolation as well as in a phrase *Now I say*' (Tlolková 2018, 51).

6.3. Procedure

6.3.1. AXB discrimination task

Participants in the experiment performed the AXB discrimination task each on their own computer using headphones. I met personally with four of them and ensured that they performed the task in a quiet environment. The rest of the participants, who sent

the results to me via email after they had finished the task, were asked to find a quiet place with no distraction to perform the experiment.

The participants' task was to listen to a sequence of three non-words A, X, and B in each trial and decide, whether the stress in X is placed on the same syllable as in A, or as in B. Consequently, they had to click either on A or on B. The Inter-Stimulus Interval between the three non-words was 0.4 s and, after each trial, there was a tone played. The duration of the tone was also 0.4 s. In total, there were 144 test trials in the experiment. In 48 of the trials, the stress of X was placed on the initial syllable, in 48 on the penultimate, and in 48 on the final syllable. In one half of the trials (in 72 of them), the position of stress in X was the same as in A, and in the other 72 trials, X had the same stress pattern as B. After each 36 trials, the participants were asked to take a break before continuing in the experiment. The data obtained by each participant were saved on the computer and analyzed.

6.3.2. Vocabulary size test

In addition to the AXB discrimination task, participants in the experiment had to perform also an online test called LexTALE (Lexical Test for Advanced Learners of English), which measures the size of vocabulary knowledge in English. It is a 'simple and short yes/no vocabulary test' (Lemhöfer and Broersma 2012, 326), which can be finished in 5 minutes and is accessible online. The participants' task in LexTALE is to complete 60 trials. In each of them, they need to read a 'string of letters' (LexTALE, "Instructions") and click on "yes", if they think that they see an existing word in English, and on "no", if they think it is not an existing word in English. In the test, 40 items are words and 20 are nonwords (Lemhöfer and Broersma 2012, 329). Due to the inequality between the number of words and nonwords in the test, the percentage of correct responses was calculated by 'averaging the percentages correct for [the] two item types' (LexTALE, "Scoring"), labeled *% correct*$_{av}$. The following formula, available on the website of LexTALE, is used to count the value:

$$\%\ \text{correct}_{\text{av}} = \frac{(\text{number of words correct}/40 * 100) + (\text{number of nonwords correct}/20 * 100)}{2}$$

7. Analysis

Data obtained in the AXB discrimination task were put into a table, which shows the percentage of correct and incorrect responses of each participant, as well as mean reaction times of each participant in the case of all responses, in the case of those that were correct, and those that were incorrect. Each participant was also matched with their score reached in the vocabulary size test, so that the correlation between incorrect responses and LexTALE scores could be determined. The percentage of incorrect responses of the subjects in the AXB discrimination task was further divided into three groups according to the stressed syllable, in the case of which the errors occurred, so that it were possible to ascertain, whether the analyzed subjects transfer stress from L1 to L2.

8. Results

Overall, 21 subjects participated in the experiment. One of the participants was a native speaker of English, and so the data obtained by her are stated separately. The data obtained by one of the native speakers of Spanish participating in the experiment were a priori excluded from the analysis due to the fact that he is a Czech, Spanish, an Italian trilingual speaker. Data obtained by all subjects are summarized in the following table (see *Table 3*). Data obtained by the excluded trilingual subject are in italics and are not included in the computation of the average.

					Wrong answers		Target syllable in Wrong			Reaction times		
Subject	NS/NNS	Age	Yrs of Eng	LexTale	Num.wrong	% Wrong	syllable 1	syllable 2	syllable 3	rtALL	rt-correct	rt-wrong
S1	NNS	21	6	87.5	61	42.36	22.00	19.00	20.00	1.45	1.26	1.70
S2	NNS	26	5	86.25	20	13.89	7.00	5.00	8.00	1.57	1.31	3.17
S3	NNS	22	13	66.25	57	39.58	18.00	23.00	16.00	1.65	1.42	2.01
S4	NNS	33	15	63.75	55	38.19	19.00	19.00	17.00	3.15	2.37	4.42
S5	NNS	23	3	52.5	45	31.25	15.00	15.00	15.00	3.89	3.68	4.36
S6	NNS	21	4	72.3	60	41.67	19.00	23.00	18.00	5.08	4.32	6.14
S7	NNS	40	30	67.5	48	33.33	18.00	16.00	14.00	1.67	1.49	2.04
S8	NNS	35	2.5	70	61	42.36	16.00	25.00	20.00	0.80	0.71	0.94
S9	NNS	28	2	47.5	34	23.61	10.00	11.00	13.00	1.28	1.11	1.84
S10	NNS	23	5	67.5	63	43.75	20.00	18.00	25.00	1.94	1.86	2.03
S11	NNS	31	25	76.25	57	39.58	21.00	15.00	21.00	2.20	2.56	1.64
S12	NNS	22	7	53.7	28	19.44	13.00	8.00	7.00	2.55	1.03	8.87
S13	NNS	27	8	72.5	48	33.33	13.00	20.00	15.00	0.58	0.57	0.61
S14	NNS	22	3	52.5	53	36.81	17.00	18.00	18.00	2.40	2.16	2.80
S15	NNS	25	15	92.5	14	9.72	2.00	7.00	5.00	2.06	1.75	4.94
S16	NNS	19	14	73.75	67	46.53	26.00	22.00	19.00	3.57	2.83	4.41
S17	NNS	24	10	83.75	10	6.94	2.00	5.00	3.00	2.36	2.22	4.14
S18	NNS	19	2	45.5	64	44.44	24.00	19.00	21.00	0.99	0.96	1.04
S19	NNS	20	15	91.25	11	7.64	5.00	3.00	3.00	1.87	1.44	6.95
S20	*NNS*	*25*	*5*	*92.5*	*56*	*38.89*	*14.00*	*23.00*	*19.00*	*1.54*	*1.44*	*1.70*
Average				**69.62**	**45.05**	**31.29**	**15.11**	**15.32**	**14.63**	**2.16**	**1.84**	**3.37**
S21	NS	25		97.5	13	9.03	1.00	2.00	10.00	0.92	0.83	1.83

Table 3: Subjects participating in the experiment are identified with their LexTALE scores, with the number and percentage of their incorrect responses in the

AXB discrimination task, the distribution of their incorrect responses across three possible stress positions, and their reaction times, and total average is computed

8.1. Results of LexTALE test

The level of proficiency in English of the subjects participating in the experiment was assessed by means of a test measuring the size of vocabulary knowledge in English called LexTALE. The mean score of the group of 19 native speakers of Spanish was 69.62%. The LexTALE score of each participant is reported in the table above (see *Table 3*). The native speaker participating in the experiment reached the score of 97.5% on the test.

The percentage of correct responses that the participants reach in LexTALE can be associated also with e.g. CEF proficiency levels (Common European Framework levels), as can be seen in *Table 4*.

* Prediction based on the results obtained by a group of Dutch native speakers

CEF Level	CEF Description	LexTALE Score*
C1 & C2	Upper & lower advanced/proficient user	80%-100%
B2	Upper intermediate	60%-80%
B1 and lower	Lower intermediate and lower	below 59%

Table 4: Relationship between CEF proficiency levels in English and scores in LexTALE vocabulary size test (adapted from Lemhöfer and Broersma 2012, 341)

From the group of 16 native speakers of Spanish participating in the experiment, who were included in the analysis, 5 subjects reached a higher score than 80% in LexTALE. Therefore, 5 participants can be considered proficient users of English. The percentage of correct responses of 7 subjects was between 60 and 80%, and so their level of proficiency in English should correspond with Upper intermediate. Four participants scored lower than 59% in LexTALE, which is why their level of proficiency in English seems to be rather low.

8.2. Reaction times

The 19 non-native speakers of English, the data of whom were analyzed, lasted 2.16 s on average to respond in the AXB discrimination task. The standard deviation from the mean reaction time of the group is 1.12 s. All subjects took longer to respond in the case of trials that they got wrong. The mean reaction time of incorrect responses

of the group was 3.37 s, while the mean reaction time in the case of correct responses was 1.84 s (see *Table 3*). The same is valid for the native speaker participating in the experiment, who also took longer on trials that she got wrong. She reacted on average under 1 s, when her response was correct (0.83 s), but the mean reaction time of her incorrect responses was 1.83 s. It took her on average 0.92 s to respond (see *Table 3*).

The difference in reaction times between correct and incorrect responses of the group of non-native speakers of English was significant, as shown by a paired-samples t-test (t [18] = -3.2. p = 0.005). Reaction times of three participants (S5. S6. S16) were more than one standard deviation above the mean reaction time, i.e. it took them more than 3.28 s on average to respond. These participants were excluded from further analysis. Therefore, only the data obtained by 16 participants in total were further analyzed.

8.3. Incorrect identification of stress

As can be seen in *Table 5*, the group of 16 participants, whose data are included in the analysis, responded incorrectly to 43.06 trials on average in the AXB discrimination task, which is 29.90%. Therefore, they responded correctly in the case of 70.1% of the trials. The maximum amount of their incorrect responses was 64 (44.44%) and the minimum amount of their incorrect responses was 10 (6.94%). The standard deviation from the mean number of incorrect responses of the group is 20.18, which makes up 14.01% (see *Table 5*).

	Mean	Minimum	Maximum	Std Dev
Num. of incorrect	43.06	10.00	64.00	20.18
% Incorrect	29.90	6.94	44.44	14.01

Table 5: Incorrect identification of stress in AXB discrimination task

As evident from the histogram in *Figure 1*, the data distribution regarding incorrect responses of the group differs from the expected normal. The error rate of the largest number of participants is between 35 and 45% (8 participants) and also between 5 and 10% (3 participants). These values are inconsistent with the expected normal, according to which the error rate of the largest number of participants should be around 30% and the marginal values of incorrect responses should be represented by the smallest number of participants (see *Figure 1*).

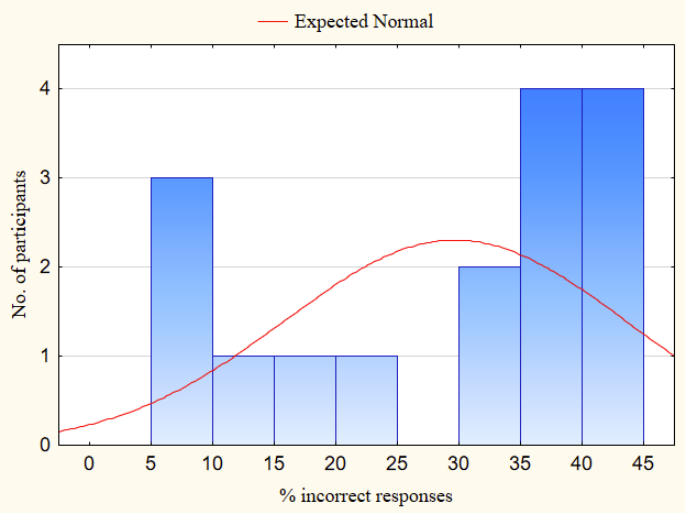

Figure 1: Histogram of the percentage of incorrect responses

Information about the distribution percentages of incorrect responses of the group is represented in the box plot (see *Figure 2*). The median value is 35.08%. Therefore, half of the subjects (8 participants) responded incorrectly to 35.08% of the 144 trials or more, and half responded incorrectly to less than 35.08% of the trials. The position of the median value suggests that the distribution of incorrect responses is negatively skewed, as evident also from the histogram (see *Figure 1*). The values of the lower and upper quartile are 16.67% and 42%. Therefore, one quarter of the subjects (4 participants) responded incorrectly in the case of less than 16.67% of the trials, and one quarter responded incorrectly in the case of more than 42% of the trials. Finally, 50% of the subjects (8 participants) got wrong between 16.67 and 42% of the trials. The minimum percentage of incorrect responses reached in the experiment is 6.94 and the maximum percentage of incorrect responses reached is 44.44, as stated also in the table (see *Table 5*).

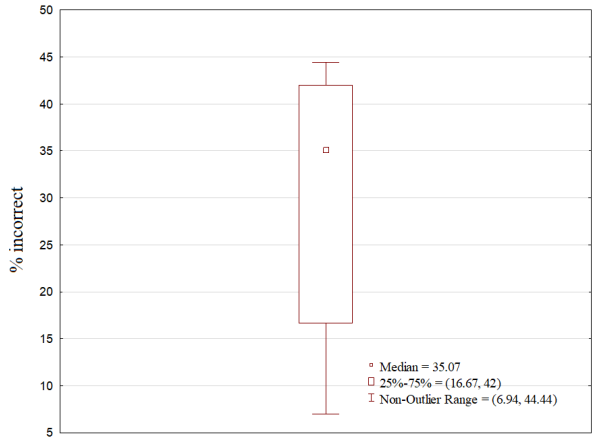

Figure 2: Box plot showing the distribution of incorrect responses

Regarding the distribution of errors across different stressed syllables, the group of 16 participants does not show a tendency to make more errors in the case of a particular syllable. Their errors are distributed evenly across the three possible stress positions. The mean percentage of errors for each syllable is approximately 14 and the standard deviation from the mean percentage of errors is approximately 7 (see *Table 6*).

	Mean	Minimum	Maximum	Std Dev
Incorrect syllable 1	14.19%	2.00%	24.00%	7.09
Incorrect syllable 2	14.69%	3.00%	25.00%	7.19
Incorrect syllable 3	14.19%	3.00%	25.00%	7.01

Table 6: Distribution of incorrect responses regarding different stressed syllables and standard deviation from the mean percentage of incorrect responses

8.4. Correlation between LexTALE results and the correctness of AXB discrimination

In order to examine the relationship between L2 proficiency and the ability of the subjects to discriminate between words with different stress patterns, a scatterplot, which shows the correlation between LexTALE scores reached by the 16 subjects and the percentage of their incorrect responses in the AXB discrimination task, was created (see *Figure 3*). There appears to be a moderate negative correlation between the two variables, since r = −0.5, i.e. the lower the score reached in LexTALE, the higher the percentage of incorrect responses. However, the p-value is greater than the significance level of 0.05, and so it is not possible to conclude that there is an association between the two variables.

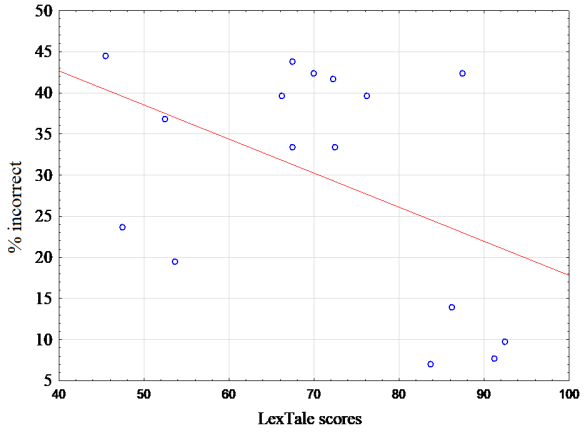

Figure 3: Scatterplot representing the percentage of incorrect responses against LexTALE scores

9. Discussion

It was not proven by the experiment conducted as part of the present thesis that native speakers of Spanish do not exhibit stress "deafness". The mean percentage of incorrect responses of the group of 16 native speakers of Spanish, whose data were further analyzed, in the AXB discrimination task was 29.90. This result can be compared for example with the results of Dupoux *et al.* (1997), who conducted four experiments with native speakers of French and Spanish regarding the perception of lexical stress. Two of the four experiments conducted as part of Dupoux *et al.*'s (1997) study tested the abilities of the subjects to detect stress differences by means of an AXB discrimination task. In both of the experiments, the mean error rate of Spanish subjects was around 4% (Dupoux *et al.* 1997), which is a considerably lower percentage of mistakes than the one reached by the group of native speakers of Spanish in the AXB discrimination task conducted as part of the present thesis.

The higher error rate of the subjects in the AXB discrimination task conducted as part of the present thesis, as well as the abnormal data distribution regarding incorrect responses, can be caused by the fact that the task is demanding on memory and attention since it contains 144 trials, which is more than in the case of e.g. Dupoux *et al'*s (1997) experiments. Moreover, the participants also need to listen to and hold in their working memory three different three-syllable non-words in each trial, which is a more demanding task than in the case of Dupoux *et al*'s experiments (1997). In experiment 1 of Dupoux *et al.* (1997), subjects were presented with three items differing only in the position of stress in each trial. In experiment 2, items in each trial differed in stress placement and only one phoneme. In the AXB discrimination task conducted as part of this thesis, however, subjects were presented with more phonemic variability of the items in each trial than in the case of Dupoux *et al*.'s (1997) experiments, and so the task could be more demanding on memory than the AXB discrimination tasks conducted by Dupoux *et al*. (1997).

In the experiments that used the short-term memory sequence repetition task (Dupoux, Peperkamp, & Sebastián-Gallés 2001; Peperkamp, Vendelin, and Dupoux 2010), the mean error rate of native speakers of Spanish was between 20% and 30% in the experiments conducted by Dupoux, Peperkamp, & Sebastián-Gallés (2001). In two experiments conducted by Peperkamp, Vendelin, and Dupoux (2010), the Spanish native speakers' mean percentage of incorrect responses was 47.1% when duration

was involved as a stress cue and 48.8% when duration was omitted. In the above studies (Dupoux, Peperkamp, & Sebastián-Gallés 2001; Peperkamp, Vendelin, and Dupoux 2010), however, a different method than the AXB discrimination task was used to test the subjects, and so it is not possible to compare their results with the results of the group of native speakers of Spanish, whose data were analyzed in the present thesis. What is more, it is not possible to ascertain, based on the experiment conducted by me, whether native speakers of Spanish exhibit stress "deafness" or not, since only the subjects' abilities to discriminate stress contrasts were tested and not their abilities to discriminate phonemic contrasts. Therefore, it is not possible to measure the extent of their stress "deafness" by counting the so-called stress "deafness" index, for which it would be necessary to subtract 'the mean percentage of errors made with the phonemic contrast [from] the mean percentage of errors made with the stress contrast' (Dupoux and Peperkamp 2002, 17).

The results of the conducted experiment do not show that native speakers of Spanish would transfer stress from their native language to English. The distribution of incorrect responses across the three possible positions of stress in the non-words contained in the AXB discrimination task was even; the subjects' error rate was approximately 14% in the case of each stress position. In other words, the 16 native speakers of Spanish, whose data were analyzed, did not make errors only in non-words with antepenultimate or final stress, but also in non-words with penultimate stress, unlike presumed.

There does not seem to be a correlation between the vocabulary size of the subjects, whose data were analyzed as part of the present thesis, and the correctness of their responses in the AXB discrimination task, i.e. subjects with a larger vocabulary size in English were not shown to perform better in the task than subjects with a smaller vocabulary size in the L2. It does not follow from the results of the conducted experiment that the abilities of native speakers of Spanish to perceive stress in English are influenced by their proficiency in English, contrarily to what follows from previous studies of Schwab *et al.* (2009) and Muñoz García, Panissal, Billières, and Baqué (2009). In the two studies, it was concluded that L2 proficiency influences the perception of stress in an L2 (Schwab *et al* 2009; Muñoz García, Panissal, Billières, and Baqué 2009). Schwab *et al* (2009) and Muñoz García, Panissal, Billières, and Baqué (2009) tested the abilities of native speakers of French to identify stress in Spanish, and from their results follows that the higher the French native speakers'

proficiency in Spanish was, the better they performed in a stress identification task. The reasons for the fact the results of these studies are different to the results of the experiment conducted as part of this thesis could be that in the above studies, a different method than the AXB discrimination task was used to test the subjects, specifically an AX discrimination task. Besides, only native speakers of French were tested in those studies, and not native speakers of Spanish. Moreover, the L2 proficiency of the subjects participating in those two studies was not measured by means of any vocabulary size test.

10. Conclusion

The aim of this bachelor thesis was to examine the abilities of native speakers of Spanish to correctly perceive lexical stress in English, specifically to find out, whether they exhibit signs of the so-called stress "deafness", or not. Another aim of the thesis was to ascertain, whether the abilities of native speakers of Spanish to perceive stress in English could be influenced by their proficiency in the L2.

The theoretical part of this thesis contains a literature review. The literature review contains the definition and a detailed description of the term *stress*, description of factors that affect the perception of stress in an L2, as well as of the phenomenon called stress "deafness", and a summary of the findings of previous studies dealing with the phenomenon.

The methodological part of the thesis consisted in conducting an experiment with a group of 20 native speakers of Spanish and one native speaker of English. The experiment was divided into two parts. The first part had the form of a vocabulary size test called LexTALE, by means of which the proficiency in English of the participants was determined. The task of the participants in LexTALE was to read a 'string of letters' (LexTALE, "Instructions") and decide, whether what they see is an existing word in English, or not. In the second part, participants in the experiment had to perform an AXB discrimination task, which tested their abilities to correctly perceive stress in English. In the AXB discrimination task, the participants had to listen to three items, which had the form of non-words, as part of each trial, and decide, whether stress in the second item labeled X is placed on the same syllable as in the first item labeled A, or as in the third item labeled B. Results of both parts of the experiment

were subsequently analyzed. In the end, only the results of 16 participants were further analyzed.

The results of the conducted experiment do not show that native speakers of Spanish exhibit no stress "deafness", since their percentage of errors in the AXB discrimination task is higher than in the case of previous experiments conducted by Dupoux *et al.* (1997), who tested the perception of stress of native speakers of Spanish using the same method. The higher percentage of errors of the subjects, when compared with previous experiments, could be explained by the fact that the experiment conducted as part of the present thesis was too demanding on memory and attention, and by the form of the stimuli, which was different than in the case of previous experiments. Moreover, it was not possible to measure the extent of the possible stress "deafness" of the subjects, because there was conducted an experiment testing only their abilities to perceive stress contrasts, and not phonemic contrasts.

It does not follow from the results of the conducted experiment that the perception of stress in English of native speakers of Spanish is influenced by their proficiency in the L2, since subjects with a larger vocabulary size in English were not shown to perform better in the AXB discrimination task conducted as part of the present thesis than subjects with a smaller vocabulary size in the language, which contradicts to the results of previous studies of Schwab *et al.* (2009) and Muñoz García, Panissal, Billières, and Baqué (2009) dealing with the same issue. The cause of that could be that Schwab *et al.* (2009) and Muñoz García, Panissal, Billières, and Baqué (2009) used a different method to test the influence of L2 proficiency on the perception of stress, as well as the fact that they tested native speakers of French and not native speakers of Spanish. Moreover, the vocabulary size of the subjects participating in the studies of Schwab *et al.* (2009) and Muñoz García, Panissal, Billières, and Baqué (2009) was not measured by means of any vocabulary size test.

The results also show that participants in the experiment, whose data were analyzed, made approximately the same number of errors in the case of all three possible stress positions in the non-words contained in the trials of the AXB discrimination task, and so it seems that native speakers of Spanish do not transfer stress from their native language to English. Otherwise, they would have a higher percentage of incorrect responses in the task in the case of final and antepenultimate stress position than in the case of the penultimate position of stress in the non-words.

11. Resumé

Tato bakalářská práce se zabývá schopnostmi rodilých mluvčích španělštiny správně vnímat slovní přízvuk či důraz v cizím jazyce, přesněji v angličtině, Fonetický důraz má v jazyce mnoho různých funkcí a mimo jiné může sloužit například k rozlišení významu slov, která se skládají ze stejných fonémů, ale liší se pouze tím, na které slabice je umístěn důraz. Tato kontrastivní funkce slovního přízvuku je typická pro španělštinu (Čermák 2015). Pro slovní přízvuk ve španělštině je charakteristické také to, že jeho pozice není příliš předvídatelná. Z důvodů nepředvídatelnosti slovního přízvuku ve španělštině a jeho kontrastivní funkce se předpokládá, že tito mluvčí si ukládají slovní přízvuk ve své paměti společně s kombinací fonémů, které tvoří každé slovo (Dupoux and Peperkamp 2002; Peperkamp, Vendelin, and Dupoux 2010).

Tato bakalářská práce vychází z následujících studií, které se také zabývaly vnímáním přízvuku: Dupoux *et al.* (1997), Dupoux, Peperkamp, and Sebastián-Gallés (2001), Dupoux and Peperkamp (2002), and Peperkamp, Vendelin, and Dupoux (2010). V těchto studiích se konkrétně zkoumal jev, který se nazývá *stress "deafness"* a projevuje se jako neschopnost rodilých mluvčích jazyků s fixním předvídatelným přízvukem správně vnimat přízvuk v novém jazyce, v němž je jeho funkce kontrastivní a jeho pozice nepředvídatelná. Z výsledků výše zmíněných studií vyplývá, že rodilí mluvčí španělštiny, jakožto jazyka s nepředvídatelným kontrastivním přízvukem, nemají potíže s rozlišením jeho umístění v rozdílných slovech, na rozdíl například od rodilých mluvčích francouzštiny jakožto jazyka s předvídatelným přízvukem, který nemá kontrastivní funkci (Dupoux, Peperkamp, and Sebastián-Gallés 2001; Dupoux and Peperkamp 2002; Peperkamp, Vendelin, and Dupoux 2010). Jev zvaný *stress "deafness"* by tudíž neměl představovat problém pro rodilé mluvčí španělštiny, což je přisuzováno tomu, že slovní přízvuk ukládají ve své paměti společně s fonologickým obrazem slov (Dupoux and Peperkamp 2002).

Cílem této bakalářské práce je pomocí experimentu, v němž se testují schopnosti rodilých mluvčích španělštiny správně vnímat slovní přízvuk v angličtině, ověřit, zda tito mluvčí skutečně nemají sklony k *stress "deafness"*. Dalším cílem je také zjistit, jestli jejich schopnost vnímat slovní přízvuk v angličtině může být ovlivněna jejich znalostí tohoto cizího jazyka a také zda rodilí mluvčí španělštiny budou transferovat slovní přízvuk ze svého rodného jazyka do angličtiny.

Teoretická část této práce má podobu přehledu literatury. Definuje se v ní termín důraz a také se v ní detailně popisují jeho charakteristiky, jak obecně, tak konkrétněji v angličtině a španělštině. Dále se v teoretické části popisují fakroty, které ovlivňují vnímání slovního přízvuku v cizím jazyce, popisuje se v ní jev *stress "deafness"* a jsou v ní shrnuty studie, které se tímto jevem zabývaly. Praktická práce sestávala z provedení experimentu. Jsou v ní definovány hypotézy a výzkumné otázky a také popis pokusů, které byly provedeny. Experiment byl rozdělen do dvou částí. První část měla formu online testu zvaného LexTALE, který je určen k měření velikosti slovní zásoby v cizím jazyce. Pomocí něj byla určena úroveň testovaných subjektů v angličtině. V druhé části byl proveden test, který se nazývá *AXB discrimination task.* Zkoumaly se v něm schopnosti účastníků experimentu správně vnímat slovní přízvuk v angličitně. Experimentu se účastnilo 20 rodilých mluvčích španělštiny a jedna rodilá mluvčí angličtiny, která byla požádána o účast za účelem získání kontrolních dat. Získaná data účastníků experimentu byla následně analyzována.

Výsledky experimentu nepotvrdily, že by rodilí mluvčí španělštiny neměli sklony k *stress "deafness"*, vzhledem k tomu, že jejich procento chyb v *AXB discrimination task* bylo vyšší než v předchozích experimentech, v nichž rodilí mluvčí španělštiny byli otestování stejnou metodou. Z výsledků nevyplývá, že schopnost správně vnímat slovní přízvuk v cizím jazyce může být ovlivněna posluchačovou znalostí tohoto cizího jazyka, protože se neukázalo, že by účastníci experimentu s větší slovní zásobou v angličtině v *AXB discrimination task* chybovali méně než účastníci s menší slovní zásobou v angličtině. Transferování přízvuku rodilých mluvčích španělštiny z jejich rodného jazyka do angličtiny se také nepotvrdilo, neboť dělali stejné množství chyb v případě všech tří možných pozic slovního přízvuku v *AXB discrimination task,* a ne pouze v případech, kdy byl důraz umístěn na poslední či první slabice.

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13. Anotace

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Název bakalářské práce: Perception of English Lexical Stress by Native Speakers of Spanish

Název bakalářské práce česky: Vnímání důrazu v anglických slovech španělskými rodilými mluvčími

Vedoucí práce: Mgr. Šárka Šimáčková, Ph.D.

Počet znaků: 109 721

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Počet titulů použité literatury: 31

Klíčová slova: slovní přízvuk, stress "deafness", vnímání důrazu, lexikální přízvuk v angličtině, lexikální přízvuk ve španělštině

Klíčová slova v angličtině: lexical stress, stress "deafness", perception of stress, lexical stress in English, lexical stress in Spanish

Anotace česky: Tato bakalářská práce se zabývá vnímáním lexikálního přízvuku či důrazu v cizím jazyce, konkrétně se zaměřuje na jev zvaný stress "deafness". Tento jev může být charakterizován jako neschopnost rodilých mluvčích jazyků s fixním přízvukem správně vnímat přízvuk v novém jazyce, který má nepředvídatelný kontrastivní přízvuk. Španělština je jeden z jazyků, v nichž je lexikální přízvuk pouze částečně předvídatelný. Ze studií, které zkoumaly více různých jazyků, vyplývá, že rodilí mluvčí španělštiny vnímají lexikální přízvuk v cizím jazyce správně. V této práci zkoumám, jestli Španělé lexikální přízvuk skutečně vnímají správně, jestli je jejich schopnost vnímat lexikální přízvuk ovlivněna jejich jazykovou úrovní v angličtině a zda transferují lexikální přízvuk ze svého rodného jazyka do angličtiny.

Anotace anglicky: This bachelor's thesis deals with perception of lexical stress in a non-native language, specifically with the phenomenon that has been called stress "deafness". Stress "deafness" can be defined as the inability of native speakers of languages with fixed stress to accurately perceive stress in a new language, which has unpredictable contrastive stress. Spanish is an example of a language with only partially predictable stress and in cross-linguistic perception experiments investigating stress deafness, native speakers of Spanish are reported to perceive stress accurately. In this thesis, I test whether Spanish listeners truly perceive lexical stress accurately,

whether their perception of stress in English is influenced by their proficiency in their second language, and whether they transfer lexical stress from their native language to English.