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Investigating knowledge of English lexical stress: Comparison of Czech, Polish, and Russian EFL learners

(Diplomová práce)

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Prohlašuji, že jsem tuto diplomovou práci vypracovala samostatně a uvedla úplný seznam použité a citované literatury.

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Abstract in English: The main purpose of this thesis is to explore the placement of lexical stress by native speakers of three Slavic languages: Czech, Russian and Polish. The thesis will examine to what extent the learners place stress in English non-words based on English phonology, and to what extent their language background and specificity of stress placement in Czech, Russian and Polish influences their decision in any way. On the following pages I describe the topic of stress in phonology and stress assignment and its peculiarity in the languages in question (English, Czech, Polish and Russian).

The second part is aimed at the experiment conducted to answer the research questions stated in this master thesis. For the experiment a method of regression analysis was used. The nonce-words were divided into three groups: disyllabic, trisyllabic and the words with four syllables, and those made using stress-shifting suffixes. It allowed us to observe various phenomena and effectively address all the research questions

The experiment was conducted with a group of 43 adult EFL learners, with 13 adult native speakers of Czech, 12 native speakers of Polish and 18 native speakers of Russian. Only nonce-words were used as stimuli in the experiment to reduce the probability of participants knowing their pronunciation from previous encounters. While some effects of language transfer were observed, particularly among Polish and Russian speakers, advanced EFL learners demonstrated the ability to acquire and use regularities in stress placement patterns. Notably, the study found no significant effects of stress-shifting suffixes on stress assignment in polysyllabic nonce-words.

Key words in English: lexical stress, language transfer, fixed word stress, free word stress, Czech, Polish, Russian

Abstrakt v češtině: Hlavním cílem této práce je prozkoumat umístění lexikálního přízvuku rodilými mluvčími tří slovanských jazyků: češtiny, ruštiny a polštiny. Práce bude se bude zabývat tématem, do jaké míry studenti umisťují přízvuk v anglických uměle vytvořených slovech na základě anglické fonologie a do jaké míry jejich jazykové pozadí a specifika umístění přízvuku v češtině, ruštině a polštině ovlivňují jejich rozhodnutí. Na následujících stránkách popisuji téma přízvuku ve fonologii, jeho přidělování ve fonologii a jeho zvláštností v daných jazycích (angličtině, češtině, polštině a ruštině). Druhá část je zaměřena na provedený experiment, s cílem odpovědět na výzkumné otázky uvedené v této magisterské práci. K zjištění potřebných výsledků byla v experimentu použita metoda regresní analýzy k identifikaci faktorů, které nejvíce ovlivňují přidělování přízvuku. Jako podněty experiment využíval pouze neexistující slova, aby se snížila pravděpodobnost, že účastníci znají jejich výslovnost z předchozí zkušenosti. Uměle vytvořená slova byla rozdělena do tří skupin: dvouslabičná, tříslabičná a čtyřslabičná slova a ta slova, která byla vytvořena pomocí přípon posouvajících přízvuk. Tímto rozdělením bylo možné pozorovat různé jevy a efektivně řešit všechny výzkumné otázky. Experiment byl proveden se skupinou 43 dospělých studentů angličtiny jako cizího jazyka, z toho 13 dospělých rodilých mluvčí češtiny, 12 rodilých mluvčí polštiny a 18 rodilých mluvčí ruštiny. Zatímco byly pozorovány určité efekty jazykového přenosu, zejména u mluvčích polštiny a ruštiny, pokročilí studenti angličtiny jako cizího jazyka prokázali schopnost získávat a používat pravidelnosti ve vzorech umístění přízvuku. Výsledky výzkumu nezaznamenaly žádné významné efekty přípon posouvajících přízvuk na přidělování přízvuku v mnohoslabičných uměle vytvořených slovech.

Klíčová slova v češtině: slovní přízvuk, jazykový přenos, pevný slovní přízvuk, volný slovní přízvuk, čeština, polština, ruština

Contents

1 Introduction

The main purpose of this thesis is to explore the placement of English lexical stress by native speakers of three Slavic languages: Czech, Russian and Polish. Several cross-linguistic studies of stress placement by Slavic L2 learners of English have been conducted (e.g. Porziczek and Rojczyk 2017, Skarnitzl and Rumlová 2019, Szpyra-Kozłowska and Stasiak 2010, Waniek-Klimczak *et al.* 2015, Crosswhite *et al.* 2003, Hart 1998, Weingartová *et al.* 2014) concerning the possibility of transfer of stress placement patterns from L1 to L2.

The thesis examines to what extent the learners place stress in English non-words based on English phonology, and to what extent their language background and specificity of stress placement in Czech, Russian and Polish influences their decision in any way.

Languages can be broadly divided into two categories – those with the fixed (predictable) stress and those with free (unpredictable, lexically marked) stress. However, some exceptions are possible in the language systems with fixed stress and not all free systems are completely devoid of stress placement rules (Kijak 2009, 14). The English language may give the impression that stress is free and there are no regularities to be observed. William Archer at the beginning of the 20th century noted: "But the larger our list of examples, the more capricious does our accentuation seem, the more evidently subject to mere accidents of fashion. There is scarcely a trace of consistent or rational principle in the matter" (Archer 1974, 193). However, while English does not possess "a uniform metrical behavior", Burzio believes that English lexicon can be divided into two major subsets where stress would follow some pattern (Burzio 1994, 43). Further studies also show that regular stress placement patterns exist in English.

There are multiple theories of English stress. Chomsky and Halle say that English stress is sensitive to syllable weight. Moreover, they state that the grammatical category of a word also makes a difference and that stress placement is sensitive to morpheme boundaries (Chomsky and Halle 1968, 69). Hayes developed the metrical theory of stress based on the analysis of the variety of languages, where sequences of weak and strong syllables are formed into feet which could be maximally binary (Hayes 1982, 238). He also further described the notion of the extrametricality rule, first introduced by Liberman and Prince where the final syllable, which is called extrametrical, would be invisible to the stress rules (Liberman and Prince 1977). Fournier proposed a system of stress rules which are based on morphological and segmental criteria (Fournier 2010).

Using Fournier's system of stress rules, Abasq and colleagues showed for high-frequency vocabulary that assignment of stress in polysyllabic words can be attributed to rules (Abasq *et al*. 2019). We want to find out whether extended foreign language experience of advanced EFL learners leads to knowledge of such rules. Other research into the frequency of lexical word occurrence revealed that words beginning with strong syllables (containing a full vowel) occur on average more often than words beginning with weak syllables (with a reduced vowel). Content or lexical words (nouns, verbs, adjectives and most adverbs) were analysed, and the findings estimate that approximately 85% of such words will begin with strong syllables (Cutler and Carter 1987).

The groups of EFL learners in this thesis were chosen because their L1s differ in placement of stress. This allows us to investigate whether L1 transfer continues to affect advanced learners' lexical stress in English. Czech and Polish, being West-Slavic languages, have weight-insensitive systems, so the position of accent is independent of the phonological make-up of the word. It is also insensitive to morphological structure (Van der Hulst 2011).

Czech and Polish have predictable word stress, where Polish is a language with fixed penultimate stress (notably with several exceptions) and Czech stress is fixed on the first syllable of the stress group and is exceptionless. Russian stress is free and not fixed, it can fall on any syllable in a word and it can also change position with the change of the form of the word. However, some studies on lexical stress in Russian came to a tentative conclusion that stress assignment is influenced by syllabic weight, or, in other words, syllables with more consonants were more likely to be stressed (Mitsiuk and Pelts 2022).

Taking the aforementioned specific features of the lexical stress in different languages into consideration, the aim of the thesis is to find out to what extent learners' language background influences stress placement in English, and whether stress typology can predict the learners' success in mastering English stress placement rules. It might be hypothesised that learners with exceptionless predictable stress in their L1 (Czech) may have more problems than learners in whose L1 predictable stress is subject to exceptions (Polish) who in turn may have more problems compared to learners in whose L1 stress is unpredictable (Russian).

The thesis is organised as follows. The first part of the paper is a literature review. In the second chapter I would outline how stress and its typology was described in a broad sense by various scholars from the phonological point of view. This chapter also deals with the features of metrical systems such as Word headedness, Foot Headedness, Extrametricality, Directionality and Quantity sensitivity. In the fourth chapter I describe stress in English and three Slavic languages in question (Czech, Polish and Russian) in greater detail to identify the differences in their stress systems. Based on the findings I formulate a hypothesis and predictions about the performance of Czech, Russian and Polish and Spanish and how their knowledge of rules of English phonology and the influence of their L1 phonology would allow them to place stress in English nonce-words.

The second part of the thesis describes the experiment I conducted with groups of advanced Czech, Polish and Russian learners of English as L2. The main objective was to see if their knowledge of English stress placement rules is sufficient to place stress in nonce-words. The data were obtained from an experiment based on the stress-placement test in the form of decision tasks. The participants were asked to read the transcriptions of the nonce-words, either made up with syllables with different syllable weight or containing stress-shifting suffixes. Based on the results I drew a conclusion and compared the data to the results of other studies of L2 stress placement.

2 Stress in phonology

Phonetically speaking, stress is a suprasegmental feature of utterances. It can be realised through several phonetic properties, including loudness, vowel length, and pitch. The actual phonetic realisation of stress is language specific. For instance, in English a stressed syllable is pronounced with a greater effort and the speaker uses up more muscular energy in comparison with the effort when pronouncing an unstressed one. These properties increase perceptual salience of syllables and make a syllable more prominent in the speech (Ladefoged and Johnson 2010, Kager 1995, 367). Increased subglottal pressure leads to higher vocal fold vibration rates and greater amplitude of sound waves. Therefore, higher frequency makes an impression not only of higher pitch but also of greater loudness and the listener thus can connect both types of increases to the same cause and perceive a syllable as a stressed one (Lehiste 1970, 106). Additionally, longer vowel duration also contributes to the perception of stress, even when intensity is held constant (Fry 1958, 126).

This thesis, however, focuses on word stress in phonology. It is concerned with the question where in words stress is placed. It considers phonological factors affecting the placement of stress in the three Slavic languages in question (Russian, Czech and Polish) and in English. First, general properties of stress are reviewed, then an outline of major theories of stress is provided, such as a theory of English stress by Chomsky and Halle (Chomsky and Halle 1968), and nonlinear theories: Metrical Theory developed by Libermann (Libermann 1975) and Libermann and Prince (1977) and Autosegmental phonology presented in McCarthy (1979) which show how general properties of stress were formalised.

In Kager (1995, 367), the following five characteristics of lexical stress are given: culminativity, hierarchy, its delimitative function, rhythm and enhancement of stress contrasts segmentally. To say that stress is culminative means that in stress languages at least one stressed syllable should be present in every content word and it typically means that in longer words one syllable has the highest degree of prominence. However, the culminativity may differ in various languages, for example, in English it is present at the word level, at the level of intonational phrase and possible on other levels as well, while in other languages, for instance, it may not be there on the word level (Hayes 1995, 24). Stress is also hierarchical, i.e., it could be categorised into a primary (the strongest emphasis), secondary (which is less strong than primary) and tertiary (even less strong). A prominence hierarchy refers to the idea that vowels in a multisyllabic word are not all stressed equally; instead, some of them receive a stronger prominence than others. In some languages, stress is deliminative; its additional function is also to mark word edges. Fourth, stress is rhythmic in such systems where there is alternation between stressed and stressless syllables, and where clashes (stresses adjacent to each other) are avoided by the means of not putting stress on such adjacent syllables. Lastly, stress contrasts may be strengthened segmentally, for instance by vowel lengthening or doubling of the consonants. In contrast, syllables which are not under stress may be weakened, e.g. by vowel reduction (Kager 1995, 370-374).

Hayes adds another property of stress – a lack of assimilation, meaning that stress does not assimilate. In other words, stress in one syllable does not induce stress in the following syllable or in the preceding syllable (Hayes 1995, 26). This is an exceptionless phonological universal.

2.1 Stress Typology

Cross-linguistically it is common to categorise word stress systems according to a few criteria: predictability, systems being either phonological or morphological and bounded (or unbounded).

The first typological distinction, predictability, concerns fixed stress systems, where the location of stress is predictable and can be derived by a rule and free systems with unpredictable lexical stress which has to be listed in the lexicon. For our work such distinction needs to be accentuated as two of the languages in question (Czech and Polish) have predictable stress (initial and penultimate stress respectively) while the other two (English and Russian) possess free stress. However, as Hayes notes (1995, 31), this distinction is rather a blurry one, as even in the languages with the free stress its position can be limited to a few certain syllables, and in the languages with the phonemic primary stress the location of the secondary one also could be predicted. For instance, while Polish has a predictable penultimate stress, it allows for a number of borrowed words to have stress in the antepenultimate position.

On the other hand, if we consider Russian, according to the Basic Accentuation Principle presented by Kiparsky and Halle (1977) in polymorphemic words where few vowels are accented or words with no accented vowels, the stress would be placed on the first vowel. The accent here means an abstract equivalent of stress or underlying stress (van der Hulst 2014, 5).

More on it will be said in Section 3.4 concerning stress in the Russian language. This leads to the suggestion that even in languages with lexical stress, such as Russian, there may be implicit rules of stress assignment.

Secondly, in some languages stress is governed only by phonological factors, i.e., stress-assignment criteria may include the distance from word edges or syllable weight. With respect to weight, syllables may be divided into two categories – heavy and light ones, where heavy syllables tend to attract stress, while light syllables are stressed only in the case if there are no heavy syllables present. The syllable is considered heavy if it ends with a long vowel or diphthong or if it is closed, whereas light syllables end with a short vowel. In other types of stress systems morphological factors determine where stress should be put, for example, the distinction is made between roots and suffixes – the root of the word bears the main stress and affixes are stressless. However, most of the systems are not purely phonological or morphological, but rather are mixed (Hayes 1995, 32). English is a such mixed system as well: it has a phonological stress system in stems but morphological stress in most cases for productive affixes.

Yet, some affixes can change the placement of stress in the word, example being *`parent/pa`rental, `atom-a`tomic* or even take stress to itself as in *`person – perso`nality*. This has been described by a few scholars (Fudge 1984, Kiparsky 1982, Guierre 1979) and will be elaborated on more in Section 3.1.2.

Russian, together with other East-Slavic languages and Bulgarian, is a language in which weight is "diacritic" (van der Hulst 1999, 2011). This means that the position of stress is specified lexically, and specific syllables in morphemes are "marked" for stress (these marks are also called "accents"). Systems of this kind are usually called lexical accent (or stress) systems. If a word with more than one morpheme has more than one such mark, the first one will receive primary stress. In case no syllable is accented because all morphemes that make up the word are unaccented, the first syllable of the word will be stressed (2011, 452).

Czech and Polish, as all other West-Slavic languages, have weight-insensitive systems, i.e., the position of accent is independent of the phonological make-up of the word, and at the same time it is insensitive to morphological structure (2011, 454).

Finally, there is a distinction between bounded (or alternating) and unbounded systems (or non-alternating). In the former stressed syllables can be put within a limited distance from each other and from the word boundaries, stem stress in English being the example of it, longer words have multiple stresses in an alternating pattern. More about that will be said in the subsequent Section 3.1.

In the latter, there are no constraints on how much interstress distance should there be if the appropriate conditions are met (Kager 1995, 368).

Slavic languages under discussion in this thesis differ in their stress placement. Czech and Polish belong to the group of languages with bounded weight-insensitive accents. However, while in Czech, with the fixed initial stress, the accent is assigned to the left edge of the word, in Polish, with its penultimate accent, the metrical tree starts at the right edge of the word. Russian possesses an unbounded or non-alternating stress system, so stress doesn't necessarily have to be put to the syllables that are near the edge of the word.

2.2 Metrical systems (Word headedness, Foot Headedness, Extrametricality, Directionality, Quantity sensitivity).

From 1968 phonology was based on the assumptions made in the book The Sound Pattern of English (further SPE) by Chomsky and Halle. Chomsky and Halle's generative phonology consists of a linear sequence of rules (Chomsky and Halle 1968). They state that these rules apply in a cycle, "as determined by the surface structure of the string to which they apply" (1968, 60). Their object of study consisted of units of two types: linear sequences of phonemes (segments) and junctures (boundaries). Segments and boundaries (or junctures) were distinguished by the features "segment", which marked boundaries [- segment] and segments [+ segment] (1968, 66). Words were defined as strings of segments, which were delimited by consecutive occurrences of word boundaries (Halle 1997, 542).

Even though SPE remained indisputably the most comprehensible theory of phonology, its claims were challenged by non-linear phonology, which started to gain significant attention after the 70s. Where SPE model organised phonological elements in such a way that that the object of study consisted only of linear sequences of phonemes (segments) and junctures (boundaries), non-linear phonology got its name because segments, as defined in the SPE model, were no longer seen as significant. Instead, utterances were seen as having multiple simultaneous levels, each of which was related to each other but organised independently of the others. Non-linear phonology is focused on phonological structure rather than on the role of phonological rules and their interaction (McCarthy 1982). Within non-linear phonology we can have a closer look at two major theoretical movements, metrical and autosegmental phonology.

The autosegmental approach is concerned with the connection of phonological and phonetic levels and with a prosodic phenomenon of suprasegmentals. The position of suprasegmentals started to be discussed already in the 40s by a number of scholars, among whom were Harris, Bloch, Trager and Smith. Harris (1944) and Bloch (1948) started to reject a strictly linear view of phonological representations proposed by SPE and discussed more complex possibilities of segmentation.

What also led to the consideration of stress being non-segmental, and thus suprasegmental, is Trager and Smith's belief that the very meaning of stress is relational and it can be defined only in the relation to adjacent segments of the utterance (Trager and Smith 1957, 35). It was distinguished from other "normal" properties, such as vowel height or voicing (Goldsmith 1976, 14).

Haugen described non-linearity of suprasegmental features as follows: "Some sounds are thought of as occurring one after another, like bricks in a wall, while others occur simultaneously with these and usually span a number of the individual bricks at a time" (Haugen 1949, 278), so the theory is called autosegmental because it allows different classes of features to occur on different levels (or, as Haugen called them, tiers), with each level unspecified in relation to the features on other levers (McCarthy 1982, 10). Likewise, Kahn (1976) stated in his dissertation that syllables can be separated or defined without the necessity to use boundary markers. Rather than doing that, he also represented syllables as on an autosegmental tier separate from the segmental tier.

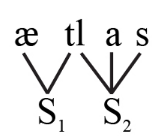

Figure 1: The syllables on an autosegmental tier (Kahn 1976, 36)

Metrical stress theory, first introduced by Libermann (1975) and further developed by Libermann and Prince (1977), McCarthy (1982), Halle and Vergnaud (1987) and Kager (1995) and also started to be discussed in the 70s as a part of non-linear phonology. By analysing the Children's Chant, a ditty for children, which has a fixed melody and a fixed rhythm, Libermann assumed that there exists a hierarchical organisation of strong and weak positions (or nodes), where the first beat is strong as related to the second beat, “while within each “half-measure” the initial position (the “beat”) is strong in relation to any subsequent position” (Libermann 1975, 54). Moreover, he suggests that metrical patterns are trees with nodes “s” (strong) and “w” (weak), they are mostly binary (“sw” or “ws”), and that they are also “oriented”, meaning that the constituents are ordered, and “rooted”, in other words, that any tree will always possess a single constituent at the highest level (1975, 207). He adds that “strong” and “weak” positions are essentially relational, or to put it differently, a strong position is strong only due to the fact it is associated with a corresponding weak position, not because it is its inherent quality of strongness, while a weak position is seen weak because it is such in relation to some strong one (1975, 208). Libermann and Prince add that considering this it should be simply meaningless to have such metrical constituents as “ss” or “ww” or isolated “s” or “w” (Libermann and Prince 1977, 256). The most prominent terminal element of a given constituent, or, in other words, its “main stress”, is called designated terminal element. In the example below that would be the third vowel in the word *Alabama*:

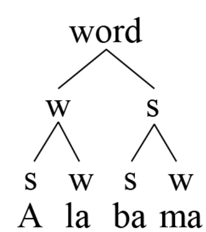

Figure 2: The main stress in a metrical tree (Kager 1995, 368)

This example presents the idea of a metrical tree for a phrase, not a separate word:

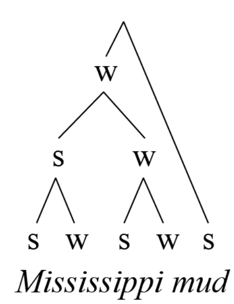

Figure 3: A metrical tree for a phrase (Hayes 1995, 38)

The “metrical tree theory” developed by Libermann and Prince was continued by “metrical grid theory”. Theory of a metrical grid, unlike metrical trees, represented a rhythmic structure in a manner quite similar to that used in music (Libermann 1975, 29). While the metrical tree displays the relative prominence of syllables, rhythmic alternation between strong and weak nodes and clash, when adjacent syllables are stressed, are not represented. Kager provides a following example for a corresponding metrical grid for a metrical tree in Figure 4:

```
      *
 *    *
 * *  *  *
Alabama
```

Figure 4: The example of a metrical grid (Kager 1995, 369)

Here, the higher the column of asterisks above a syllable, the more prominent this syllable is. Therefore, in the second example the third syllable is the most prominent, the initial one is less prominent by one degree, and the second and fourth possess the least prominence.

Another way to provide metrical representation of stress, “bracketed grid”, was offered by Halle and Vergnaud (1987) who suggested viewing it as a string of stressable elements which are analysed into a sequence of constituents. The constituent boundaries are shown by parentheses, while heads are indicated by asterisks in the first line.

```
 *   .   *   .   * .
(*   *)(*   *)(* *)
Apa lachi cola
```

Figure 5: The example of a bracketed grid (Halle and Vergnaud 1987, 233)

Hayes (1995, 31-33) defines four parameters which are used to group languages according to their word-level stress patterns: Foot Dominance, Boundedness, Quantity-sensitivity, Directionality and Iterativity. To paraphrase, languages could be divided into right-dominant vs. left-dominant, bounded vs. unbounded, left-to-right vs. right-to-left and also quantity-sensitive vs. quantity-insensitive ones. We will elaborate on these parameters.

In right-dominant languages nodes on the right are marked strong, while in the left-dominant languages the situation is the opposite and strong nodes are situated on the left. Such left foot dominance is called trochees, right-dominated feet are iambs.

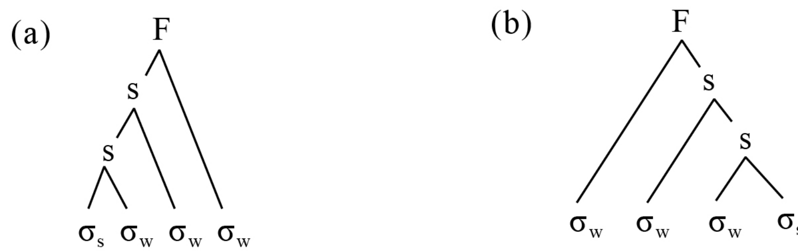

Figure 6: The examples of a trochee and an iamb (Kager 1995, 371)

By the bounded and unbounded systems we mean such systems where stress either appears a fixed distance from the word boundary and the second stress also appears at fixed intervals from other stressed syllables, or the opposite situation when there is no restriction to the distribution of stresses.

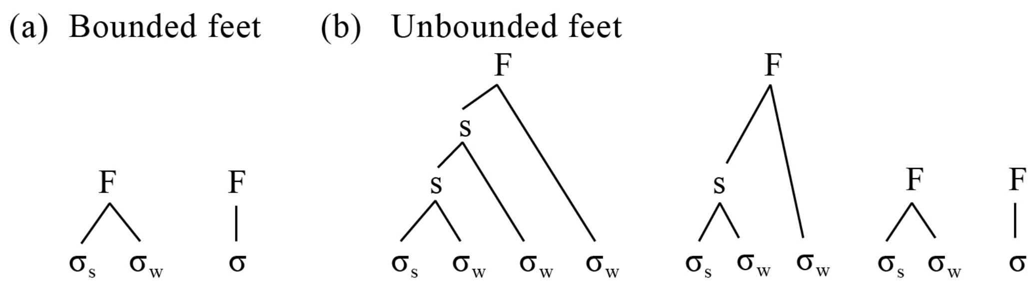

Figure 7: The examples of bounded and unbounded feet (Kager 1995, 371)

Bounded systems in their turn are further subdivided into left-to right vs. right-to left and quantity sensitive vs. insensitive. In left-to-right systems metrical trees are constructed starting from the left edge of the word, and in the right-to-left systems trees start at the right edge of the word.

Syllable weight makes a difference in quantity-sensitive systems, where the “w” (weak) node cannot be dominant in a heavy syllable. An example could be a Latin stress rule, where in Latin words with a heavy penultimate syllable receive penultimate stress, but if a penultimate syllable is light – a word gets stressed on antepenultimate syllable. If the word is too short to obey these laws the word is stressed on the farthest syllable to the left (Hayes 1995, 33). At the same time, in a quantity-insensitive system metrical trees are not influenced by the heaviness of the syllables. All the syllables there are considered light or equally heavy (Kager 1995, 372).

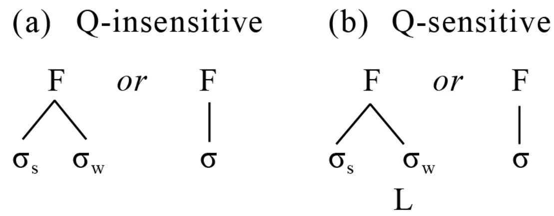

Figure 8: The examples of quantity-sensitive and quantity-insensitive metrical trees (Kager 1995, 372)

2.3 Extrametricality

The phenomenon of extrametricality first mentioned by Libermann and Prince (1977) was later developed by Hayes in his metrical theory (1982). Libermann and Prince noticed certain irregularities in metrical trees in English, and started viewing certain final syllables as extrametrical (or, as they also called them, "underlyingly nonsyllabic") (Libermann and Prince 1977, 295). In other words, stress assignment procedures are "blind" to such extrametrical elements and these extrametrical rimes go unnoticed in foot construction. More on Extrametricality will be said in the subsequent sections describing the languages under investigation.

3 Stress assignment in investigated languages

3.1 English

English is the target language of all the learners involved in the study, that is why we start looking at the stress systems under investigation with English word stress. Moreover, a brief review of studies describing stress placement in English by native speakers will be done, which will show how stress patterns existing in the language are perceived, and, what is more important, can be recognized and reproduced by native speakers, as later in the experiment we will try to investigate how these patterns are grasped by those whose first language is not English.

As it was mentioned earlier in Section 2.2, the book The Sound Pattern of English (further SPE) by Chomsky and Halle (1968) was the first comprehensive analysis on English stress. Chomsky and Halle proposed a complex phonological rule which aims to assign a primary stress in English with minimum of exceptions. The model is based on Classical Latin metrical rules and runs as follows: in case a word's penultimate syllable is heavy, then it receives penultimate main stress, however, if the penultimate syllable is light, then the antepenultimate syllables get main stress (Chomsky and Halle 1968, 78).

Thus, verbs received their main stress on the penultimate vowel if the last vowel in the word was lax and didn't have a complex coda consonant (i.e., was followed by no more than a single consonant). The examples are such verbs as *as`tonish, `promise*. However, if the last vowel in verbs was tense or had a complex coda (more than one consonant) – such vowel was stressed, examples being: *a`tone, col`lapse*.

In case of nouns, the stress pattern was identical, except for the final extra syllable, if it had a lax vowel and was followed by zero or more consonants. In case such syllables are present in the word, it was excluded from the application of the rule and treated as if it was not there at all. Chomsky and Halle provide a few examples: such words as *A`merica, `cinema, `venison* (1968, 71).

However, some assumptions, expressed in SPE has been challenged, for instance, Burzio argues that there are numerous nouns with a final long vowel that nonetheless have penultimate stress (e.g., *protein /ˈprəʊtiːn/, alumni /əˈlʌmnaɪ/*) (Burzio 1994, 49). The opposite is also possible: in some words (Burzio provides *the Adirondack* as an example), the stress is thought to be placed on the final syllable, which, it was presumed, is the unreduced vowel (1994, 80).

SPE claims in general were tried to be either proved or be disputed by a number of scholars. However, the results were various – while some linguists have managed to prove that native speakers of English do have innate knowledge of rules, as described in SPE, some of them reported no effects of English stress rules, and somebody got mixed results.

Thus, to the former group, where linguists have managed to find proof for adhering to SPE rules, belong studies by Ladefoged and Fromkin (1968), Domahs with the colleagues (2014), Moore-Cantwell (2020), Guion with the colleagues (2003), Dabouis and Fournier (2023), Baker and Smith (1976). To the latter group where SPE claims were not proved belong Baptista (1984) and Walch (1972).

The mixed results were mainly caused by the human factor and experiment design, which will be discussed further.

If we look at the positive evidence of application of SPE rules, Ladefoged and Fromkin (1968) in their early experiment asked students of linguistics to transcribe pronunciation of nonce-words and came to the conclusion, that the stress assignment in transcription mainly coincided with those predictions of SPE rules.

Baker and Smith (1976) in their turn investigated the correlation of SPE rules with real English words on the basis of which nonce-words were invented and put into context. Participants in many cases successfully predicted the stress placement in real words, moreover, predictions were made based on the analogy with really existing words even when the stress placement in them contradicted the rules. To be precise, analogical predictions happened more often than rule-based predictions for those cases where stress by analogy presupposed initial stress in nouns or the second syllable stress in verbs. Longer words had a higher chance to get stressed based on phonologically similar words (Baker and Smith 1976).

Guion and her colleagues (2003) also used disyllabic nonce-words in their tasks, with the aim to investigate if it is possible to predict stress placement based on the structure of the syllables which make up the word, its lexical class (noun vs. verb) and the stress placement in phonologically similar words. They anticipated that words of similar structure but which differed in vowel length in one of their syllables should be stressed comparatively more often on the syllable with the long vowel, while words of similar structure but different in number of coda consonants in a final syllable should get stressed more often on the syllable with more coda consonants (2003, 409). The results they came up with largely correlated with the predictions and indicated that primary stress was assigned to nonce-words based on their resemblance to stored lexical items in their memory and general understanding of the distribution patterns of stress placement throughout the lexicon (i.e., lexical class and vowel length) (Guion *et al.* 2003).

In their experiment Domahs with colleagues (2014) went further than Guion (2003) and looked at stress assignment in trisyllabic nonce-words of different syllabic structures. They tried to avoid resemblance to real words as much as possible both in orthography and pronunciation. They claim that in previous research by Guion (2003), Hammond (2004) and Baker and Smith (1976) some associations with existing words were still left or the words could rhyme with existing words, however, in their experiment these issues were eliminated with controlled orthography in order to isolate syllabic weight as a factor. Domahs with colleagues created the words in such a way that all three syllables could potentially carry stress which allowed them to treat syllables equally, however, they still had to mention that there could be the possible effect of extrametricality. All of the words were also presented as nouns. Their results showed that the weight of the final and the penultimate syllable were strong predictors for stress placement, and almost 100% of words with heavy penult syllable were stressed on the penultimate syllable, however, some discrepancy still occurred, which made the authors question if it was due to the improper methods or unreliable reflection of the speaker' intuition (Domahs *et al.* 2014).

Moore-Cantwell (2020) in her experiment used light and heavy penult trisyllabic words (with LLL and LHL structure) as stimuli, both with final [i] and with final [ə]. The main difference from the experiment by Domahs (2014) was that stimuli were presented auditorily, rather than orthographically, as in the former case. The results of the study roughly coincided with the predicted ones: it was shown that participants were choosing penultimate stress when the penult was heavy, and antepenult stress in case it was light. One more observation made by Moore-Cantwell was that the subjects preferred antepenultimate stress when the final syllable contained [i] rather than it had [ə]. The weight of the penult didn't matter here, in both heavy and light conditions words with final [i] had more cases of antepenult stress than those with [ə]. That, as Moore-Cantwell later speculates, leads to the conclusion that participants are aware of the fact that heavy penults are to be stressed (according to the Latin Stress Rule), and they both know the trend for [i]-final words to be mostly stressed on the antepenultimate syllable.

However, as she notices, there is close to no information in the lexicon about how these two phenomena interact with each other. Furthermore, even though the frame sentences were modelled in such a way that stimuli could be understood both as nouns or as verbs, there was no effect on stress placement, as described by the scholar (2020, 687). Comparing the results of her experiment with the one by Domahs (2014) it is also necessary to note that Domahs's experiment was conducted in a lab, while hers took place online, and while in the former study the participants were asked to produce the item, in the Moore-Cantwell's experiment the forced-choice methodology with two alternatives was used, which, she says, may also lead to the discrepancy in the results.

Dabouis and Fournier (2023) in their analysis of the stress patterns of English verbs tested two main generalisations about the assignment of primary stress to verbs, where the first one was put proposed by SPE (the penultimate syllable should be stressed if the final is light, otherwise, the final is stressed) and the second one concerned morphologically complex verbs as they were mentioned in Fudge (1984) and developed by Guierre (1979) and later Fourier (2010). The second generalisation, also called the Germanic Law, claims that prefix(es) should be overlooked and stress should be assigned normally to what remains (Fournier 2007, 224). Daboius and Fournier mainly focused on prefixed verbs, while in our study we will deal with suffixes, however, it still might be useful to note the effect of the affixation on stress placement, therefore the results of Daboius and Fournier's study will be briefly outlined. What differs their study with those described before, is that they didn't come up with the stimuli themselves, but analysed a corpus based on dictionary (Jones 2006) data, leaving out verbs, converted from nouns. The usage of the Germanic Law was seen in all opaque prefixed verbs, while the effect of syllable weight was clearer in non-prefixed verbs, so, the overall conclusion was that the results of the experiment have shown that both generalisations have high efficiencies.

The most recent study conducted by Seiler and his colleagues (2024) also uses several variables which impact stress placement in disyllabic invented nouns and verbs: syllable weight, the grammatical category (a noun vs. a verb) and whether the verb has an obvious prefix or not. Words were presented both visually and auditorily where they were recorded with two possible stress patterns. The results they received showed a high proportion of final stress in both nouns and verbs: 61 and 70% correspondingly. They make a remark that the binary choice, given to the participants, might have biased their decision, so they saw the need to equalise the number of their responses per option (2024, 15). In the experiment in the current thesis it will be possible to make a choice between any syllable in the word (which could be di-, tri- and quadrisyllabic), therefore, we can possibly avoid the bias in the subjects' decisions described by Seiler and his colleagues and look purely at participants intuitive choice of stress placement.

In the second experiment by Seiler and his colleagues, the influence of syllable weight and prefixation (either with productive or unproductive prefixes) on stress was investigated with the use of trisyllabic nonce-words (LLH, LHL, HLL word structure). The results showed that antepenultimate stress was strongly preferred in non-prefixed verbs with more than 60% of overall choice, while final stress was strongly dispreferred. The explanation the authors come up with runs as follow: they suggest that the choice is due to distributional patterns in the lexicon, where long verbs in English would rather be morphologically complex (have prefixes and/or suffixes *(-ify, -ate, -ize*), and it could be theorised that participants see morphologically complex verbs as being based on morphologically simple with word initial stress, thus, in trisyllabic verbs the stress would stay antepenultimate (2024, 26). Overall conclusion concerning the role of syllable weight confirms previous predictions: nouns are influenced by the weight of the ultima (the same result as in Domahs *et al.* 2014) and syllable weight impacts the results in long verbs (more than disyllabic) in all positions, not just the final syllable (as in Domahs *et al.* 2014).

However, as it was mentioned before, some studies couldn't clearly confirm SPE predictions. One of them was conducted by Walch (1972) who presented nonce-words to three native English speakers in orthographic forms to find out how well they are aware of regular English stress patterns. However, the results showed that the participants did not show any evidence of rule application in their productions and even the knowledge of rules did not help them when they were asked to deal with the words they haven't previously come across.

Another experiment with nonce-words conducted with native speakers by Baptista (1984) in the production stage, where they were asked to read the words in the sentences aloud, also showed no evident knowledge of application of English stress rules as described in SPE. However, in a perception task the same participants could recognize if stress placement was done according to rules or not.

However, many scholars admitted the results were biassed because of the design aspects. For instance, Kelly and Bock (1988) report, that disyllabic nouns and verbs were more likely to be stressed initially in the context, where the word preceding them had the last unstressed syllable, and, on the opposite, if the last syllable of the word preceding them was stressed – words under investigation were rather stressed finally, to avoid stress clash. In our experiment in the subsequent section the nonce-words will also be put in the carrier sentences, where some of them would have an unstressed syllable in front of the nonce-word (article "a" or particle "to"), and some would have a stressed "such", which may also affect stress placement.

The second problem concerning experiment design was connected with orthographic issues: presentation of the stimuli might be complicated by the level of literacy of participants and reading effect. So, Baptista (1984, 221) says that the ambiguity of English orthography could lead to the situation, that if some word was pronounced the way it wasn't intended to be pronounced by a researcher, it no longer satisfied the conditions for the rule to be applied. In our experiment all words are transcribed, therefore all alternative reading had to be theoretically eliminated. Moreover, only the participants with the advanced level of English who have taken a course in English phonetics would be chosen for the experiments, which again has to reduce the risk of complications caused by flaws in experiment design. However, some data may still be discarded upon further investigation the same way as it was admitted by many researchers in their experiments.

3.1.1 Phonology

3.1.1.1 Syllable overview

Different theories were proposed regarding the syllable structure and its representation where the number of constituents, the obligatory part of a syllable, boundaries and representation of syllable structure were discussed. As Jones noted it, the syllable is "a peak of prominence" (1972, 55), however, he didn't elaborate further on its boundaries. Likewise, Chomsky and Halle in SPE (1968) didn't develop the topic of syllables, only pointing out features of the segments as all vowels are mentioned as [+ syllabic] and consonants are seen to be [- syllabic].

However, the notion of a syllable was later given more attention by McCarthy (1979), Selkirk (1982), Clements and Keyser (1983), Hogg and McCully (1987) and was discussed in greater detail.

The syllable started to be recognized as a fundamental unit in phonological analysis in all major approaches, starting from the early Prague School to modern generative approaches, including autosegmental and metrical phonology. We will consider some major elements of stress typology to outline the potential effect of syllabic structure on stress placement.

Foot structure commonly determines stress placement, and the words are footed and stressed either in a right-to-left or left-to-right manner where the main stress would either fall on the first or last foot in the word. The nature of the feet can be either sensitive or insensitive to syllable weight (i.e., length of vowel and number of coda consonants). Most languages have feet that are weight-sensitive, English being one of such languages, while Czech, Polish and Russian are insensitive to syllable weight.

3.1.1.2 English Stress Rule, Extrametricality, Long Vowel Stressing and other "exceptions"

As it was mentioned above, the stress system of any language is either weight-sensitive or weight-insensitive. While Slavic languages, which will be discussed later in more details, belong to the latter category, English could be interpreted in two ways: on the basis of quantity-sensitive and quantity-insensitive models, so, we will look at it from the point of view of phonology in this section and morphology in Section 3.1.2.

Hayes claims that English stress exists as both listed in the lexicon and could be derived by rule (1982, 237). The basic stress rule is called the English Stress Rule (can be also named Basic Stress Rule and Main Stress Rule), which makes generalisations about determining the position of the primary stress in words. The number of scholars (Chomsky and Halle 1968, Liberman and Prince 1977, Giegerich 1985, Hayes 1982, Kager 1988) noticed that the English stress system is similar to the Latin Stress Rule and it is sensitive to sensitive weight. The following rule was formulated: "At the right edge of the word, form a binary foot on the rime projection, with the left node dominant" (Hayes 1981, 237). All other stress patterns are considered to be lexically specified. According to Hayes, the stress rules designate stress foot status to the rimes (part of a syllable which contains the vowel and a consonant after it). If the final rime branches (i.e., contains more than one segment), it gets the foot status. However, in case it consists only of one segment – then it is represented as the weak node and thus, its conjoined node (the left one) will be strong. Verbs and adjectives words would receive ultimate stress if they end with at least two consonants or with a syllable having a long vowel. The examples of verbs following this rule would be: *o`bey* (has a diphthong in the last syllable), *tor`ment* (has two consonants at the end), *as`tonish* (has only one consonant in the last syllable, therefore stressed penultimately). However, the stress pattern of nouns is slightly altered. Here, the final syllable receives stress only in case it contains a long vowel, the examples being *mon`soon, caval`cade, ve`to*, while if the final vowel is short – penult is stressed (*a`genda*). More on that will be said later when we will describe extrametricality in nouns (Hayes 1981, 236).

We can see the application of this rule in some borrowings from Russian (*Ni`notchka, ba`bushka*) which were taken into English with penultimate stress while the original Russian stressing (on the first syllable) would sound very strange for native English speakers (Hayes 1981, 236).

However, the final syllable may also get stressed even if its vowel is short – usually, when the final syllable contains consonant cluster or a non-coronal consonant in the rime, but, as Hayes (1982, 239) adds, these are only tendencies but not a regularity.

In case of longer nouns (more than disyllabic) if the final vowel is light (and, therefore, stressless) stress, as it was said, is mainly assigned to a heavy penultimate vowel, but if the penult is also light – stress is put to the antepenult. The examples of such nouns would be: *A`merica, `discipline, `labyrinth*. Hayes claims that this situation is similar to Latin Stress Rule, described earlier, and also that it makes marking word-final rimes as extrametrical justifiable (1982, 228).

Nevertheless, there is the number of exceptions that violate the rule where words with heavy penult (for instance, *`galaxy*) are not stressed on the penult and, on the opposite, the words with the light penult, which, according to the rule, should be stressed on the antepenultimate, have penultimate stress (like *va`nilla*). However, as statistics show, the first part of the rule has very few exceptions where only around 4% of words with heavy penultimate syllables are not stressed there, but the proportions of the words obeying the second clause of the rule almost equals this one which obeys it (Moore-Cantwell 2020, 660).

The notion of extrametricality was first introduced in Liberman and Prince's (1977) article as a way of dealing with the deviant stress patterns of words like *`allegory, `alligator, `Aristotle*. We have already described it briefly in Section 2.3. and here we will look in greater detail how it impacts stress placement in English. One more option describing the same phenomena was developed by Burzio (1994) and Hammond (1999) and is called catalexis. Here, instead of making the last consonant invisible to stress placement rules, the linguists introduce a final null vowel, which turns the final consonant into the onset of a syllable with an empty nucleus, thus, also stressless. Different approaches to treating the last syllable can be represented graphically in the following way for words *adapt, edit*:

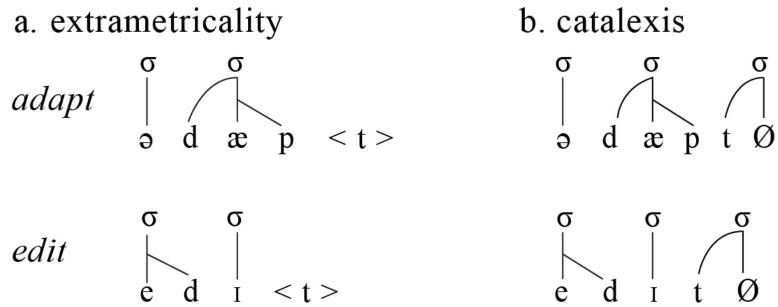

Figure 9: Examples of Extrametricality and Catalexis
(Dabouis and Fournier 2023, 175)

Hayes also proposed constraints on extrametricality in English in their Consistency, Peripherality, Edge Markedness and Nonexhaustivity. By Consistency he meant that only constituents could be marked as extrametrical, such as segments, syllables, affixes, feet or phonological words. Moreover, they could be such only in the case if they appear at the word edge (left or right), while the unmarked edge would be the right one, according to Edge Markedness restriction. He also added that as extrametrical entities can be found only at the edges of the word in the languages with the word stress, such in languages where stress is phrasal could exist at the edge of the phrase (Hayes 1995, 57-58). Nonexhaustivity requirement prevented the situation where in the word would go completely unstressed if degenerate feet were not allowed. If the word has more than two syllables, it would have one or more stress and thus exhaustivity does not apply.

Nonetheless, such an algorithm described above was still not capable of explaining all cases of English stress patterns. For example, there are nouns where the final syllable receives primary stress (*Hallo`ween, vio`lin, lemon`ade*) where this final syllable, according to the rule of extrametricality, should have been excluded from the stress placement mechanism. Such words have to be considered exceptions to the rule. Hayes (1982, 239) offers to treat final syllables containing a long vowel not extrametrical. In his view, they form monosyllabic feet and can receive either primary (as in the example with *Hallo`ween*) or secondary stress (*`misan,thrope*). Such a phenomenon was called Long Vowel Stressing. In case syllables have a short vowel they should adhere to the extrametricality rule and be ignored in the stress placing mechanism.

The notion of extrametricality accounts for the noun/verb pairs with the same spelling, but stressed differently (such as *`abstract/ab`stract*). While the stress in verbs is placed according to the English Stress Rule, in nouns the final VCC rimes are treated as weak syllabled, due to the last consonant being excluded by the extrametricality rule (Hayes 1981, 315). The example of stress placement in such noun/verb pairs can be see below:

(noun)	(verb)	
abstract	abstract	
ab act	ab act	Rime Projection
ab act	ab act	Con.Extrametricality
~~act~~	N.A.	Noun Extrametricality
|	|	Stress Rule
N.A.	| |	Retraction Rule
s w	w s	
\ /	\ /	Word Tree Construction

Figure 10: The derivation of stress placement in the noun *`abstract* and the verb *ab`stract* (Wong 1991, 85)

Another peculiarity, concerning extrametricality in English, is connected with the weight of vowels and consonants: it was proposed that coda consonants in facts have variable weight (Burzio 1994, Giegerich 1999, Halle and Vergnaud 1987, Selkirk 1984). As it was said before, recent proposals suppose that stress placement in English verbs is determined not only by the number of coda consonants which follow the last vowel but also by the nature of these consonants.

Thus, Ross claims that there is a number of consonant clusters where, if final syllables in words contain them, stress has to be marked lexically and we can't predict confidently that stress will be put to the final syllable (*ro`mance*), to the penult (*o`pponent*) or antepenult (*`elephant*). He names the following clusters: *nt, st, ts, ns, rt, rd, rn* which play a decisive role in stress placement (Ross 1972, 247).

Vowel weight is also variable, and certain vowels are claimed to be lighter than it is thought. What seems obvious is that [ə] is viewed as less heavy than full vowels (Burzio 2007) or it is even considered to be non-moraic (Hammond 1999). The diphthong [əʊ] when it is in the final unstressed position is also argued to be underlyingly lax (Chomsky and Halle 1968, Hammond 1999) and, while usually diphthongs make the syllable heavy, this one can be interpreted as being monomoraic.

To sum up the assigning of stress in English, in stress placement mechanism Long Vowel Stressing must be executed before Noun Extrametricality as all long vowels in final syllables are stressed, no matter if they are or they are not in a position which can be viewed as extrametrical. The extrametricality rule, in its turn, operates before the English Stress Rule, to achieve the outcomes discussed earlier.

3.1.1.3 Two approaches: Constituency theory and Moraic theory

A few proposals have been made considering syllable-internal structure and the relation of it to syllable weight. Here, we will talk more about a moraic approach developed by Hyman (1985), McCarthy and Prince (1986), Hayes (1989) and constituency theory described by McCarthy (1979) and Levin (1985).

(1) Constituency theory

Theory of syllabic constituency says that a syllable possesses a particular internal constituent structure, that is: either branching or non-branching rhyme (nucleus).

A heavy syllable is a such which has either a long vowel or a diphthong (abbreviated as CVV) or a closed syllable with one or more consonants at the end of it (CVC), and it would have a branching rime (or nucleus). While some CVC syllables can be considered light in some languages, in English it is a heavy syllable, therefore, it tends to attract stress under certain circumstances. A syllable with a non-branching rime (having a short vowel as the nucleus and no coda) is considered light and abbreviated as CV syllable. Thus, the weight would differ between branching and non-branching rimes (Levin 1985, McCarthy 1979).

The examples of such syllables can be seen in Figure 11:

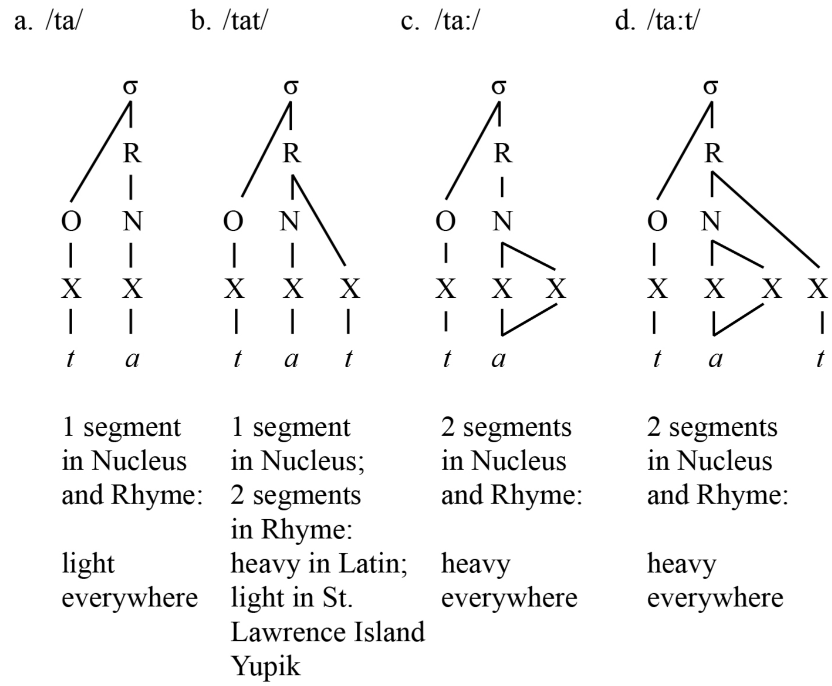

Figure 11: Examples of syllables with different weights from the point of view of Constituency theory (Hayes 1995, 51)

(2) Moraic theory

In moraic theory units of syllable weight are represented by so-called moras, often written as μ (Hyman 1985, Prince 1976, van der Hulst 1984, McCarthy and Prince 1986). As both Czech and Polish are weight-insensitive and there are few views that consider Russian weight-sensitive (and they are more experimental), we will look only at English from the position of this theory.

The mora has a dual role here, where first, it represents the opposition between light and heavy syllables: a light syllable has one mora, a heavy syllable two, and superheavy – three. In English short monophthongs are monomoraic, diphthongs and long monophthongs are bimoraic, consonants ending a syllable bear each one more as well as geminated consonants while ordinary short consonants are moraless (Hayes 1989, 257). Here, the syllabic structure of the word *ban* is presented on Figure 12 as seen by moraic theory:

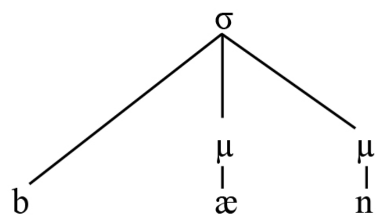

Figure 12: Example of syllabic structure of a word "ban" in Moraic Theory (Kamran *et al.* 2020, 305)

Second, the mora is considered to be a phonological unit just as in previous theories where a long segment is put under stress.

Hayes adds that moraic theory is not segmental (1989, 257), i.e., segments (weight units) are not just represented in forms on CV (consonants and vowels) tier, originally proposed by McCarthy (1979), or on X-tier by Levin (1985) but now they provide information about their role in the weight of syllable or prosodic structure of language.

Hayes also declares that moraic theory is more appropriate for the description of phonological systems than earlier SPE, because while SPE is more of a rule collection, moraic structure, in his view, acts as overall property of a language phonology and therefore makes it possible to describe phonological systems in a better way (1989, 256).

3.1.2 Morphology

As it was mentioned before, stress in English could be interpreted in two ways: on the basis of quantity-sensitive and quantity-insensitive models, so, we can look at it from either the point of view of phonology or morphology.

While some scholars claimed that the English stress system parallels the Latin Stress Rule and therefore is sensitive to syllable weight (Chomsky and Halle 1968, Liberman and Prince 1977, Giegerich 1985, 1992, Hayes 1982, Kager 1988), some, for example, Fournier (2007) based on Guierre, Kiparsky (1982, 1985), Booij and Rubach (1992), Fudge (1984) and a few others argue that word stress placement is rather regulated by word built and not by syllable weight properties.

Scholars, supporting the idea of English being a weight-sensitive system, proposed the English Stress Rule which was first described by Hayes (1982) (Section 3.1.1.2), where a trochaic foot is built over the last two syllables, leading to penultimate stress (the example would be a word *agenda*, stressed penultimately). All other stress patterns are considered to be lexically specified.

However, the inclusion of suffixes can make a relatively simple system more complicated. While underived words would follow the default stress pattern, derived ones may deviate it and there exists a principle that imposes consistent metrical characteristics on morphemes (Burzio 1994). When a word contains one or more suffixes, the final suffix starts to determine the placement of the primary stress.

Lionel Guierre tried to disprove the claim that English stress systems relied on Classical Latin metrical rules (where a penultimate heavy syllable would mean that the stress would fall on the penult, and a light penult entails antepenultimate stress). After the analysis of Jones' English Pronouncing Dictionary (1968) he came to the conclusion that only in case of pre-final consonant clusters syllable-weight becomes a determining factor of English phonology, while in other cases the pronunciation of the vowels rather follows stress assignment (Guierre 1983).

According to him, the morphological system plays an important role regarding the position of the primary stress and the pronunciation of the vowel under the main stress.

It is necessary to note that the names for the classes of suffixes under question may vary between different theories, however, the idea remains the same – some of them affect the position of stress and differ from those suffixes, constituting the second group, which do not do that.

Fournier (2007) following Guierrian school, calls two categories of suffixes investigated by Guierre “strong endings” and “separable suffixes”.

Speaking of the first category, Fournier notes that certain “endings” trigger specific “direct computation (or calculation)” (“le calcul direct” as in French), i.e. indicate that the stress placement for derivatives is unaffected by the original stress positions in their base. On the other hand, neutral suffixes trigger “computation by reference” (“calcul par référence)”, i.e. stress is preserved as it was in the base. Certain “endings” would contain such triggers, for instance, some adjectival ones would trigger penult stress only in case they are preceded by a consonantal cluster and would have no effect on stress placement under other conditions (Fournier 1998, 229-230). Guierre points out that in a majority of cases, the pronunciation of the derivative remains the same as the derived form and that only approximately 30 out of a total of 200 suffixes can be classified as "strong," and, what is more, some of these are applicable only in specific contexts. Some suffixes trigger direct computation in case they are placed by a certain suffix (e.g. *-ival, -inal, -iacal, -inous*, *-ulous*). That is why the category is named “endings” rather than just “suffixes” (Fournier 2007, Guierre 1975).

“Strong endings” include suffixes which are also called “stress-imposing”, and could be further subdivided into three categories. Moreover, according to Gueirre this category also incorporates a few non-affixal endings of similar structure as suffixes.

The first subgroup involves suffixes which are stressed themselves (such as *-ee, -ade, -eer, -elle, -aire* and some others). It is also mentioned that most of these suffixes are of French borrowings or have “stylish” connotations. The second subgroup comprises suffixes, which make the last syllable before it stressed (i.e., stress would be penultimate). The examples of such suffixes would be disyllabic *-itis, -osis* and some others and monosyllabic *-ic, -ent, -ence, -ine, -ive, -ous* and a number of others with a number of exceptions. Finally, speaking of the last subgroup of words with antepenultimate stress, Fournier names such disyllabic suffixes as *–ity/ety, –ify/efy, –acal, –ical, –inal, –inous, –ular, –ulous*, a verbal suffix *-ate*, and noun-making suffixes *-ent/ence* (Fournier 2007).

The second group described by Guierre (and later Fournier) is “separable suffixes” – all other suffixes which are neutral, i.e. they don’t change the stress or vowels in the stem (or the deriving form) to which they are attached. Some of them, though, can become strong in certain circumstances, and, contrarily, strong suffixes can turn into neutral ones in certain environments (Fournier 2007).

Another theoretical framework, first proposed by Pesetsky (1979) and then developed by Kiparsky in his work (1982) is named Lexical Phonology and Morphology and proposes that the cyclic application of phonological rules should stem from the organisation of the lexicon. In other words, stress-shifting suffixes would be attached before phonological stress rules have applied, while stress-preserving suffixes are added after stress rule application.

Speaking of how the English lexicon should be organised, Kiparsky, basing his ideas on Selkirk (1982) and Siegel (1974) outlines 3 levels of morphology, where the first one contains “primary suffixes”, i.e., derivational (such as *-al, -ous, -ity* and others), inflectional suffixes and other stem-changing morphology which is associated with "+ boundary". Level 2 deals with "# boundary" or "secondary" derivation and compounding. Examples of such secondary suffixes would be *-er, -hood, -ness, -ism, -ist* which don't trigger any stress shift.

So, for instance, suffix *-(i)an* (as in S*hakespearean*) would be Level 1 suffixes, as it causes stress shift, while such suffix as *-ism* (as in *nationalism*) would be of Level 2 morphology, because it doesn't influence stress placement (Kiparsky 1982, 133). Level 3 deals with all other cases of "regular" inflection.

One more point of view to be discussed when we take into consideration the influence of morphology on word stress is the one expressed by Fudge (1984). According to him, the effect of affixes (i.e., prefixes and suffixes) on stress patterns in English could be developed into an algorithm that will make it possible to locate the main stress. The algorithm consists of two components: the first one uses a Basic Stress Rule, the other one involves the analysis of words into their constituent morphemes.

Fudge (1984), whose classification we would use later in the experiment, distinguished suffixes into three groups from the perspective of stress placement: stress-neutral, autostressed and pre-stressed. The names, descriptions and lists of these suffix classes vary considerably between theories, but their main idea – how they would influence stress placement, remains the same. The distinction between "stress-neutral" and "pre-stressed" affixes (Fudge, 1984) essentially corresponds to other divisions of word-forming suffixes by different scholars in this field, such as that of "level I" – "level II" (Kiparsky 1982), "cohering" – "non-cohering" (Booij 1983), "neutral" – "stress-bearing" – "stress-moving" (Roach 2004), "stress-placing" – "neutral" (Burzio 1994) or "strong endings" – "separable suffixes" (Guierre 1983).

Autostressed suffixes in Fudge's view, as it follows from their name, attract the main stress onto themselves. Mostly they are of French origin and the words they form are also perceived as borrowings. Some examples of such suffixes would be *-esque, -aire, -oon, -eur, -elle, -ee, -ise* and others.

Stress-neutral suffixes do not affect the placement of stress. Some of them are always stress-neutral, however, some could change their category depending on the words they are attached to – they would be referred to as "mixed" one (or *(m)*) later. Examples of pure stress-neutral suffixes would be: *-al, -dom, -ful, -ish, -ly, -less* and some others, while those, which can act both as stress-neutral and pre-stressed under different circumstances are: *-able, -acy, -ant, -ance, -ise/ize, -ism, -ist, -ous* and a few others.

Suffixes which would interest us the most are pre-stressed (or stress-shifting) which form the largest group influencing the assignment of stress on a syllable a certain number of syllables before the one which contains the suffix. They could be subdivided into three categories:

Pre-stressed 1, causing stress to move to the penult – that is, the stress moves to the second-to-last syllable, i.e., the syllable immediately preceding the suffix. Examples: *-erie, -ic, -id, -ion, -ish (m), -itory, -ity/-ety, -uble.*

Pre-stressed 2, causing stress to move to the antepenult – that is, the stress moves to the third-to-last syllable, i.e. the stress falls two syllables before the syllable containing the suffix. Examples of pure pre-stressed suffixes of the 2nd type: *-ast, -cide, -ene, -fy, -gon, -ine, -ite, -tude*, while *-able, -acy, -ate, -er, -ise/ize, -ism, -ist, -ite, -ment, -oir, -ose* and *-y* are of a mixed type, i.e. will have different function under certain circumstances.

Pre-stressed 1/2: causing stress to be placed according to the weight of the syllable which they follow:

(1) If the syllable before the suffix is strong, then this syllable will bear stress, or
(2) If the syllable before the suffix is weak, then stress is put on the syllable preceding this weak syllable.

The list of such suffixes includes: *-ad, - age (m), -al, -an, -ance (m), -ant (m), -ar, -ary (m), -ate, -ative, -ature, -ee (m), -ée, -ence, -ent, -ery (m), -ible, -ide, -ile, -ine, -ine, -is, - ive, -oid, -on, -or (m), -ory, -our, -ous (m), -um, -ure (m), -us,* where *(m)* after a suffix means that they are of a mixed kind (Fudge 1984).

3.2 Czech

Czech belongs to the weight-insensitive language system, i.e., vowel length or number of coda consonants don't matter in stress placement, and syllabic trochee acts as a basic foot type. Thus, except certain words which do not bear stress under usual circumstances (such function words as prepositions, conjunctions, auxiliary verbs etc), all Czech words are stressed on their first syllable. Morphological make-up of a word (i.e., word class) also doesn't matter to the extent it matters in English, where a verb and a noun with the same spelling may differ in stress. One more radical distinction from English is that Czech is a syllable-timed language and not a stresstimed one, therefore, Czech syllables have the same duration without regard to stress placement, while in English stressed syllables tend to be elongated (Palková 1994, 157).

We also can mention the features of secondary stress, which in Czech differs in formal and colloquial speech. In formal speech, secondary stress would fall on odd-numbered syllables starting from the left edge of the word, while the opposite case would be seen in colloquial speech. Here, secondary stress falls on alternating syllables starting from the right edge (i.e., on the penultimate syllable and on alternating syllables preceding it). This pattern is usually preferred if the penultimate syllable contains a long vowel (van der Hulst 1999, 454).

Czech possesses no extrametricality and foreign words are integrated into the Czech lexicon and its stress system, and similarly to the unborrowed word have the same main initial stress and alternating secondary stress pattern (Jakobson 1971).

One more feature to note in Czech stress is the way it is placed when nouns are preceded by prepositions. Monosyllabic prepositions in Czech like *do* (to), *od* (from), *pod* (under) etc., attract main stress, if there is a mono- or disyllabic noun or pronoun placed directly after them within the prepositional phrase.

To sum up, stress placement in English even by advanced Czech speakers of English might be problematic, as English stress systems differ significantly from a Czech one and stress in English is learnt by Czech native speakers purely purposefully, therefore, mistakes can occur in unknown words.

3.3 Polish

The view on extrametricality differs according to various linguists. So, Archibald (1993) claims that Polish has no extrametricality, however, some authors argue that Polish has restricted extrametricality and a syllable could be marked as extrametrical in a restricted set of items (Comrie 1976, Greenberg 1980).

The examples of such words are: *`fyzika, `Korsika, `opera, `okolica, mate`matyka* where final *-a* is marked as extrametrical. Therefore, this last syllable will be ignored by the Main Stress Rule which assigns penultimate stress and the stress would be antepenultimate. However, there are no words with stress farther than 3 syllables from the right edge of the words, so the conclusion is made that preantepenultimate stress is not possible in Polish (Franks 1985, 147).

Another example of possible extrametricality happens in a few masculine borrowed words and a few proper names, examples of which will be: *uni`wersytet, `Leningrad, `Hannibal* (1985, 146).

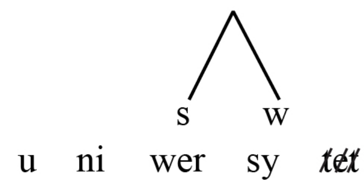

Figure 13: The antepenultimate stress as the result of marking the final syllable extrametrical (Franks 1985, 147)

However, it was noted that final *-tet* might act as extrasyllabical only when it is final and there would be alternation between antepenultimate stress in the nominative singular and penultimate stress in other forms. Moreover, Franks argues that, for example, in comparison with English, where extrametricality is a feature of nouns in general and the final syllable does not count for stress assignment in them, in Polish it is rather a property of a particular syllable (1985, 146). Some other linguists simplify this idea even more, claiming that *-y* of the penultimate syllables could be viewed as extrametrical. For instance, Comrie (1976) processes the stress in words with peculiar stress as *uniwersytet* by marking the *-y* [- Accent], therefore, whenever stress should be put there, instead it is placed on the antepenult. There are few more nouns possessing the similar pattern and also having the antepenult stress: *`leksykon , `prezydent, mate`matyka, `republika* (Franks 1985, 147).

While there are a certain number of exceptional cases in Polish, other than that their stress system is rather straightforward, and, as Czech speakers of English, Polish perceive English stress patterns as unfamiliar and challenging due to the differing stress placement rules between the two languages. While their proficiency with English stress might be improved through practice and exposure to the language, the variability in English stress can still pose difficulties for them.

3.4 Russian

Russian stress is described as not explicitly marked in the orthography and not outlined by clear rules (Jouravlev and Lupker 2015, 945). Phonetically speaking, Russian words have a single stress prominence per word, where the vowel in the stressed syllable possesses a peak in intensity and greater duration than those in the neighbouring syllables (Alderete 2001, 67). It is necessary to mention that there exists a special orthographic element that explicitly points out what syllable in a word should be stressed – a diacritic (it could be seen in texts as: *за́мок/замо́к (`zamok/za`mok)*). However, in Russian, as well as in many other languages with lexical stress, its usage is optional and it's highly unlikely to be used in texts made for adult skilled readers.

Russian has a complex system of lexical stress, where it can be put on various syllables in words with the same syllable structures (e.g., *по́лка/тоска́* (*`polka/tos`ka*)) and the variation occurs within the forms of the same word, as in derivatives or in declension of nouns (e.g., *рука́* (ruká), Sg. for *hand* – *ру́ки* (rúki), Pl. for *hand*).

A number of linguistic theories aim at describing the types of alternation of stress patterns in inflected forms (Halle 1997, Melvold 1990), the common idea being that Russian morphemes are stored in the lexicon together with their status: either "accented" or "unaccented". It is necessary to mention the difference between stress and accent, where what can be observed on the surface and what can be perceived audibly is stress. It can be also strengthened by vowel lengthening and, on the other hand, syllables which do not bear stress may be made weaker by vowel reduction (Kager 1995, 367). Accent, in its turn, is a realisation of that prominence that exists at an abstract level. It is an abstract property of a word, or underlying stress:

> "[it] refers to a lexical property of lexemes (morphemes or words) which marks the location of certain types of observable stress properties that occur in words: often, then, the term "stress" is simply used as a cover term for these observable phonetic properties (such as greater duration, greater intensity, etc.) […]" (van der Hulst 2014, 5).

While these two concepts are often interchangeable in literature as one implies another, when Russian stress is described, the distinction should be made. The term "stress" would be used when the difference is not that crucial and when we talk about the abstract representation of stress, however, the term "accent" would be used in case this distinction is important (Kijak 2009, 14).

In the vast majority of nouns, approximately 98%, lexical stress is explicitly shown in the underlying representation within the lexicon, where it can be placed either on the stem or the inflection. In such cases where stress has no lexical marking, a phonological mechanism assigns default stress. It is computed by a set of rules that guide how we retrieve this information concerning “accented/unaccented” morphemes from lexical memory and apply it to a specific word.

However, due to the variability in stress location, default stress (e.g., trochaic or iambic) has been the subject of a long-lasting debate (e.g. Halle 1973, 1997, Melvold 1990, Alderete 1999, Revithiadou 1999), but aforementioned linguists have tentatively proposed stress assignment rules that indicated that some regular stress patterns may take place and a number of experimental studies have found certain regularities in the speakers’ placement of stress in familiar and unfamiliar words (Crosswhite *et al.* 2003, Jouravlev and Lupker 2015, Nikolaeva 1971, Mołchanow *et al.* 2013). As there is no uncontroversial evidence that would define which foot type Russian has, both left-headed (trochaic) or right-headed (iambic) feet have been hypothesised in the literature only on theoretical grounds altogether with the predicted default positions of stress. Thus, analyses of metrical foot differ significantly in different studies, where some linguists suppose Russian has trochaic foot (Revithiadou 1999, Halle 1997, Lavitskaya and Kabak 2014, Mołchanow 2013, 2019), some (van der Hulst 1999) claim that Russian is an unbounded lexical accent system and therefore stress assigns purely in lexicon and finally, some argue that Russian has an iambic foot (Halle and Vergnaud 1987, Crosswhite 2000, Melvold 1990). Default positions of stress is also a debatable issue, where different linguists’ research puts stress ether word-initially (Melvold 1990, Kiparsky and Halle 1977), stem-finally (Crosswhite *et al.* 2003) or in post-stem position (Alderete 2001). Further we will briefly outline their findings.

Mołchanow with his colleagues (2013) in their study conducted an EEG experiment with speakers with surface dyslexia (also called visual dyslexia), a disorder where the ability to read regular words (i.e., spelled the same as they sound) is relatively preserved, while at the same time speakers find it difficult to read irregular words with exceptional print-to-sound correspondences. In the experiment participants were shown written disyllabic words and their pronunciation with either correct or incorrect stress. The experiment showed that Russian speakers influenced by this syndrome display a high sensitivity to stress violation and notice incorrectly stressed words faster when the expected stress is trochaic. This may lead to the suggestion that the trochaic stress pattern can be viewed as default in Russian (Mołchanow *et al.* 2013).

However, in the similar experiment conducted later (Mołchanow *et al.* 2019), the findings were not consistent with the results obtained in the previous experiment (2013). This time, words with incorrect stress on the first and second syllables elicited asymmetric brain responses, nevertheless the results indicated that processing was better for disyllabic words with initial stress. Therefore, this finding was again viewed in favour of syllabic trochee being the default foot type in Russian (Mołchanow *et al.* 2019).

Several other studies suggested that there is correlation between stress patterns and the final sound of the word (whether it be consonant or vowel). For instance, in Nikolaeva's study (1971) the Russian-speaking participants were presented with unknown borrowed words in isolation and were asked to read them aloud. She identified a number of tendencies, for instance that penultimate stress in vowel-final words and final stress in consonant-final ones are the most prominent. Trisyllabic words which ended in a consonant were likely to have final stress, while disyllabic consonant-final words were stressed both word-finally as well as prefinally. Consonant clusters occurring in words in various positions didn't contribute to stress assignment. It is necessary to mention that this study was one of the first ones concerning stress assignment in Russian and Nikolaeva didn't offer a formal analysis of her findings.

Jouravlev and Lupker (2015) in their experiment with disyllabic words found the same tendency as Nikolaeva (1971) and Mołczanow with the colleagues (2019) however, their explanation to this stress assignment was different. They pointed out that disyllabic words with complex onsets are more likely to be stressed word-initially (i.e., they have a trochaic stress pattern), whereas complex codas rather trigger word-final stress (i.e., iambic). This correlation was compared to one represented in English where the complexity of codas is related to stress patterns. Therefore, they conclude that in disyllabic words syllables with more complex structure, i.e. heavier syllabic weight, tend to attract stress both in Russian and English (Jouravlev and Lupker 2015). The same results were obtained by Mitciuk and Pelts (2022) who in the recent research agreed that stress assignment is impacted by syllabic weight (in that case – the number of consonants in a syllable, where CVC syllables got stressed more often than CV syllables).

Alternatively, Crosswhite with colleagues (2003) offers a different explanation than Mołczanow (2013). In their experiments they used nonce-words that ended in either a homophonous sequence of segments with a Russian case ending or not, i.e. they were rather morphemic (e.g., *-om* (Instr. Sg.) or non-mophemic (e.g., *-on*). They argue that the pattern noticed by Nikolaeva (1971) actually stems from morphology. Statistically, it is uncommon for stems of Russian words to end in vowels. While there is a limited number of words ending a vowel, mostly they are borrowed and indeclinable (*кимонó* (*kimo`no*), *кафé* (*café*)). In other cases vowels in words would rather belong to inflections, while consonant-final inflections are limited in number. At the same time consonants-final nonce-words tend to be rather bare stems. Therefore, as in Nikolaeva's study (1971) words were presented in isolation on separate cards, participants had the flexibility to interpret them in any morphological structure they saw appropriate. Consonant-final forms therefore were rather interpreted as bare stems, and those having a vowel in the end – as inflected words. Thus the position of stress – Nikolaeva's participants consistently placed stress on the rightmost syllable of the stem.

Result of the experiment conducted by Crosswhite displayed a strong dependence on morphology, speakers assigned stress stem-finally to the words without inflections, and the antepenult or penultimate stress in words which had them. Based on these results, Crosswhite with colleagues proposed the default stress in Russian is on the right edge of the stem (i.e., iambic) and that "the assignment of stress depends crucially on the position of the right stem boundary" (Crosswhite *et al.* 2003, 160).

Other theoretical studies also suggest that the location of stress in a word depends on the properties of its morphemes (Halle 1973, Alderete 2001, Melvold 1990). As it was mentioned earlier, each morpheme has an accentuation or lack of it, and here that either allows it to have a stress or stress would never be put on that morpheme (Zaliznyak 1967, Kiparsky and Halle 1977).

Zaliznyak (1967), who attempted a first description of Russian stress, divided all nouns, pronouns, adjectives, and numerals taken from the grammatical dictionary of the Russian language in 6 main accent types (and some additional applied only to feminine nouns) in accordance with three parameters: what is stressed in the word – either stem or inflection, how consistent is the stress within a word, and if it consistent – in which morphological forms its shifting occurs. On the basis of this classification, two accent types appeared to be the most frequent: type A and type B. Type A words always have stress on the stem, whereas words of type B have inflectional stress fixed on the ending.

Early Halle (1973) later suggested that stress placement in type A words reminds of trochaic foot, while type B words are more likely to have iambic foot. Iola and Mustajoki, basing their data on Zaliznyak's grammatical dictionary (1977), say that 91,6% of all the nouns in the dictionary belong to type A, while there are 6,1% of nouns of type B (1989, 49). As there is the definite prevalence of type A nouns, Halle implies that trochee is the default foot in Russian (Halle 1973).

However, Melvold (1990) in her study follows Halle and Vergnaud (1987) who also propose an iambic foot as a default one on Russian, on premises of a rule, where when a stressed vowel is deleted, stress shifts to the to the left which implies a right-headed foot, i.e., iambic one (Halle and Vergnaud 1987, Melvold 1990).

She proceeds with the outline of four basic patterns of stress in Russian in non-derived nouns. It could be either:

(1) Fixed on the stem (around 90% of all the nouns belong to this stress pattern)
(2) Stress in Russian is 'root-controlled', so root stress will always override affix stress. Hence, if a word has an accent in the root, it will persist throughout the paradigm, which will result in the consistent pattern of fixed stress;
(3) Fixed on the inflection (i.e., on the final vowel) (Melvold predicts that approximately 2,000 nouns exhibit this pattern);
(4) Stress alternating between the initial and the final vowel (approximately 450 nouns; this type of stress is referred as a "mobile" one);
(5) Stress alternating between the final and penultimate vowel, where the final vowel belongs to the ending in plural, and penult – to the ending in singular form (approximately 250 nouns; this type of stress is referred to as a "shifting" one) (Melvold 1990, 13-15).

The abovementioned patterns may be explained on the basis of the Basic Accentuation Principle, suggested by Kiparsky and Halle (1977). As it was already said, Russian morphemes can either be accented or unaccented. Accent is defined by Melvold as a diacritic feature which stands for metrical prominence and is associated with a particular vowel in a word. Stress, in its turn, is defined as the phonetic interpretation of metrical prominence (Melvold 1990).

Kiparsky and Halle (1977) in their work outlined the default stress pattern which could be seen in several Indo-European languages (including Russian) and named it the Basic Accentuation Principle (further BAP). The BAP states that the stress is assigned to the first accented vowel, and if there is no accented vowel, to the initial one. In other words, in words with several accented vowels or in case none of them are accented at all, the stress is put on the first vowel. This implies that even in languages with lexical stress, such as Russian, which don't have certain stress rules, implicit rules of stress assignment may be present.

As opposed to non-derived nouns, stress in derived words would be fixed either on the stem (the root or a derivational suffix). In a very few cases it could be put on the ending, yet the accentual properties of inflectional endings don't affect accentuation. This phenomenon can be explained by the fact that the stress rule in Russian applies cyclically and that all suffixes are cyclic (Kiparsky 1982). If a word has such a form, that it consists of a root, a derivational suffix and an inflectional ending, BAP rule would apply twice: after the derivational suffix is attached on Cycle 2, and after the stem adds the ending on Cycle 3. It won't matter if ending has any accentual properties as the accent applied on Cycle 2 would override it on the grounds that any accent that was assigned on Cycle 2 would in any case be put to the left of the ending and this will be chosen by the BAP, in which the first accented vowel is stressed (Dubina 2012).

Just like roots, derivational suffixes may be either underlyingly accented or unaccented – they can either attract or repel stress (Melvold 1989). When an accented suffix is attached to an unaccented base, the derived word will be stressed on the suffix. If the derivational base is accented, the BAP ensures that the base accent wins over the suffixal accent, so the derived word is stressed on the accented vowel of the base, and the suffixal accent is left unexpressed (Melvold 1990).

Taking into consideration derived nouns, Melvold (1990) proposes that there is an important correlation between the derivational status of nouns and stress which can be attributed by two factors: the BAP is a cyclic rule and that all suffixes in Russian are cyclic.

The suffixes can be divided into 4 groups, or accentual classes. Together with their accentual status [+ accented]/[- accented] they might also possess the additional property which in literature is referred to as "dominance" (Halle and Kiparsky 1977, Halle and Vergnaud 1987). Such suffixes as, for example *-ag* in the word *rabo'tjaga* (*hard worker*) are underlyingly dominant and even if they are attached to the accented root, stress in the derived noun would be shifted to that suffix and not to the root, as it could be expected. These suffixes delete any accent on the root to which they are attached. The opposite type of suffix is referred to as [- dominant] or “recessive”. The examples of such (i.e., [- accented, - dominant]) could be *-ost* or *-nik*, as in words *molodost* (*youth*) or *rabotnik* (*worker*).

In case of [+ accented, - dominant] suffixes (i.e., those which could be accented themselves, but don’t delete accent from the stem) assignment of stress will be influenced by the accentual property of the root morpheme. If it is accented, the stress will be placed on it; in the opposite case, the accented derivational suffix will get stressed. The fourth possible combination is suffixes which are dominant and unaccented. Only one such suffix exists in Russian, *-en’*, which forms masculine forms with different meanings. Addition of them [- accented, + dominant] suffix to the accented stem leads to deletion of the stem accent which is not initially put on the first syllable. Then, after application of the BAP, an accent is assigned to the initial vowel and constructs unbounded, right-headed feet (e.g. Sg. Noun *oborót +en’* - *óboroten’ (werewolf*)).

Van der Hulst refers to the ability to attract or repel stress as “diacritic weight” (1999, 457), so it can be explained in terms of weight rather than in terms of lexical accents and presupposes and accent-attracting morphemes are diacritically heavy (as opposed to having inherent lexical accents), while morphemes that repel stress are diacritically light (rather than lexically unaccented). The difference between syllable weight and diacritic weight is in their motivation. While syllable weight is phonologically motivated (by syllable and/or segmental structure), diacritic weight is not predictable and has to be assigned in the lexicon (Van der Hulst 1999).

Alderete (2001) provides another approach in favour of an iambic foot in Russian. Even though he took as the basis of his analysis the same word properties as Melvold (1990), he applied another mechanism of stress assignment to words with [- accented] morphemes. Dominant affixes in Russian lead to a deletion of the stress of the base, and if they are themselves [- accented], it results in default ending stress. Alderete argues that post-stem stress occurs more frequently, both in words with unaccented roots and in words possessing [+ dominant] suffix. For disyllabic words that means that iambic stress pattern is more common and thus default in Russian (Alderete 2001, 163).

Lavitskaya and Kabak (2014) in their research raise suspicions about Alderete's and Melvold's claims. They point out a few irregularities in their theoretical discoveries, for instance that dominant suffix *-ok* (unaccented in Alderete's theory (2001) and accented in Melvold's study) has no influence on stress placement in words with prefixes. Similarly, recessive accented suffixes also bear no stress in prefixed words, in which stress would be put on the stem in all forms. Moreover, as both theories claim, dominant unaccented affixes which should remove base stress and promote default stress pattern (post-stem in Alderete's and word-initial in Melvold's theory) don't always operate in such a way. For example, such suffixes as *-ka, -ika, -l'nja* that rather stress pre-suffix syllable, which wasn't described by abovementioned scholars.

Lavitskaya and Kabak themselves (2014) conducted an experimental study of stress placement in nouns which were devoid of morphological factors, and, therefore, had to serve as establishing stress default. To achieve that they chose vowel-final place names and acronyms as the stimuli in the experiment. They discovered that "stress in words ending in consonants is overwhelmingly final whereas in those ending in vowels, it is penultimate" (Lavitskaya and Kabak 2014, 376), therefore strengthening their previous assumptions that Russian is a quantity insensitive language and trochee being its default pattern (Lavitskaya and Kabak 2014).

To sum up, linguists describing stress assignment in Russian weren't able to come to agreement both on the question of which stress pattern (trochee or iamb) should be viewed as default and where the default position of stress should be, however, most of them acknowledge that Russian is a quantity-insensitive system. While the position of stress in Russian does not depend on the phonological characteristics of a word or a number of syllables it has, placement of stress is influenced by lexical accents (or diacritic weight) that morphemes either possess or not possess. If some syllables are marked lexically for stress – the first such would be stressed, otherwise – the first syllable in the word starting from the left (Van der Hulst 1999).

4 Stress judgments by L2 learners: experiment

In the following section I describe the experiment that was created as part of this master thesis with the aim to examine stress placement by advanced English learners. To be more precise, I examined the placement of English lexical primary stress by Polish, Czech and Russian advanced learners of English as L2. The methodology and stimuli which are used in the experiment will be described in detail in the following sections, followed by an analysis of the results and a discussion of their implications.

4.1 Research questions and hypotheses

This research aims to examine which L1 group (Czech, Polish or Russian) would be better at assigning stress in English words based on the characteristics of stress systems in their respective languages and on the rules governing stress assignment in English. Both phonological factors (syllable weight) and morphological factors are considered in the experiment. The goal is to find out if the advanced learners rely on their L2 linguistic intuition and experience while assigning stress in English nonce-words or if some first language transfer still takes place. This thesis asks the following research questions:

(1) Do such EFL speakers differ in their placement of stress in unknown polysyllabic English words in ways that reveal transfer from L1 (i.e., a Czech preference for the initial stress, Polish preference for penultimate stress, no preference for Russians)?

(2) Does their stress placement in unknown English words reveal sensitivity to syllable weight and grammatical class of the word?

   a. Do learners in whose language syllable weight and grammatical class do not play a role (Czechs and Poles) differ from the Russian learners?

(3) Does their stress placement in unknown English words reveal sensitivity to the effect of specific suffixes?

4.1.1 Participants

Participants are 51 adult native speakers of Czech, Polish and Russian, all of them are either university students or have recently graduated and took part in the experiment voluntarily without any financial benefit.

The basic criterion for choosing participants is to speak English on the advanced level, so as the preliminary step before the experiment they were asked to take LexTale test (which stands for *Lexical Test for Advanced Learners of English*) (Lemhöfer and Broersma 2012) and which purpose is to measure English vocabulary knowledge and also indicate general English proficiency. With reference to the Common European Framework (CEF) for language levels, learners are distinguished by this test between intermediate (or lower) (whose score equal to 59 or below), upper-intermediate (score of 60–80), and advanced (score of 80–100) levels depending on how they performed in the tasks. For our experiment those participants who scored 60 and above were selected, which was assumed to be sufficient for deducing stress patterns based on their linguistic experience.

They were also asked to mention their native language and if they had any formal classes of phonetics at school or university to evaluate how accurate their reading of transcription is. These conditions led to the exclusion of the few participants, who either scored less than 60% on LexTale test or didn't have any phonetics classes during their studies. Ultimately, the total number of participants was 43, with 13 adult native speakers of Czech, 12 native speakers of Polish and 18 native speakers of Russian.

Two native speakers of English, one from the UK and one from the USA, who could read IPA transcription were asked to assess the words from their perspective and give comments on them, i.e., judge how phonologically possible for them to appear in English.

4.1.2 Stimuli

For the stimuli we used nonce-words as their usage would reduce the probability of participants knowing their pronunciation from previous encounters and thus simply answering from their memory. Therefore, invented words would be indicative of knowledge of the general stress pattern in English as acquired by participants. Three sets of nonce words were created, in total 45 tokens. They will be described in greater detail in the following subsections.

All the items were pre-tested on their acceptability and a lack of immediate phonological similarity to real existing English words. Two native English speakers were presented with a list of possible test items put in carrier sentences. They were asked if any of them reminded them immediately of any real existing English words, which would be counterproductive, and they were also asked if the items could theoretically exist as possible novel English words. One four-syllable word which was impossible to pronounce and was highly unlikely to pass as a real English word was eliminated from the list of tokens.

4.1.2.1 Set I of disyllabic words

The first set of words is aimed at testing the role of the grammatical class and syllable structure. They test participants' intuition concerning placement of stress in two-syllable nouns and verbs with the same phonological form.

The nonce-words for this set were borrowed from Guion with the colleagues (2003) where they were used in one of the tasks to find out if the structure of syllables within a word affects stress placement for that word.

Guion and her colleagues in their study invented nonce-words with four types of syllabic structure. Here and later light syllables with no coda consonant will be presented as L, heavy syllable of CVC type as H, heavy of CVCC type (with complex coda) as Hc, and heavy of CVV type, where a long vowel is represented either by a tense vowel or a diphthong – as Hv.

Type 1 in Guion's experiment has a long vowel in the first syllable and a complex coda in the second one (HvHc, e.g., /beɪ.tɪst/[1]). In Type 2 the first syllable has a short vowel and no coda, while the second – a short vowel but a complex coda (LHc, e.g., /dɛ.kɪps/). Type 3 words also have the first syllable with a short vowel and no coda, but the second syllable coda has only one consonant (LH, e.g., /nɪ.lɛt/). Finally, in Type 4 words the first syllable has a short vowel with no coda, while the second – a long vowel (either tense or a diphthong) and one coda consonant (LHv, e.g., /kɪ.gi:n/) (Guion *et al.* 2003).

However, as it was mentioned before, the aspect to be judged is how participants would perceive nonce-words when they are put in carrier phrases and perceived as either verbs or nouns. The sentence frames used for that would be "I'd like to …" and "I'd like a …" accordingly.

To reduce the time and effort spent on the completion of the survey or the participants, we shortened the list of tokens from each set to 6, where 3 of them were put in verb sentence

[1] The sound /t/ in this word and the consonants in the middle of other disyllabic words from Guion (2003) can be considered ambisyllabic – that is, functioning both as the coda consonant of the first syllable and the onset of the second one. Guion (2003), however, does not explicitly address that in her experiment, therefore I also refrain from discussing this issue furthermore and borrow the words as they are, with dots separating the syllables.

frames and 3 – in nouns (see Table 1), so, in total, 12 words were put with the carrier frames "I'd like a …" and 12 – in the frame "I'd like to …".

Noun	Verb	Weight Distribution	Type
beɪ.tɪst taɪ.gɛpt tuː.mɪnz	tuː.kɪps taɪ.mɪnz giː.gɛpt	HvHc HvHc HvHc	1
dɛ.kɪps kɪ.mɪnz bɪ.bɛkt	nɪ.gɛpt sɛ.tɪst sɛ.bɛkt	LHc LH LHc	2
nɪ.lɛt sɛ.lɪn sɛ.gɛt	dɛ.sɪn bɪ.tɛs dɛ.lɛt	LH LH LH	3
nɪ.liːt bɪ.teɪs kɪ.giːn	dɛ.guːt bɪ.toʊs sɛ.liːt	LHv LHv LHv	4

Table 1: Disyllabic words with the combination of light and heavy syllables (borrowed from Guion *et al.* 2003)

4.1.2.2 Set II of trisyllabic words

For the purpose of our experiment, longer than disyllabic words were needed, as for Polish learners of English at least three-syllable words can show the impact of transfer. This set of words was borrowed from the study by Pater (1993) concerning metrical parameter resetting by French learners of English. Nonce-words in the original study were presented in the form of regular words and they were created with a variety of syllable weight combinations, to prove or disprove the idea that syllable weight has any effect on stress placement. For our experiment we borrowed only 3-syllable words with the various combinations of light and heavy syllables, however, they could be divided into two categories: those with a light penultimate syllable and those with a heavy one.

Light penult	Heavy penult
ga.di.ma (LLL) ta.di.net (LLH) ki.ta.mat (LLH) toe.bi.da (HvLL)	tu.gum.ster (LHL) ka.dow.tet (LHvH) a.klip.ter (LHL) poe.dek.tal (HvHH)

Table 2: Trisyllabic words with the combination of light and heavy syllables (borrowed from Pater 1993)

As was mentioned in Section 3.1, the weight of a penultimate syllable might impact stress placement in English in three-syllabic and longer words. If the penult is heavy, stress would be put there, in case it is light – stress would shift to the antepenult. Pater (1993) also mentioned that in an earlier pilot study he came to the conclusion that native speakers showed inconsistent results in their pronunciations of words with CVV penultimate syllables, which weren't always perceived as strong probably because such long vowels were shortened by native participants, therefore in heavy penultimate syllables, where the syllable weight is more crucial for the sake of the experiment, CVC syllables were used.

However, for this study the nonce-words were adapted by transcribing them in the IPA so the whole set of words used in the survey would look universal. One word was slightly altered (*tu.gum.ster* into *te.gum.ster*) so it would fit better in our experiment after its transcription. We came up with the following transcriptions (see Table 3).

Light penult	Heavy penult
gæ.dɪ.mə tæ.dɪ.nɛt kɪ.tə.mæt təʊ.bɪ.də	tɛ.gʌm.stə kə.dɔː.tɛt ə.klɪp.tə pəʊ.dɛk.təl

Table 3: Transcribed trisyllabic words with the combination of light and heavy syllables (borrowed from Pater 1993)

The eight above-mentioned words were put in the carrier phrases for nouns "I'd like a …".

4.1.2.3 Set III of affixed words

The third set of words is based on the first two sets. However, an additional factor of stress placement in English is considered – the influence of suffixes (Fournier 2007, Kiparsky 1985, Booij and Rubach 1992, Fudge 1984).

The suffixes in question were chosen on the basis of Fudge's (1984) description, described in more detail in Section 3.1.2. As discussed earlier, Fudge distinguished several groups of suffixes: autostressed, pre-stressed and mixed suffixes. For the purposes of our experiment only pre-stressed suffixes were selected, i.e., those in which stress is assigned to a syllable located a certain number of syllables before the suffix. They can be divided into 2 groups: Pre-stressed suffixes 1 and 2, where in the first group stress falls on the syllable immediately preceding the one containing the suffix, and in the second one stress is assigned two syllables before the suffix. Moreover, some suffixes could be of a mixed type (named "Pre-stressed 1/2" in Fudge's term), those were not included in the stimuli. Table 4 shows the suffixes divided according to parts of speech they form.

	Nouns	Verbs	Adjectives
Pre-stressed 1	-erie, -ion, -itory, -ity/-ety	-ish	-ic, -id, -uble
Pre-stressed 2	-acy, -ast, -cide, -ene, -er, -gon, -ine, -ism, -ist, -tude, -y	-ate, -fy, -ise, -ite, -ment	-able, -oir, -ose

Table 4: Pre-stressed 1 and Pre-stressed 2 suffixes (Fudge 1984)

To choose the most suitable suffixes for the survey, the following selection process was undertaken. Firstly, some suffixes which are either not productive, or not frequent enough to be easily recognized by participants, especially in a transcribed form and attached to nonce-words, were eliminated from the list (for instance, *-erie, -cide, -gon*). Next, suffixes which could be used both as Pre-stressed 1 and Pre-stressed 2 on the basis of some feature of the stem (for instance, stem being either free or bounded) were also eliminated from the list. Some examples of such suffixes are those spelled as *-er*, where 3 distinctive suffixes should be recognized: agent-noun-forming *-er*, which could be stress-neutral or Pre-stressed 1 depending on the fact if the stem is free or bound; abstract-noun-forming *-er* which is stress-neutral and adjective-forming *-er*. Therefore, even in the sentence frame it might be problematic for participants to decide with which part of speech they deal with and, what is more important, with nonce-words we can’t distinguish between free and bound stems. Thus, such confusing suffixes were eliminated from the experiment.

The last group of eliminated suffixes were those with a considerable number of exceptions. For example, for the adjective-forming suffix *-able*, which could be stress-neutral and Pre-stressed 2 based on the boundedness of the stem, Fudge (1984) lists dozens of exceptions for each category, which makes it counterproductive to use this suffix in our experiment. After the consideration of all the criteria, seven suffixes were left to be used in the experiment (see Table 5).

	Noun-forming	Verb-forming	Adjective-forming
Pre-stressed suffixes 1	-ion, -ity/-ety	–	-ic
Pre-stressed suffixes 2	-ast, - -tude	-ate	-ous

Table 5: Suffixes, used for the experiment in the current thesis (Fudge 1984)

The seven suffixes attached to the words from Sets I and II (excluding one word judged as impossible in English) formed 13 words in total. These were put in the carrier phrases determining their parts of speech (either a noun, a verb or an adjective).

4.1.3 Procedure

The stress-placement test was presented in the form of a decision task on an online platform Survio. It was distributed via the link with the explanation that we are testing the possibility of existence of new words in English, thus, the direct aim of the experiment was unknown to the participants. The test was done individually by each participant. The screen the participant saw is presented in Figure 14.

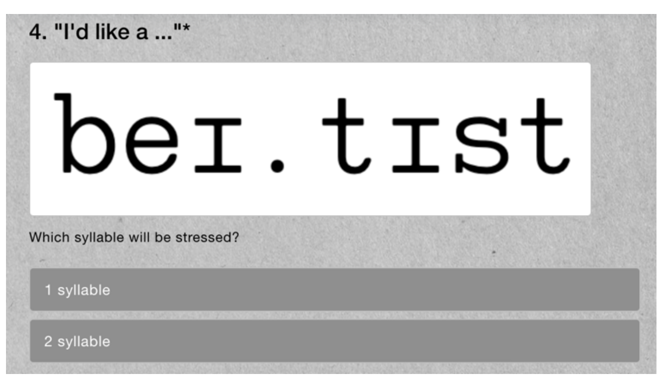

Figure 14: Screen during stress placement decision task

The test was designed to find out which position of main stress participants thought to sound more correctly and naturally. They were to read the transcribed word in a carrier phrase, pronounce it either silently or aloud and choose the syllable they consider to bear primary stress. Words were put in the survey in random order, moreover, they were shown one after another and it was impossible to come back to change your answers. The approximate time the test took was 15 minutes as the statistics showed. During the test no feedback was given to the participants.

After the experiment the results, collected from all participants, were first saved as an Excel and then as tab-separated file.

4.1.4 Analysis

The analysis focused on studying the data collected from three different sets of words described in Section 4.1.2. It examined how the different factors (predictors) including the grammatical category of a nonce-word, and the weight distribution of the syllables within the word, participants' L1 (i.e., the linguistic background) and the LexTale score (i.e., their language proficiency) influenced participants' responses. The dependent variables in the analysis were the participants' responses to the stimuli, where the response could be either 1 or 2 (in case of disyllabic words) or 1, 2 or 3 in case of trisyllabic ones. In the third set of words, aimed to explore the influence of stress-shifting suffixes on stress placement, participants' responses were compared against the anticipated stress placement, which yielded a two-valued dependent variable Match (1 = the actual stress placement matches the anticipation, 0 = or the actual stress placement does not the anticipation).

4.1.5 Results

4.1.5.1 Set I – stress placement in disyllabic words

In the programme STATISTICA (TIBCO 2020), the generalised linear model was used to estimate response to disyllabic words. Since the response variable could have one of two values (1 for stress on the first syllable, 2 for stress on the second syllable) binomial distribution and the Logit link function, $f(z) = \log(z/(1-z))$, were selected. Participants' LexTale score was included as a continuous predictor. The categorical predictor variables included the participant's L1 (Russian, Polish, Czech), the item's grammatical category (Verb, Noun), and the syllable weight (LH, LHc, LHv, HvHc). The reference category for the comparisons with the other categories for L1 was Czech, for the Grammatical category it was Noun, for the distribution of weight in syllables it was LHv. In STATISTICA, the test of significance of the regression coefficient is the Wald statistic. Results, significant for the analysis, are in red.

Table 6 presents the results of testing the effects of various factors (L1, grammatical category and weight distribution) on the probability that the first syllable is stressed. I also considered the interactions between them in order to find out how they can potentially impact each other. Therefore, interactions between L1 and weight distribution, L1 and grammatical category, grammatical category and the LexTale score and weight distribution and the LexTale score were chosen for the investigation. The reasons for choosing these interactions are that language proficiency (represented by the LexTale score in the given experiment) may influence how sensitive the learners are to English-specific stress-assignment factors; learners' L1 also may have an effect whether they pay attention to weight or grammatical category.

Effect	Response - Test of all effects Distribution : BINOMIAL, Link function: LOGIT Modeled probability that Response = 1		
	Degr. of (Freedom)	Wald (Stat.)	p
Intercept	1	9.2221	0.0024
L1	2	2.4904	0.2879
G.Cat.	1	6.5417	0.0105
WeightDist	3	12.4780	0.0059
L1*WeightDist	6	23.6497	0.0006
L1*G.Cat.	2	4.5690	0.1018
LexTale	1	7.8101	0.0052
G.Cat.*LexTale	1	11.5045	0.0007
WeightDist*LexTale	3	20.5034	0.0001

Table 6: Wald statistic and respective *p*-values for all effects in the model

From the test of all effects it is seen that for the Intercept the Wald statistic is 9.2221 with p=0.0024 which indicates that the intercept term is statistically significant, as even without looking at any other factors (like L1 etc.), there is a meaningful probability of the response being 1, that in our case implies the stress on the first syllable in nonce-words.

Grammatical category, weight distribution and the LexTale score also turned out to be significant. Thus, the grammatical category of words (whether the word is a noun or a verb) has a statistically significant effect on occurrence of the first syllable as the stressed one. Weight distribution is also influential for the stress being put on the first syllable. Thus, the weight distribution of different linguistic syllables has an impact on the likelihood of a first syllable stress. The same can be observed for the continuous variable of the LexTale score, which suggests that the LexTale score influences the responses of the participants.

While L1 on its own is not statistically significant, its interaction with other valuables turns out to be meaningful. There is a significant interaction effect between the participants' L1 and weight distribution of the words, with 23,6497 and 0,0006 of the Wald statistic and *p*-value correspondingly. However, the interaction between the language background and the grammatical category is not statistically important.

The same significance can be observed in case of the interaction between the LexTale scores of the participants and the grammatical category. Here, the Wald statistic of 11.5045 with *p*=0.0007 suggests a strong correlation between the subjects' level of English and the stress placement in either nouns or verbs, while the Wald statistic (20.5034) with *p*=0.0001 of the interaction between the LexTale scores and weight distribution indicate that the outcome is heavily based on the level of English of the participants.

To sum up, the factors of grammatical class of the word, weight distribution across the syllables in a word, and the language proficiency of the speaker indeed play a role in stress placement, while the language background on its own is not so significant. However, it starts being relevant in combination with weight distribution of the syllables, implying that speakers of some languages (Russian) may be more sensitive to the weight of the syllable than others (Czechs).

Effect	Response - Likelihood Type 1 Test Distribution : BINOMIAL, Link function: LOGIT Modeled probability that Response = 1			
	Degr. of (Freedom)	Log- (Likelihd)	Chi- (Square)	p
Intercept	1	-713.0860		
L1	2	-711.9230	2.3259	0.3126
G.Cat.	1	-688.1297	47.5866	0.0000
WeightDist	3	-631.8121	112.6352	0.0000
L1*WeightDist	6	-624.1429	15.3383	0.0178
L1*G.Cat.	2	-621.5630	5.1599	0.0758
LexTale	1	-617.6529	7.8201	0.0052
G.Cat.*LexTale	1	-613.8315	7.6427	0.0057
WeightDist*LexTale	3	-602.6161	22.4308	0.0001

Table 7: Response - Likelihood Type 1 Test

Likelihood Type 1 Test evaluates individual predictors one after another, so, when the reference category (Czech nouns with LHv stress pattern) is taken into account, the influence of different predictors and their interactions is estimated. It is done by comparing the likelihood of the full model (including all predictors) with the likelihood of reduced models (in which certain predictors are excluded). A higher Log-likelihood implies that the modelled probability fits the actual results better. The Chi-square test shows if there is a significant association between categorical variables, in that case, between L1 of the participants, grammatical category of a word and its weight distribution and their influence on modelled probability – that is, of the first syllable being stressed. While a higher Chi-square value implies a stronger association between the predictor or interaction and the response of the participant, lower p-values show if the level of each Chi-square value is significant for the analysis.

The results indicate that the categorical variables of weight distribution, lexical class and, to lesser extent (because of its lower Chi-square), the LexTale score are significant for the modelled response, with their p-values <0,05. While the language background of the participants doesn't impact the responses that much, it becomes significant in interaction with weight distribution patterns of the words. Other interaction effects, such as between the grammatical category and the LexTale score and weight distribution patterns and the LexTale score also proved to be statistically meaningful.

Effect	Descriptive Statistics for Dependent Variable						
	Level of (Factor)	Level of (Factor)	Total (Count)	Category (1)	Percentage	Category (2)	Percentage
Total			1032	550	53,3	482	46,7
"L1"	Russian		432	227	52,5	205	47,5
"L1"	Polish		288	164	56,9	124	43,1
"L1"	Czech		312	159	51,0	153	49,0
G.Cat.	Verb		516	220	42,6	296	57,4
G.Cat.	Noun		516	330	64,0	186	36,0
WeightDist	HvHc		258	195	75,6	63	24,4
WeightDist	LH		258	139	53,9	119	46,1
WeightDist	LHc		258	136	52,7	122	47,3
WeightDist	LHv		258	80	31,0	178	69,0
"L1"*WeightDist	Russian	HvHc	108	86	79,6	22	20,4
"L1"*WeightDist	Russian	LH	108	57	52,8	51	47,2
"L1"*WeightDist	Russian	LHc	108	61	56,5	47	43,5
"L1"*WeightDist	Russian	LHv	108	23	21,3	85	78,7
"L1"*WeightDist	Polish	HvHc	72	51	70,8	21	29,2
"L1"*WeightDist	Polish	LH	72	46	63,9	26	36,1
"L1"*WeightDist	Polish	LHc	72	37	51,4	35	48,6
"L1"*WeightDist	Polish	LHv	72	30	41,7	42	58,3
"L1"*WeightDist	Czech	HvHc	78	58	74,4	20	25,6
"L1"*WeightDist	Czech	LH	78	36	46,2	42	53,8
"L1"*WeightDist	Czech	LHc	78	38	48,7	40	51,3
"L1"*WeightDist	Czech	LHv	78	27	34,6	51	65,4
"L1"*G.Cat.	Russian	Verb	216	90	41,7	126	58,3
"L1"*G.Cat.	Russian	Noun	216	137	63,4	79	36,6
"L1"*G.Cat.	Polish	Verb	144	73	50,7	71	49,3
"L1"*G.Cat.	Polish	Noun	144	91	63,2	53	36,8
"L1"*G.Cat.	Czech	Verb	156	57	36,5	99	63,5
"L1"*G.Cat.	Czech	Noun	156	102	65,4	54	34,6

Table 8: Descriptive Statistics for Dependent Variable (the stress on the first or the second syllable) and the calculated percentages

Table 8 is focused on the descriptive statistics for the dependent variable, that is the stress placed either on the first or the second syllable. As the number of the participants with different L1 was not the same and the number of items under analysis also varies, the percentages for each factor were calculated and added to STATISTICA table, so the results are demonstrated more visually.

Observing the raw data, some certain regularities can be noticed. For instance, the nouns are predominantly stressed on the first syllable (64%) what is viable for all three languages under investigation, where nouns are stressed on the first syllable in 63,4%, 63,2% and 65,4% of cases for Russian, Polish and Czech. However, if we take verbs into consideration, while overall results show that in 57,4% of cases they are stressed on the second syllable, the same results can't be observed with Polish participants – here, the distribution between the occurrence of the different stress placement is approximately the same.

The correlation of the weight distribution and the language background also reveals the influence of the participants' L1 on their responses. Thus, it can be seen that the Russian language speakers tend to place stress on Hv syllable without making a difference if it is the first (79,6% of cases) or the second one (78,7%). The same can be said about the Czech speakers (74,4% and 65,4% correspondingly), however, the disparity is slightly lower. In case of Polish speakers, the sensitivity to Hv syllable in the second position is even lower – while in 70,8% of cases words are stressed on the first syllable with HvHc weight distribution, Hv syllable in the second position receives approximately the same stress as L. What is more, in words with LH structure, Polish natives tend to place stress more often initially, with 63,9% of cases.

These findings implicate that both grammatical category and weight distribution, as well as their interactions with the language background of the participants, might have significant effects on the stress patterns observed in the dependent variable.

Effect	Response - Parameter estimates Distribution : BINOMIAL. Link function: LOGIT Modeled probability that Response = 1							
	Level of (Effect)	Column	Estimate	Standard (Error)	Wald (Stat.)	Lower CL (95.0%)	Upper CL (95.0%)	p
Intercept		1	1.8546	0.6107	9.2221	0.6576	3.0516	0.0024
L1	Russian	2	-0.1384	0.1020	1.8399	-0.3383	0.0616	0.1750
L1	Polish	3	0.1345	0.1020	1.7379	-0.0654	0.3344	0.1874
G.Cat.	Verb	4	1.5602	0.6100	6.5417	0.3646	2.7558	0.0105
WeightDist	HvHc	5	-2.5216	1.0941	5.3114	-4.6660	-0.3771	0.0212
WeightDist	LH	6	-0.3336	1.0070	0.1098	-2.3073	1.6400	0.7404
WeightDist	LHc	7	-1.0274	0.9946	1.0670	-2.9769	0.9220	0.3016
L1*WeightDist	1	8	0.5083	0.1853	7.5215	0.1450	0.8715	0.0061
L1*WeightDist	2	9	0.0174	0.1668	0.0109	-0.3095	0.3443	0.9169
L1*WeightDist	3	10	0.2968	0.1656	3.2130	-0.0277	0.6214	0.0731
L1*WeightDist	4	11	-0.3852	0.1840	4.3825	-0.7459	-0.0246	0.0363
L1*WeightDist	5	12	0.2646	0.1731	2.3368	-0.0746	0.6038	0.1263
L1*WeightDist	6	13	-0.1813	0.1699	1.1381	-0.5143	0.1518	0.2861
L1*G.Cat.	1	14	-0.1583	0.1018	2.4189	-0.3579	0.0412	0.1199
L1*G.Cat.	2	15	0.2039	0.1023	3.9730	0.0034	0.4044	0.0462
LexTale		16	-0.0210	0.0075	7.8101	-0.0358	-0.0063	0.0052
G.Cat.*LexTale	1	17	-0.0255	0.0075	11.5045	-0.0403	-0.0108	0.0007
WeightDist*LexTale	1	18	0.0440	0.0135	10.6201	0.0175	0.0704	0.0011
WeightDist*LexTale	2	19	0.0045	0.0123	0.1342	-0.0197	0.0287	0.7141
WeightDist*LexTale	3	20	0.0120	0.0122	0.9706	-0.0119	0.0359	0.3245
Scale			1.0000	0.0000		1.0000	1.0000	

Table 9: The parameter estimates, their standard errors, and statistical significance

The last table tells us how much each factor impacts the outcome we're interested in – the initial syllable being stressed. The findings confirm the ones in the previous tables. Thus, the estimated weighted mean for the grammatical category of the verb is 1,56, what we can see in Table 9 and Figure 15 below. However, for nouns this number is approximately 1,35 (see Figure 15), which implies that nouns are more likely to receive initial stress than verbs.

The words with the weight distribution HvHc have coefficient of -2,5216 which with *p*=0,0212 indicates that the likelihood of the word-initial stress is significantly lower compared to the reference category (LHv weight distribution). This can also be seen in Figure 16, from which it is obvious, that while for the words with HvHc stress pattern the first syllable stress is preferred, the opposite stands for the words with LHv pattern, and the second syllable stress is more frequent in them.

The LexTale score also proves to be significant, which is seen both in this and former tables. What can be deduced is that with the estimated coefficient of -0.021017, the higher the LexTale score of the participants is, the lower the chance they stress the words initially. Low *p*=0,0052 confirms that it is statistically significant.

Speaking of the interactions between variables, those which are meaningful are: between the language background (Polish) and weight distribution pattern, grammatical category and the LexTale score and weight distribution pattern HvHc (for Label names see Appendix C).

Based on the previous evidence, it is defined that the effect of the native language of the participants can be better observed in the interaction with other variables. So, if we look at the performance of the Polish speakers in comparison with the reference category (Czech) in correlation with the way they assign stress in HvHc words as opposed to the reference category (LHv), we can see the negative coefficient (-0.3852) indicates that the Polish participants are more likely to put stress on the first syllable in comparison with the Czechs. However, as the data in Figure 18 shows, they are also more likely to stress the first syllable in LHv words.

The data concerning the interaction between lexical class and the LexTale score suggests that the higher the score is (i.e., the level of English of the participant), the less impact it will make if the word is a noun or a verb. However, with the increase of the score also increases the chance of the word to be stressed initially, as the next interaction between the LexTale and weight distribution shows. Here, the positive combination (0,0440) of higher the LexTale scores and the HvHc weight distribution pattern increases the likelihood of the words stressed on the first syllable compared to the reference category (LHv). That also proves to be significant by a low *p*=0,0011.

The figures 15-19 show the observed weighted means. These are computed as the standard means for the respective combinations of factor levels, directly from the data. Thus, the resulting means are weighted marginal means, since they are weighted by the number of observations in each cell of the design.

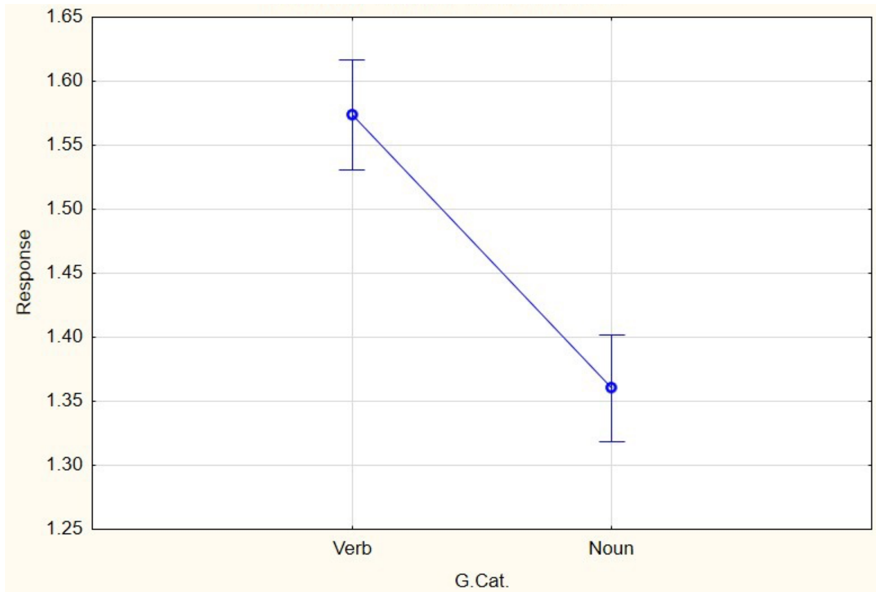

Figure 15: Weighted Marginal Means for the grammatical category (a noun or a verb)

The graph shows visually how more often disyllabic verbs are stressed words finally and disyllabic nouns – words initially.

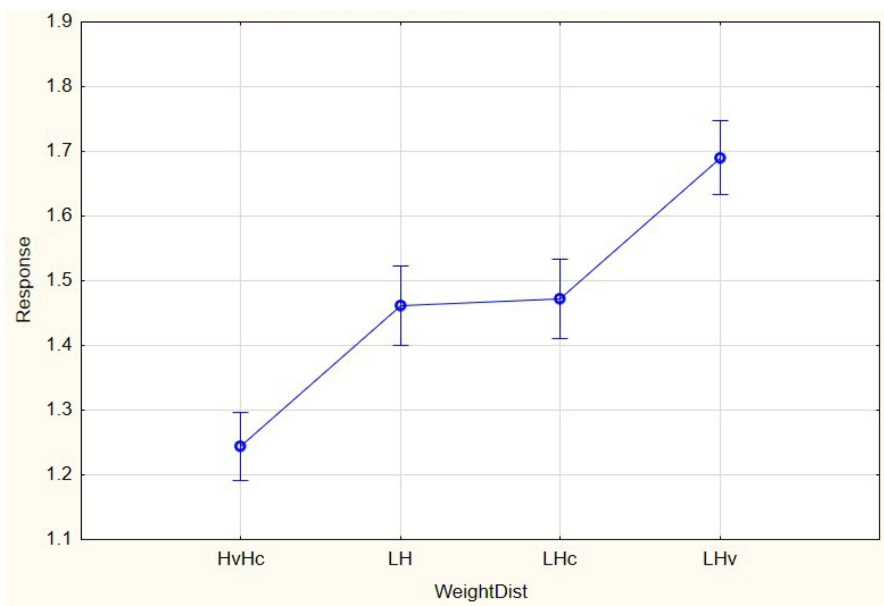

Figure 16: Weighted Marginal Means for the weight distribution of the syllables in words

The difference between the treatment of Hv syllable (the one with a long vowel – either a tense one or a diphthong) in comparison with the syllables of different weight. Thus, Hv syllable is predominantly stressed both in the initial position and in the final one.

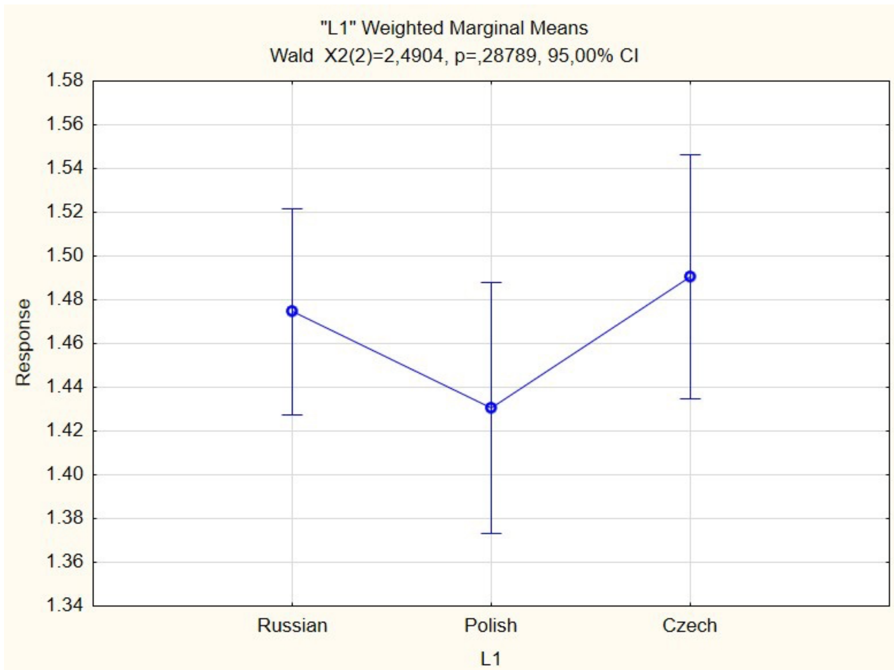

Figure 17: Weighted Marginal Means for L1 (the language background)

While in the previous tables L1 of the participants didn't prove to be statistically significant, if we have a look at the weighted means in respect with one another, it's possible to observe that the Polish speakers are more likely to stress the first syllable in all patterns of weight distribution while for the Czechs the number of the first and the second stressed syllables is almost equal.

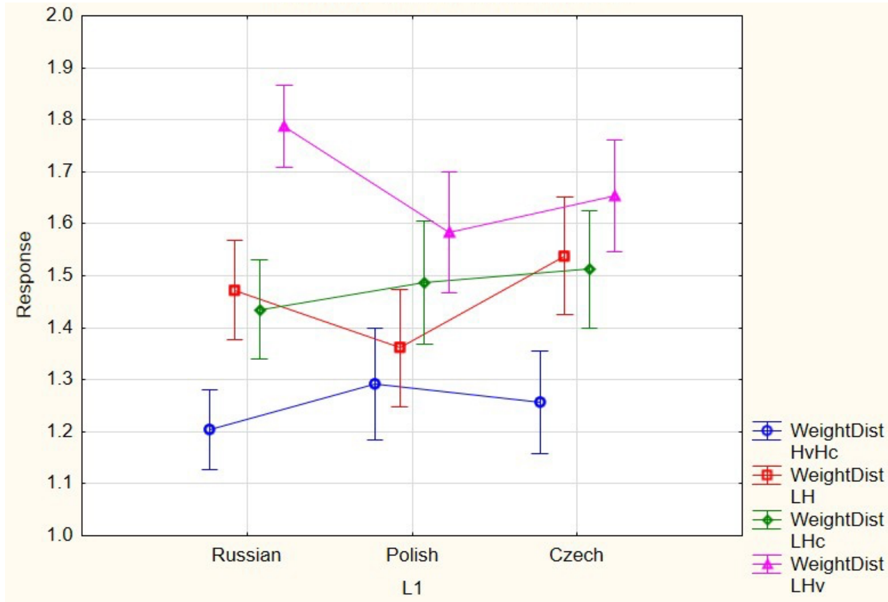

Figure 18: Weighted Marginal Means for the interaction between L1 and weight distribution of the syllables in words

While for Polish speakers all the weighted means of the first stressed syllables lie in the range of approximately 1.2–1.6 as the mean response, the distinction for Czech and Russian speakers is far more noticeable. Thus, the first syllable in LH and LHv words is less likely to be stressed for the participants with Russian and Czech L1, while in words with HvHc weight distribution they tend to stress the first syllables more often than Polish speakers, which has also been discussed before. In general, as it can be seen from the graph, the sensitivity to the heaviness of the syllable is greater for the Russian language speakers, while the Polish participants' mean responses are closer to the weighted arithmetic mean.

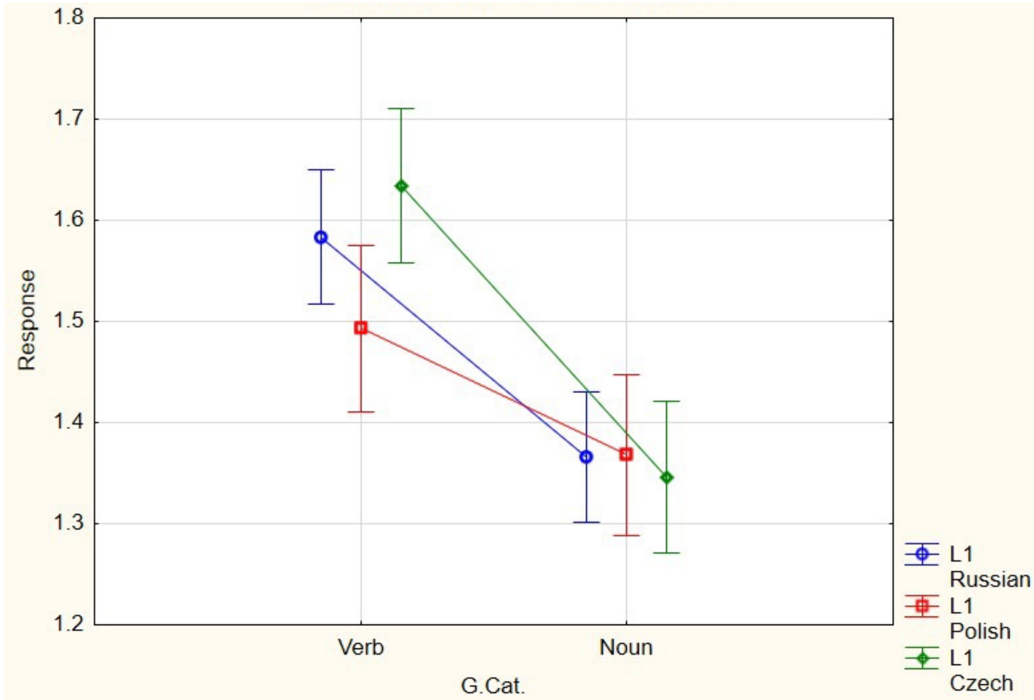

Figure 19: Weighted Marginal Means for the interaction between L1 and the grammatical category (a noun or a verb)

While both Czech and Russian speakers prefer the second syllable stress in verbs, for the Polish participants the choice between the initial stress almost equals the final one. On the other hand, the speakers of all three languages are ether unanimous when it comes to the noun stress – here, all of them tend to place it word-initially.

If we compare the results with those obtained by Guion and her colleagues (2003), a few parallels could be made, even though her study concerned stress placement by native English speakers. For instance, in Guion's study the syllabic structure of the words was significant in stress placement process, and while Hv syllables had a tendency to attract stress in both positions (word-ultimately and word-finally), Hc syllables (with two coda consonants) were not preferred over just H syllables (with one coda consonant). The same discovery is made in the experiment in this thesis. Moreover, as Guion noticed, lexical class of the words turned out to be significant for main stress distribution, with nouns stressed more often on the first syllable. The same can be observed in the data above, leading to the conclusion that the advanced speakers of English who took part in the given experiment, are, as native speakers of English, sensitive to stress placement rules. The results we obtained will be discussed in greater detail in Section 4.2.

4.1.5.2 Set II – stress placement in trisyllabic words

While it was possible to create the regression analysis model with the first, bigger, set of disyllabic words, the second and the third set have fewer items, so it proved to be more informative to calculate the Descriptive Statistics for both of them to note the most prominent features.

The perusal of percentages in Figures 20 and 21 suggests that trisyllabic words tend to be stressed less often on the final syllable. This is especially the case if the penultimate syllable is also heavy (as in LHL, LHvH, HvHH words). One more recurring feature is the tendency of Hv syllable to be stressed predominantly in all the positions, here – the initial (in HvLL words) and the penultimate one. In the words with LHL stress pattern the heavy syllable is stressed exceptionally frequently, in 76,7% of cases.

Comparing the answers of the speakers from different countries, the most notable figures are 55,2% of penultimate stress by Polish speakers (see Figure 21). The possible implications of this result will be discussed in Section 4.2.

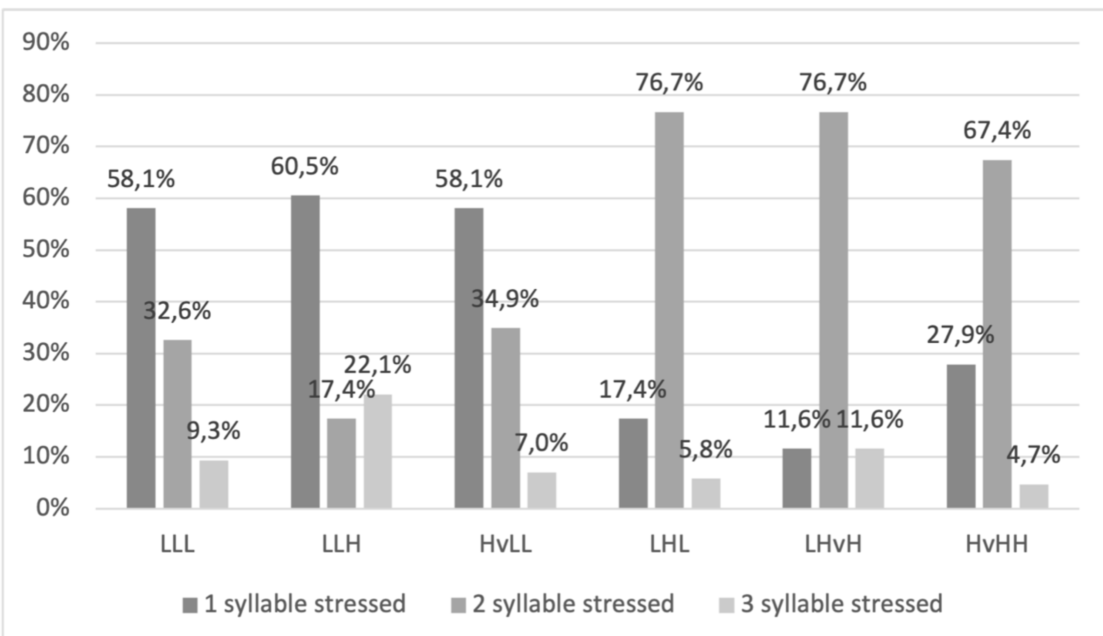

Figure 20: The distribution of stress (on the first, second of the third syllable) in trisyllabic words with different weight distribution of the syllable within the word

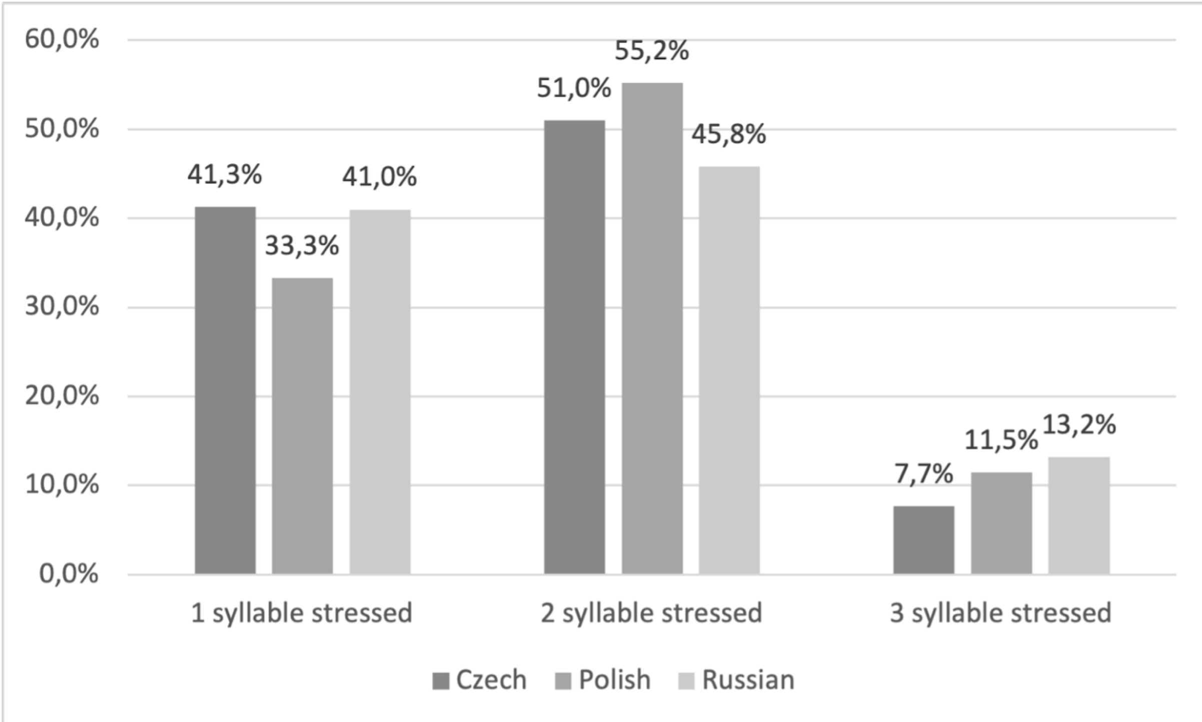

Figure 21: The distribution of stress (on the first, second of the third syllable) in trisyllabic words by the groups of Czech, Polish and Russian EFL learners

4.1.5.3 Set III – effect of suffixes on stress placement

As it is seen from Figures 22 and 23, the adjectives turned out to be the most troublesome to be recognized and be stressed correctly. It is further proved by the interaction of the effects of the lexical class and L1 of the participants – Russian and Polish speakers struggled the most, for the Czechs though the stress assignment in adjectives was less challenging. However, Russian speakers had less problems with stress placement in nouns, with 63,5% percent of answers which matched the expected responses. Overall, the results of this task are quite even, with approximately the same number of correct and incorrect answers.

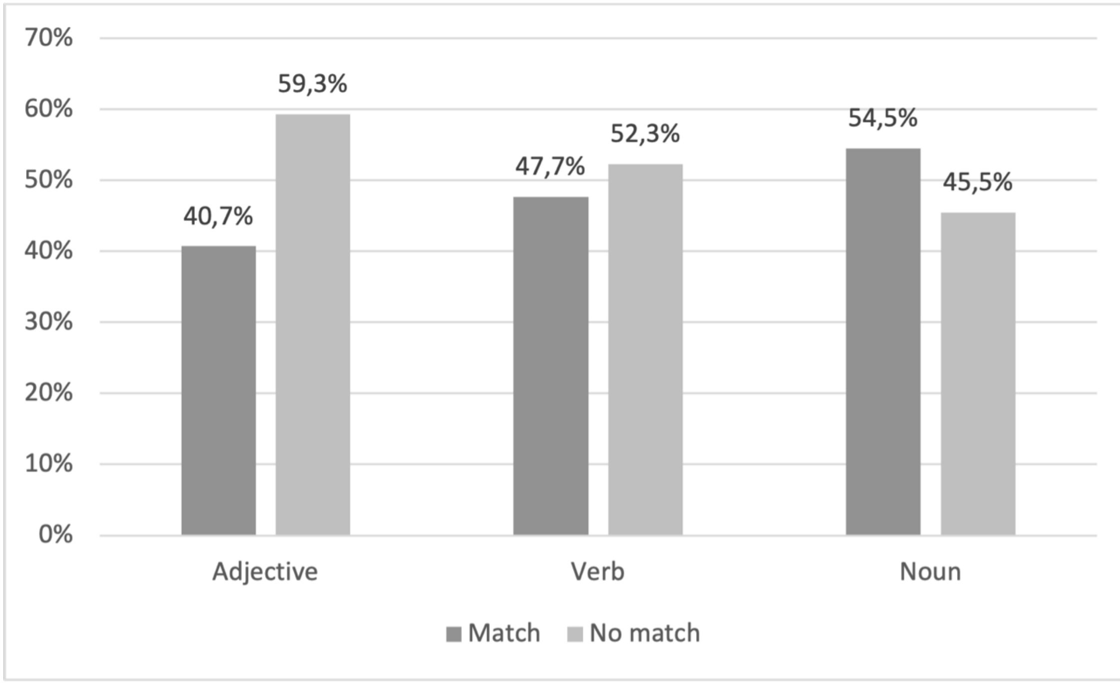

Figure 22: The distribution of the answers matching and not matching the correct responses for the grammatical categories (adjectives, verbs and nouns)

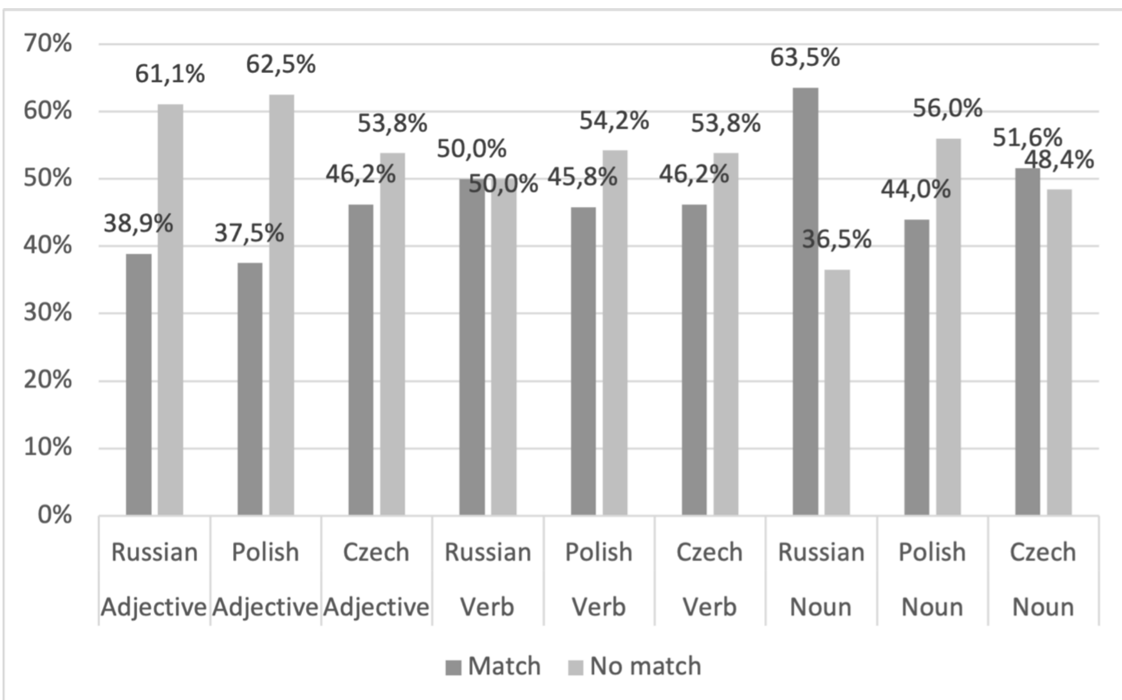

Figure 23: The distribution of the answers matching and not matching the correct responses for different groups of EFL learners (Russian, Polish, Czech)

4.2 Discussion

The results of the first part of the experiment showed that the determining factors, such as the participants' first language background , syllable weight and the grammatical category of the word, indeed, influenced stress placement in disyllabic and trisyllabic words. These results correspond to the ones obtained in Guion et al. 2003, reviewed in the theoretical part of the paper. Moreover, the LexTale score, taken to show the participants' proficiency in English, also contributes to their answers, both on its own and in the interactions with other variables. The effect of LexTale was not expected, as all the participants were at the B2 (and higher) level of English proficiency according to CEFR. However, it appears that even within this range from advanced to highly proficient EFL speakers the more experienced the learners are and the larger their vocabulary is, the more sensitivity to the stress placement rules they developed even if the word is non-existent in English.

Considering the extent to which the language background and specificity of stress placement in Czech, Russian and Polish influences the non-native speakers' assignment of stress in English it is possible to say that Polish EFL speakers seem to be the least sensitive to weight distribution patterns. For instance, the data provided in Table 8 shows that in words of the Light-Heavy pattern the first syllable was stressed much more often by the Polish than by the other two groups. Additionally, in trisyllabic words (Table 10) they placed the stress on the penultimate syllable more often, compared to Russian and Czech speakers. This allows us to, at least tentatively suggest, that language transfer did take place for Polish speakers. It can be explained by strict regularity of stress placement in their native language, although some borrowed words (e.g., *`prezydent, mate`matyka*) exhibit different stress patterns from the regular penultimate stress. These words are simply learnt as they are and no specific calculation is done during the stress assignment in them. In contrast, it is impossible to state whether the language transfer took place for the Czech speakers, whose L1 has regular initial stress. In the disyllabic words stress was placed almost equally frequently on the initial and final syllables, and in trisyllabic words the second syllable was stressed even more frequently than the first one. There is no direct explanation why the Czechs were more sensitive to stress placement than Polish speakers. Interestingly, Kijak (2009, 253), in an experiment concerning stress "deafness" and the perception of stress by speakers of different languages, comes to the same conclusion while comparing Czech and French speakers. She states that it could be due to stress having an important demarcative function. Thus, the Czechs use stress information to segment speech and, as a result, perceive stress better. I can further suggest that if they perceive stress better, they can also predict its placement better even in non-existent words, which, however, are created on the basis of real stress patterns. That can be seen in Table 10. I suggested that the Czech speakers might have a preference for initial stress, which would have been especially noticeable in three-syllable words, but no effect of language transfer was found.

In Kijak's experiment, the Polish had fewer correct answers, which can also support the results of the research in the current thesis. Russian speakers, on the other hand, seem to be the most sensitive to the syllable weight, and, especially to the syllables containing a long vowel. In Section 3.4 I have already touched upon the topic of quantity-sensitivity of Russian and while the majority of scholars, even modern ones, support the idea of Russian being quantity-insensitive (e.g., Lagerberg 2003), some start discussing the opposite situation (Jouravlev and Lupker 2015, Mitciuk and Pelts 2022). Mitciuk and Pelts (2022) provide statistical evidence that syllable weight influenced stress assignment in Russian nonce-words, however, in their experiment, syllables that contained more consonants were more likely to be stressed rather than syllables with long vowels, as in Russian there is no phonemic distinction between long and short vowels. However, I can suggest, that the sensitivity to heavier syllables for Russian speakers may take place, as heavy syllables (no matter if they contain complex codas or long vowels) may be perceived as outstanding ones, and, as stress placement rules in Russian are not limited to one specific place, such outstanding syllables may be preferred in stress assignment.

The analysis of the data indicated that depending on the weight some syllables were attracting stress while others were less preferred for stress placement. Thus, heavy syllables containing either a tense vowel or a diphthong were stressed more often in any position, than just heavy syllables with more than one coda consonant or heavy syllables closed by a single coda consonant. These syllables were probably more salient and hence noticeable to all EFL speakers. Guion (2003, 416) came to the same conclusion in the experiment with disyllabic words, adding that the prediction that heavy syllables with coda consonant clusters would tend to be stressed more often than those with one coda consonant was not supported.

The grammatical category of the word was also taken into consideration by participants deciding about stress in disyllabic words, in line with the results of Guion's research (2003). When the words were put in the carrier sentences, which determined whether a nonce form was a noun or a verb, the participants intuitively stressed otherwise similarly structured nonce forms more often finally if they were in the position of a verb (57, 4%) and initially (64%) if they were in the position of a noun. Nevertheless, the trend is not so decisive to claim that the grammatical category of disyllabic words really makes an impact in the stress assignment process.

The observations align with the idea that language learners have the ability to perceive, acquire, and use statistical regularities. In the context of my thesis, I may suggest that the participants who speak English at the advanced level have acquired knowledge of the statistical distribution of stress patterns taking into account varying vowel lengths and, to a lesser extent, across grammatical categories.

The third set of words was added to the experiment with the aim to investigate the impact of stress-shifting suffixes on stress placement. With the use of pre-stressed suffixes of Type 1 and Type 2, words from three grammatical categories were generated: adjectives, verbs, and nouns. However, the analysis revealed that the presence of these suffixes did not significantly change stress placement patterns as it was predicted. As it is shown in Figure 22, adjectives turned out to be the most challenging for the participants in correctly assigning the stress. Overall results from this part of the survey were balanced, with comparable numbers of correct and incorrect answers. It also appears that certain suffixes could have been more recognizable even in nonce-words. The participants seemed to draw upon familiar lexical items as a reference point for stress assignment, thus placing stress correctly in some items from my experiment. That again highlights the role of language experience in the stress placement process.

5 Summary

To conclude, the topic of this master thesis was stress placement in L2 English by Czech, Polish and Russian advanced speakers of English as a foreign language.

In the first part of the paper relevant literature was reviewed. On the basis of this review the research questions were formulated. To examine the stress placement of Czech, Polish and Russian speakers an experiment was conducted with a group of 45 speakers.

The participants first performed an online vocabulary size test and then completed the experiment on the online platform Survio. Transcribed nonce-words were put in the carrier sentences (e.g., "I like to …", "I like a …") and presented in the random order one by one. The participants clicked on the button with the syllable which, as they supposed, had to bear the main stress.

Regression analysis was used to identify which variables have impact on stress placement in the polysyllabic nonce-words. The generalised linear model was built in STATISTICA to estimate responses to the nonce-words. The responses for the place of stress in the first and the second set of words were counted, as well as responses that either aligned with or deviated from the correct answers for the third set of words in the form of Match/No match binomial variable.

The result of the experiment revealed that the syllabic weight, the grammatical category and the language background in interaction with syllabic weight distribution contributed to the stress assignment, which correlated to the results reported in the study investigating the same effects but with the native speakers of English (Guion 2003). Moreover, there was a correlation between the proficiency in English and the stress placement, both on its own and in the interaction with the weight distribution and the grammatical pattern. Nevertheless, no effects of the stress-shifting suffixes were found on the stress assignment in polysyllabic nonce-words, with approximately an even number of responses either corresponding to or diverging from the correct answers.

Summarising the three-part experiment, it can be said that language transfer did take place, however, the advanced EFL speakers were still able to acquire and use regularities in stress placement patterns.

6 Resumé

Hlavním cílem této práce je zkoumat umístění anglického lexikálního přízvuku rodilými mluvčími tří slovanských jazyků: češtiny, ruštiny a polštiny. Tato práce se zabývá správností umístění přízvuku těchto studentů v anglických vymyšlených slovech použitých v rámci experimentu, jejich typické vzory umístění přízvuku, jejich povědomí o pravidlech anglické fonologie a vliv fonologie mateřského jazyka.

Jazyky lze široce rozdělit do dvou kategorií – ty s pevným (fixním) přízvukem a ty s pohyblivým (nepředvídatelným, lexikálně označeným) přízvukem. Nicméně existují některé výjimky v jazykových systémech s pevným přízvukem a ne všechny volné systémy jsou zcela zbaveny pravidel umístění přízvuku (Kijak 2009). U anglického jazyka můžeme dojít k závěru, že přízvuk je volný a žádné pravidelnosti pozorovat nemůžeme. Nicméně zatímco angličtina nevlastní "jednotné metrické chování", Burzio věří, že anglický lexikon lze rozdělit do dvou hlavních podmnožin, kde by přízvuk následoval určitý vzor (Burzio 1994, 43). Další studie také ukazují, že jsou již známy i pravidelné vzory umístění přízvuku v angličtině.

Existuje několik teorií anglického přízvuku. Chomsky a Halle (1968) tvrdí, že anglický přízvuk je citlivý na váhu slabiky. Navíc také uvádí fakt, že lexikální kategorie slova také hrají roli a umístění přízvuku je citlivé na hranice morfémů (Chomsky a Halle 1968). Hayes vyvinul metrickou teorii přízvuku na základě analýzy různých jazyků, a take popsal pojem pravidla extrametričnosti, které poprvé představili Liberman a Prince (Hayes 1982, Liberman a Prince 1977). Fournier navrhl systém pravidel přízvuku, které jsou založeny na morfologických a segmentálních kritériích (Fournier 2010).

Cílová skupina studentů byla vybrána z důvodu rozdílnosti jejich jazykově pravidelného umisťování přízvuku. Fakt, že se mateřský jazyk respondentů lišil, nám umožňuje zkoumat, zda přenos z mateřského jazyka ovlivňuje umístění lexikálního přízvuku u pokročilých studentů angličtiny. Čeština a polština, jako západoslovanské jazyky, mají systémy citlivé na váhu slabiky, takže pozicepřízvuku je nezávislá na fonologické stavbě slova. Je také nezávislá na morfologické struktuře (van der Hulst 2011). Čeština a polština mají předvídatelný slovní přízvuk, kde polština je jazykem s pevným přízvukem padajícím na předposlední slabiku slova (významné jsou výjimky) a český je jazyk, ve kterém je přízvuk fixován na první slabice přízvukové skupiny a bez vyjímek. Ruština má volný přízvuk, který může být umístěn na libovolné slabice ve slově a může se také měnit se změnou tvaru daného slova. Ačkoliv studie o lexikálním přízvuku v ruštině dokazují, že přiřazení přízvuku je silně ovlivněno váhou slabiky, jinými slovy, slabikám s více souhláskami byl přízvuk obvykle přidělen. (Mitsiuk a Pelts 2022).

Tato diplomová práce se zabývá výše specifikovanými rysy lexikálního přízvuku ve třech konkrétních jazycích. Mohli bychom předpokládat, že studenti s bezvýhradně předvídatelným přízvukem ve svém mateřském jazyce (čeština) mohou mít více problémů než studenti, jejichž mateřský jazyk má předvídatelný přízvuk podléhající výjimkám (polština), kteří ovšem mohou mít více problémů ve srovnání se studenty, jejichž mateřský jazyk má pohyblivý přízvuk (ruština).

Práce je rozdělena do dvou částí. V první části je popsáno teoretické pozadí tématu. Specifika umístění přízvuku v zkoumaných jazycích (angličtina, čeština, polština a ruština) jsou popsána v podsekcích. Závěry týkající se umístění přízvuku a přehled stejných experimentů provedených s rodilými mluvčími angličtiny jsou také uvedeny v této části.

Druhá část je zaměřena provedený experiment, s cílem odpovědět na výzkumné otázky uvedené v této diplomové práci. K vypracování danného experimentu byla použita metoda regresní analýzy k identifikaci faktorů, které nejvíce ovlivňují přiřazení přízvuku. Neexistující slova byla rozdělena do tří skupin: dvouslabičná slova, tříslabičná slova a čtyřslabičná slova, a nakonec ta slova vytvořená pomocí přípon které přízvuk posouvají. Zmíněné rozdělení umožnilo pozorovat různé jevy a účinně se zabývat se všemi výzkumnými otázkami.

Experiment byl proveden se skupinou 43 dospělých studentů angličtiny jako cizího jazyka, s 13 rodilými mluvčími češtiny, 12 rodilými mluvčími polštiny a 18 rodilými mluvčími ruštiny. Jako podněty v experimentu byla použita pouze uměle vytvořená slova z důvodu snížení pravděpodobnosti, že účastníci znají jejich výslovnost z předchozích zkušeností s angličtinou.

Výsledky ukázaly, že různé faktory, jako je jazykové pozadí účastníků, distribuce váhy slabik a gramatická kategorie slov, významně ovlivnily umístění přízvuku u dvouslabičných a tříslabičných slovech. Tato zjištění potvrdila předchozí výzkumná práce lingvistů, popisující vliv jazykově specifických faktorů na přiřazení přízvuku (Guion *et al.* 2003). Navíc účastníci s vyššími skóre v testu LexTale prokázali větší citlivost na pravidla umístění přízvuku v neexistujících slovech. Pokud mluvíme o vzorcích distribuce váhy a jejich vlivu na umístění přízvuku, mluvčí polštiny se zdáli být nejméně citliví na váhu slabik, mluvči ruštiny projevili zvýšenou citlivost, vzhledem k těžkým slabikám obsahující dlouhé samohlásky nebo diftongy.

Zmíněná zjištění souhlasí s novými diskusemi o citlivosti na kvantitu ruštiny, které významně ovlivňují předchozí představy o nedostatečné citlivosti na kvantitu (Jouravlev a Lupker 2015, Mitciuk a Pelts 2022).

Dále analýza odhalila, že gramatická kategorie má roli při přiřazování přízvuku, zejména u dvouslabičných slov. Slovesa měla tendenci být častěji přízvučná na konci, zatímco podstatná jména projevovala přednost pro počáteční přízvuk. Je však třeba poznamenat, že tento trend není tak výrazný, aby se dalo tvrdit, že gramatická kategorie dvouslabičných slov skutečně ovlivňuje proces přiřazování přízvuku.

Je třeba zdůraznit, že studie nenašla žádné významné účinky posouvajících přízvukových přípon na přiřazování přízvuku u tříslabičných slov. Nicméně, některé přípony se zdály být rozpoznatelnější dokonce i v neexistujících slovech, což naznačuje, že účastníci se mohli opírat o známé lexikální znalosti jako o referenční body pro přiřazení přízvuku.

Shrnující data z experimentu, lze usuzovat, že nějaký účinek přenosu z mateřského jazyka skutečně nastává, nicméně pokročilí mluvčí angličtiny jako cizího jazyka stále dokázali definovat a následně aplikovat pravidelnosti ve vzorcích v rámci umístění přízvuku.

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9 Appendices

In the section below you can find the data I referred to in my thesis. The data are organised as follows.

Appendix A: Complete list of nonce-words used in the experiment in corresponding carrier sentences.

Appendix B: Descriptive Statistics for Continuous predictors for Set I of disyllabic words.

Appendix C: Column Labels for Set I of disyllabic words.

Appendix A: Complete list of nonce-words used in the experiment in corresponding carrier sentences.

Carrier sentence	Set I of disyllabic words
I'd like a …	beɪ.tɪst taɪ.gɛpt tuː.mɪnz dɛ.kɪps kɪ.mɪnz bɪ.bɛkt nɪ.lɛt sɛ.lɪn sɛ.gɛt nɪ.liːt bɪ.teɪs kɪ.giːn
I'd like to …	tuː.kɪps taɪ.mɪnz giː.gɛpt nɪ.gɛpt sɛ.tɪst sɛ.bɛkt dɛ.sɪn bɪ.tɛs dɛ.lɛt dɛ.guːt bɪ.toʊs sɛ.liːt

Carrier sentence	Set II of trisyllabic words
I'd like a …	gæ.dɪ.mə tæ.dɪ.nɛt kɪ.tə.mæt təʊ.bɪ.də tɛ.gʌm.stə kə.dɔː.tɛt ə.klɪp.tə pəʊ.dɛk.təl

Carrier sentence	Set III of affixed words
This is very …	kə.dɔː.tɛt.ɪk
I don't like such a …	gæ.dɪ.mə.ʃn
I don't like such a …	tæ.dɪ.nɛt.ətɪ
He is such a …	pəʊ.dɛk.təl.æst
I don't like such a …	təʊ.bɪ.də.tjuːd
He really likes to …	[kə.dɔː.tɛt.eɪt
His ideas are very …	tæ.dɪ.nɛt.əs

Appendix B: Descriptive Statistics for Continuous predictors for Set I of disyllabic words.

Effect	Descriptive Statistics for Continuous predictors (Set 1 in Results_Set_1)							
	Level of (Factor)	Level of (Factor)	N	LexTale (Mean)	LexTale (Std.Dev.)	LexTale (Std.Err)	-95.00 (Cnf.Lmt)	+95.00 (Cnf.Lmt)
Total			1032	81.3419	10.3379	0.3218	80.7104	81.9733
"L1"	Russian		432	78.2944	10.9323	0.5260	77.2606	79.3282
"L1"	Polish		288	80.4958	10.0825	0.5941	79.3265	81.6652
"L1"	Czech		312	86.3423	7.4970	0.4244	85.5072	87.1774
G.Cat.	Verb		516	81.3419	10.3429	0.4553	80.4473	82.2364
G.Cat.	Noun		516	81.3419	10.3429	0.4553	80.4473	82.2364
WeightDist	HvHc		258	81.3419	10.3530	0.6446	80.0726	82.6111
WeightDist	LH		258	81.3419	10.3530	0.6446	80.0726	82.6111
WeightDist	LHc		258	81.3419	10.3530	0.6446	80.0726	82.6111
WeightDist	LHv		258	81.3419	10.3530	0.6446	80.0726	82.6111
"L1"*WeightDist	Russian	HvHc	108	78.2944	10.9705	1.0556	76.2018	80.3871
"L1"*WeightDist	Russian	LH	108	78.2944	10.9705	1.0556	76.2018	80.3871
"L1"*WeightDist	Russian	LHc	108	78.2944	10.9705	1.0556	76.2018	80.3871
"L1"*WeightDist	Russian	LHv	108	78.2944	10.9705	1.0556	76.2018	80.3871
"L1"*WeightDist	Polish	HvHc	72	80.4958	10.1356	1.1945	78.1141	82.8776
"L1"*WeightDist	Polish	LH	72	80.4958	10.1356	1.1945	78.1141	82.8776
"L1"*WeightDist	Polish	LHc	72	80.4958	10.1356	1.1945	78.1141	82.8776
"L1"*WeightDist	Polish	LHv	72	80.4958	10.1356	1.1945	78.1141	82.8776
"L1"*WeightDist	Czech	HvHc	78	86.3423	7.5335	0.8530	84.6438	88.0408
"L1"*WeightDist	Czech	LH	78	86.3423	7.5335	0.8530	84.6438	88.0408
"L1"*WeightDist	Czech	LHc	78	86.3423	7.5335	0.8530	84.6438	88.0408
"L1"*WeightDist	Czech	LHv	78	86.3423	7.5335	0.8530	84.6438	88.0408
"L1"*G.Cat.	Russian	Verb	216	78.2944	10.9450	0.7447	76.8266	79.7623
"L1"*G.Cat.	Russian	Noun	216	78.2944	10.9450	0.7447	76.8266	79.7623
"L1"*G.Cat.	Polish	Verb	144	80.4958	10.1001	0.8417	78.8321	82.1596
"L1"*G.Cat.	Polish	Noun	144	80.4958	10.1001	0.8417	78.8321	82.1596
"L1"*G.Cat.	Czech	Verb	156	86.3423	7.5091	0.6012	85.1547	87.5299
"L1"*G.Cat.	Czech	Noun	156	86.3423	7.5091	0.6012	85.1547	87.5299

Appendix C: Column Labels for Set I of disyllabic words.

Label	Column Labels Labels for the columns of the design matrix X						
	Column	Variable	Level of (Variable)	versus (Level)	Variable	Level of (Variable)	versus (Level)
Intercept	1						
"L1"	2	L1	Russian	Czech			
"L1"	3	L1	Polish	Czech			
G.Cat.	4	G.Cat.	Verb	Noun			
WeightDist	5	WeightDist	HvHc	LHv			
WeightDist	6	WeightDist	LH	LHv			
WeightDist	7	WeightDist	LHc	LHv			
"L1"*WeightDist	8	L1	Russian	Czech	WeightDist	HvHc	LHv
"L1"*WeightDist	9	L1	Russian	Czech	WeightDist	LH	LHv
"L1"*WeightDist	10	L1	Russian	Czech	WeightDist	LHc	LHv
"L1"*WeightDist	11	L1	Polish	Czech	WeightDist	HvHc	LHv
"L1"*WeightDist	12	L1	Polish	Czech	WeightDist	LH	LHv
"L1"*WeightDist	13	L1	Polish	Czech	WeightDist	LHc	LHv
"L1"*G.Cat.	14	L1	Russian	Czech	G.Cat.	Verb	Noun
"L1"*G.Cat.	15	L1	Polish	Czech	G.Cat.	Verb	Noun
LexTale	16	LexTale					
G.Cat.*LexTale	17	G.Cat.	Verb	Noun	LexTale		
WeightDist*LexTale	18	WeightDist	HvHc	LHv	LexTale		
WeightDist*LexTale	19	WeightDist	LH	LHv	LexTale		
WeightDist*LexTale	20	WeightDist	LHc	LHv	LexTale		