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Jakub Kaprál

Utilization of general rhythm metrics for differentiation of Slovak English from Slovak and English

Použitelnost rytmických vzorců na odlíšení slovenské angličtiny od slovenštiny a angličtiny

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I declare that the following BA thesis is my own work for which I used only the sources and literature mentioned, and that this thesis has not been used in the course of other university studies or in order to acquire the same or another type of diploma.

Prehlasujem, že som bakalársku prácu vypracoval samostatne, že som riadne citoval všetky použité pramene a literatúru, a že práca nebola využitá v rámci iného vysokoškolského štúdia alebo k získaniu iného alebo rovnakého titulu.

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Abstract

The purpose of the present thesis is to analyze Slovak English from the perspective of speech rhythm in relation to its native (Slovak) and target (English) language. The first part contains theoretical background for the study of language rhythm, history of its research, and describes rhythmically relevant features of English and Slovak phonetic systems. It is concluded by summary of rhythmical differences between the two languages and hypotheses are proposed. The experimental part uses rhythm metrics for determination of phonetic properties of rhythm in Slovak English. It is based on recordings of one English and two Slovak representative radio reporters along with six recordings of Slovak students of English studies. The rhythm metrcis results for Slovak English closely approximate the results for native English but due to inconsistency of the results the question of aplicability of rhythm metrics to L1, let alone L2, remains open.

Keywords: Slovak English, speech rhythm, rhythm metrics, prosody, second language acquisition

Abstrakt

Cieľom tejto bakalárskej práce je analyzovať slovenskú angličtinu z hľadiska rytmu v jej vzťahu k materinskému (slovenčina) a cieľovému jazyku (angličtina). Prvá časť práce obsahuje teoretický podklad k štúdiu rytmu reči, históriu jeho výskumu a popisuje vzhľadom na rytmus relevantné vlastnosti anglického a slovenského fonetického systému. V závere prvej časti sú rozdiely medzi týmito dvoma jazykmi zosumarizované, a hypotézy sú predložené. Praktická časť tejto práce používa rytmické vzorce na určenie fonetických vlastností rytmu v slovenskej angličtine. Je založená na nahrávkach jedného anglického a dvoch slovenských reprezentatívnych rádiových hlásateľov spolu so šiestimi nahrávkami slovenských študentov angličtiny. Výsledky rytmických vzorcov slovenskej angličtiny sa tesne približujú k hodnotám angličtiny rodeného hovoriaceho. Vzhľadom na nejednotnosť výsledkov však otázka používania rytmických vzorcov pre skúmanie L1 jazykov, tobôž L2, ostáva otvorená.

Kľúčové slová: slovenská angličtina, rytmus reči, rytmické vzorce, prozódia, osvojovanie si cudzieho jazyka

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1. Introduction

Rhythm is undoubtedly an integral and inseparable part of nature. Its presence and influence is obvious from rhythmical changes of four seasons, alternation of night and day, recurrence of tides, etc. The common denominator for all rhythmical processes is an alternation, or recurrence of certain event. Since humanity is closely intertwined with nature, rhythm seems to be essential to human beings as well. Inside the human body rhythm governs beating of the heart, blood circulation, breathing, sleeping, nerve impulses, or, for instance, women cycles. The ubiquitousness of rhythm emphasizes its significance. Warner Brown declared that there is "hardly an act performed by us, either mentally or physically, into which rhythm does not enter as one of the obvious factors" (Warner Brown, 2013, p.4).

People seemed to have learned that rhythmical order of events considerably helps to organize human life. Various experiments proved that the rhythmic actions are executed more easily than arhythmic ones (e.g., Port, 2003; Cummins, 2009). Humanity has thus incorporated rhythmical patterns to their everyday activities – daily routines, work, military marching, architecture, music, dance, traffic and many more. According to the philosopher and sociologist Herbert Spencer rhythmical actions save energy, "rhythm is the only possible form of activity … [and] continuous motion is impossibility" (Adams, 1979, p. 9). Without rhythm every natural process would be distorted by anarchy. This assumption's veracity may be traced in the principle of prediction and confirmation. If any expectation is refuted, human beings tend to be more confused and their understanding of reality becomes difficult. If winter followed autumn, but next year winter followed spring, people would not be able to predict and organize their work accordingly. If women never knew how their menstrual cycles work, they would not be able to predict the probability of conception.

Similarly, this principle is present in perception of speech. The brain receives acoustic signal, upon which it bases a prediction of following sounds, words, or even statements. If there was no order in language and no rhythmical arrangement of sounds, the language would be less comprehensible and it would become much more difficult for brain to process it. According to Huggins and Buxton's studies, human ear tends to comprehend linguistic information more easily when it is rhythmical (Huggins, 1979; Buxton, 1983). Infants, our model learners, acquire language by listening to songs and nursery rhymes. Before the invention of printing press, songs, chants and poems –

the genres utilizing music in which the rhythm constitutes an inherent element – made learning of a text easier.

As all the processes that man does tend to become as simple and at the same time as effective as it is possible, the presence of rhythm in language is inevitable. Language exploits rhythm within all layers of both spoken and written form; whether it is the alternation of voice and silence (between sentences or words), alternation of strong and weak syllables, vowels and consonants, rhymes in poems, verses and choruses in lyrics of a song, equal distance between letters on the paper, or simple numbering of the pages. Speech itself has to adjust to the rhythm of breathing which provides for intentional or unintentional pauses. Innumerable languages have been spoken in various regions of the world. These languages frequently differ substantially from each other in e.g. spelling system, articulation and pronunciation, intonation and stress, number and quality of speech sounds. All these properties form the identity and characteristic rhythm of a given language.

Rhythm in general has been studied from many angles and defined from various standpoints, but the phenomenon of language rhythm has received empirical attention only some seventy years ago. There has been a number of studies investigating the issue of speech rhythm, and various metrics have been developed in attempts to capture it. But it is not only native speech that has been subjected to research and rhythm measurements. Along with the development of transport and traveling, the need for communication between nations has become inevitable. Apart from their mother tongue, men had to acquire – at least in a certain level of proficiency – a language different from their own so that they could speak to and be understood by other people. The comprehensibility of the second language (hereafter L2) was conditioned by the learner's proficiency in a new language; how he adopted grammatical rules, how wide vocabulary he learned, and how close in pronunciation he was to a native speaker. One of the most prominent features of continuous speech concerning intelligibility is rhythm. There has been plenty of research confirming the assumption that a speech produced arhythmically or with a rhythm improper for a given language is much harder to understand; and everyone will agree that it is much easier to learn by heart a clearly rhythmical poem than one composed in free verse (though it contains thrusts which can be considered as rhythmical impulses). Last decades have seen a considerable increase in the amount of investigations in L2 speech rhythm. Fundamental questions have been presented by Ulrike Gut (2012) whether the differences between the rhythm

of a native speaker and the rhythm of L2 learner can be observed, and the progress in the rhythm acquisition measured (see section 2.1.4). I shall, in my thesis, follow Gut's inquiry into the possibility of measuring L2 speech in contrast with L1 and investigate the possibility of comparing the rhythm of Slovak L2 learners of English to the English native rhythm.

2. Theoretical Background

2.1 Rhythm research

If we are to present a relevant study on language rhythm, first it is necessary to look back to history of rhythm research in order to examine the approaches and proposed solutions to the issue of rhythm and its components.

2.1.1 History of Rhythm Research

Since different languages of the world seemed to be characterized by different rhythmic properties, the need for a universal classification of languages rhythms arose. Lloyd James (1940) was the first who attempted to impressionistically describe the dichotomy of language rhythm types, with the terms "morse-code" rhythm for English and "machine-gun" rhythm for French. Later, a widely accepted categorization of languages as syllable-timed and stress-timed was proposed by Pike (1945). The two types differ in rhythmical structuring: in stress-timed languages the intervals between stresses, and in syllable-timed the intervals between successive syllables are said to be equal. Languages traditonally regarded as stress-timed are English, Spanish and Russian; syllable-timed languages are exemplified by French and Spanish. Later the classification was extended by inclusion of mora-timed languages, Japanese being the prototype.

The idea of isochrony in the language rhythm has been undermined by a number of studies. Lehiste (1977) assigned the principle of isochrony a merely perceptual phenomenon. Her claim is based upon fact that listeners tend to hear interstress intervals in English as more isochronous than they are in reality. According to Roach (1982), the interstress intervals in stress-timed and mora-timed languages do not differ from syllable-timed languages. Contrary to the traditional belief, Roach's results show greater variability of syllable durations in syllable-timed than stress-timed languages.

Dauer (1983) concluded that the difference in language rhythm types has nothing to do with the durations of interstress intervals. Instead, she observes three areas in which the two language types differ: (1) Concerning syllable structure, there is greater variety in syllable types in stress-timed languages. (2) Vowel reduction in unstressed syllables is extensively employed in stress-timed languages (e.g. English, Swedish, Russian). As a result, schwa or syllabic /r/, /l/, or /n/ can be often found as the nuclei of unstressed syllables. (3) Whereas stress is usually lexically fixed in stress-timed languages, it is usually not very prominent in syllable-timed languages (e.g. French). In the conclusion, Dauer uses the term stress-based rather than stress-timed as a result of scepticism whether the rhythmic types are connected with timing at all. Since no reliable method to reliably measure the phonetic rhythm was found, Dauer argued that "description … requires both phonetic and phonological information" (Dauer, 1987). She proposed a new method for the rhythm classification based on the complex idea that language rhythm is influenced by a number of factors: syllable duration, syllable structure, vowel/consonantal quality distinctions, intonation, tone, and distribution of stress.

2.1.2 Rhythm metrics

To examine the impressionistic accounts and capture speech rhythm empirically, various metrics have been developed to measure the differences in speech rhythm: %V, ΔV, ΔC, VarcoC, Varco V, nPVI, rPVI (Ramus et al., 1999; Grabe & Low, 2002; White & Mattys, 2007a). These metrics were loosely based on the idea of isochrony (Lehiste, 1977) and Dauer's idea (Dauer, 1983; Dauer, 1987) that rhythm can be observed in relative consonantal and vocalic variability.

ΔV	Standard deviation of vocalic interval duration
ΔC	Standard deviation of consonantal interval duration
%V	Sum of vocalic interval duration divided by the total duration of vocalic and consonantal intervals
VarcoV	Standard deviation of vocalic interval duration divided by mean vocalic interval duration, multiplied by 100
VarcoC	Standard deviation of consonantal interval duration divided by mean consonantal interval duration, multiplied by 100
nPVI-V	Normalised Pairwise Variability Index for vocalic intervals
rPVI-C	Raw Pairwise Variability Index for consonantal intervals

Figure 1. Overall summary of rhythm metrics.

Ramus, Nespor and Mehler (1999) aimed to provide empirical support for the categorization of syllable and stress-timed languages. They divided speech into vocalic and consonantal intervals and employed three measurements in order to find the rhythm correlates: %V – percentage of utterance duration taken by vocalic intervals, ΔV – standard deviation of vocalic intervals, ΔC – standard deviation of consonantal intervals. Eventually the combination of %V and ΔC provided some support for the rhythm classes: %V emphasizes vowel duration and ΔC reflected a more complex syllabic structure, both present in stress-timed languages.

Grabe & Low (2002) aimed to capture the impressionistic observations of rhythmic differences in the acoustic singal. They followed Low, Grabe & Nolan (2000) and measured durations of vowels and the intervals between them (pauses excluded) and computed Pairwise Variability Index (PVI) which expresses a level of variability in consecutive measurements. Meanwhile Low et al. (2000) used a normalized version nPVI (Figure 1), Grabe et al. (2002) used raw non-normalized rPVI-C (Figure 2b) for consonants which are assumed to be less sensitive to speech-rate variations and normalized nPVI-V for vowels (Figure 2a). The results point at a greater variability of vowel durations in English which exhibits great vowel reductions, as opposed to French which lacks the vowel reduction, resulting in a distinctly lower vocalic variability. Overall, Grabe et al. (2002) conclude that their results show a weak distinction between stress and syllable-timed languages, possibly forming a continuum between the two categories.

$$r\,PVI = \left[\sum_{k=1}^{m-1} \left| d_k - d_{k+1} \right| / (m-1)\right]$$

Figure 2a. rPVI calculation according to Grabe & Low (2002)

$$n\,PVI = 100 \times \left[\sum_{k=1}^{m-1} \left| \frac{d_k - d_{k+1}}{(d_k + d_{k+1})/2} \right| / (m-1)\right]$$

Figure 2b. nPVI calculation according to Low, Grabe & Nolan (2000).

Barry et al. (2003) suggest a new metrics in measuring language rhythm. They introduce an extension of PVI, using a label PVI-CV. The metrics involves both consonantal and vocalic intervals together in order to capture the complexity of consonantal and vowel groupings in sequence. Barry et al. (2003) claim %V and the new PVI-CV to be the most plausible metrics since they are suited to capture consonantal-vocalic relationship.

Ten years later, Dellwo and Wagner (2003) proposed speech-rate normalised versions of rhythm metrics, VarcoC and VarcoV (Figure 3).

$$\mathbf{VarcoΔC = ΔC * 100/meanC}$$
$$\mathbf{VarcoΔV = ΔV * 100/meanV}$$

Figure 3. VarcoC/VarcoV by Dellwo & Wagner (2003) is defined as the percentage of ΔC/ΔV of the mean value for consonantal intervals.

2.1.3 Rhythm research on L2

Although the research in language rhythm is primarily concerned with native speech rhythm, rapidly growing numbers of foreign learners call our attention to the study of L2 language properties. Foreign L2 accents have been given empirical attention only last forty years (Piske, 2001). As Crystal (1996) noted, the L2 speakers of English would soon outnumber native ones. The study of L2 speech-rhythm may illuminate the difficulties of acquiring a foreign accent and help the learners cope with rhythmical differences between their own language and L2. Gut (2012) investigates the possibility of comparing L1 and L2 rhythms, and explores the option of evaluating the stages of L2 rhythm acquisition with the quantitative rhythm metrics. On the basis of White & Mattys (2007a), Gut (2012) claims that when the speaker's L1 and L2 are rhythmically similar, none of the metrics differentiates between native and non-native rhythm.

Even for L2 speakers of English, the results for rhythm metrics were not black-and-white. Both White & Mattys (2007a) on the basis of English and Spanish, and Stockmal et al. (2005) on the basis of Latvian agree that both PVI-V and PVI-C (see section 2.1.2, Figure 2a and 2b) are unable to differentiate between native and non-native rhythm. The studies that at least in some metrics succeeded in differentiating native and L2 speech rhythm were those which used PVI-V and ΔC (Gut, 2003; Stockmal 2005).

The study of Wagner and Dellwo (2005) on L2 rhythm builds on the suggestion that if the rhythm classes exist, the learners whose L1 belongs to the same rhythm class as their L2 should have advantage over the learners with L1 of a different rhythm class. The metrics %V, ΔC, and PVI were used, but no significant advantage was found and it was suggested that the speakers of either rhythmic class may produce the same rhythmic output independent of their L1. In White & Mattys (2007a) study,

it was hypothesized that the measurements of the learner's L2 speech rhythm would be different from the values for his native L1 and target L2 language. Above all, VarcoV best discriminated between native and non-native rhythm (see section 2.1.2, Figure 3).

Concerning the level of L2 acquisition, the metrics did not display significant differences between L2 learners' levels. The results of Guilbault (2002) and Gut (2009) did not succeed in measuring the L2 acquisition process. Stockmal (2005) is one of few studies that validate the rhythm metrics in assessing the L2 rhythm acquisition. Significant differences in PVI-V and ΔC were reported between beginners and advanced Russian learners of Latvian. On the other hand, %V and PVI-V did not differentiate between the two groups.

2.1.4 Difficulties of Rhythm Metrics

However, the issue of measuring speech rhythm has remained controversial. As Volín (2010) proposed, the metrics are too trivial to explain the configurational wealth of a language. Gimson (1975) points to psychological foundations of language rhythm: "Since rhythm involves […] a 'mental beat,' there is no requirement that it should have *any* phonetic manifestation. This is true of musical rhythm as well as speech; the regular beat of a piece of music is not necessarily marked by any specific dynamic feature, but is nevertheless perceived by both performer and listener" (Gimson, 1975, p. 124). There has been a growing tendency to orientate the rhythm research on the listener as the concepts of isochrony and language rhythm might be merely perceptional matters. This view is supported by Ramus who states that perceptual experiments "should be the yardstick by which theories of speech rhythm will be measured" (Ramus et al., 2003, p. 6), and Volín who claims that "rhythm is not a property of the acoustic signal but a perceptual phenomenon" (Volín, 2010, p. 5). The elusive character of speech rhythm does not yield to rhythm metrics since they are limited to capture the timing of speech. According to Roach "all languages display both sorts of timing … [and] different types of timing will be exhibited by the same speaker on different occasions and in different context" (Roach, 1982, p. 5). The strict division into stress and syllable-timed languages is not appropriate. As Crystal (1996) suggested, the two extremes form rather the ends of a continuum on which the languages can occur (see section 2.1.2).

On the basis of the preceding research on speech rhythm and L2 rhythm acquisition, Gut (2002) doubts the validity of the rhythm metrics altogether. The question of the applicability of the rhythm metrics in order to measure the speech rhythm differences still remains open. It has been emphasized by a number of prominent phoneticians that while the metrics do capture some phonetic properties of speech, it is not possible to grasp the elusive aspect of speech rhythm with them.

Kohler (2009a), providing a concise review of the rhythm research history, emphasizes the fact that the "results point the way for future research into rhythmic patterning: to place the listener at the centre, even in the analysis of its production, in order to provide an insightful account of rhythm as a feature of speech interaction in languages" (Kohler, 2009a, p. 36). Kohler proposes a new way of measuring speech rhythm. He suggests to incorporate into the research four temporal variables which are supposed to signal rhythmicity: fundamental frequency, syllabic duration, syllabic energy and spectral dynamics. In addition, Kohler (2009a) criticizes the language rhythm research for measuring inappropriate properties that do not capture the concept of language rhythm and for disregarding the listener. The research should concentrate on communicative aspect of rhythm since "speech rhythm is different from, and goes beyond, phonology-driven speech timing" (Kohler, 2009a, p. 8).

2.2 Language rhythm

Research of language rhythm requires a preliminary study of the relevant linguistic factors, since it is those elements that interplay to form the resulting rhythm of a particular language. In order to provide a concise study, we will have a look at the components of language rhythm at all layers. Rhythm of the language is conveyed by language stress. The elements that are affected by language stress are syllables**,** and the relevant units for the rhythmic character of syllables are vowels.

2.3 English Rhythm

There is not a more thoroughly studied and researched speech rhythm than the English one. Its foundations and properties are throughly discussed in Roach (1983). English has been traditionally considered a stress-timed language *par excellence* (Bertran, 1999). Basic unit of rhythmic patterning in English is the foot. It begins with a stressed syllable and includes all the unstressed syllables up to (but not including)

the following stressed syllable (Roach, 1983). All the feet are perceived to be of roughly the same duration.

2.3.1 Vowels

English vowel system contains 20 vowels (i.e. In Southern British Standard (SBS), which will be used as referential in the thesis). They are divided into short and long vowels, but they do not however differ merely in length – which is rather relative – but in quality. The short vowels are /ɪ/, /æ/, /ʌ/, /ɒ/, /u/ and schwa, the long vowels are /iː/, /ɜː/, /ɑː/, /ɔː/, /uː/. English has eight diphthongs: /eɪ/, /aɪ/, /ɔɪ/, /aʊ/, /əʊ/, /ɪə/, /eə/, /ʊə/. Regarding their length**,** English diphthongs are composed of two vowels. The first part is much longer and stronger than the second one. For example, /a/ in the personal pronoun "I" comprises about three thirds of the diphthong /aɪ/ and /ɪ/ therefore remains much shorter and quieter. Occasionaly, English exploits triphthongs /eɪə/, /aɪə/, /ɔɪə/, /əʊə/, /aʊə/. Since the movement in English vowel pronounciation is very small, the middle vowel is hardly noticeable in triphthongs. A specific feature of English language is the vowel reduction phenomenon in which all the vowels in unstressed syllables tend to converge to the schwa speechsound. It is the most frequent English vowel, centralized and with lax pronounciation.

2.3.2 Syllables

Syllable plays an important role in the perception of speech. Each syllable is constituted by its nucleus. It is the centre which creates little or no obstruction to the airflow. Usually, a short vowel, long vowel or diphtong functions as a syllable nucleus. Sometimes, the nuclei of syllables can be syllabic consonants /l/, /m/, /n/, or /r/. In most languages in the world minimum syllable is a single vowel in isolation without onset (preceding speechsounds) or coda (following speechsounds). Syllables in English are limited by maximum three onset consonants and maximum four coda consonants. Onset consonant clusters can be composed of maximum three consonants in *pre-initial, initial* and *post-initial* positions. Final consonant clusters are composed of maximum four consonants labelled *pre-final, final, post-final 1 and post-final 2.*

Since there is no general agreement of a syllable division in English, widely accepted guidelines for assesing the syllable boundaries are observed: (1) Maximum onsets principle attaches the consonant clusters between two vowels to the right-hand syllable, as far as possible. (2) Second principle assigns intervocalic consonants

to the stronger vowel, the one that is stressed. If ambivalent, they are assigned to the left-hand syllable. (3) Moreover, morphological boundaries and phonotactic rules should be observed. After short vowels there cannot be a syllable division.

One of the prominent features of English is that some of its syllables are strong and others are weak. The vowels in weak syllables tend to be shorter, have lower intensity and are different in quality. There are several restrictions. Syllable nuclei in weak syllables can be represented only by vowels schwa, /ɪ/, /u/ or syllabic consonants. If the vowel in the strong syllable is short it must have a coda. Similarly to the syllables, some English words can have weak and strong forms as well. Strong form of the word preserves the prominence of the stressed syllable, or at least the full vowel in the syllable. In weak forms, the prominence is not preserved and the vowel is often reduced in schwa. Nearly all the words with weak forms are grammatical. Their occurrence usually depends on their position in the sentence and recoverability from the context. The utilization of weak forms significantly helps create the distinctive English rhythm.

2.3.3 English stress

English stress is a highly complex matter. Its placement can be predicted on the basis of several factors, such as complexity of the word, its grammatical category, number of syllables and their phonological structure (only strong syllables can be stressed). English words often have variable stress caused by conversion (noun-verb, adjective-verb) which usually moves the stress to the following syllable.

According to Roach (1991), we can study stress from the productional and perceptional point of view. Production of stress is believed to be related to the muscular action of the speaker. Perceptually, all stressed syllables are prominent due to four factors: they are louder, longer, of higher pitch and different quality. In English language two levels of stress are widely recognized: primary and secondary stress which is slightly weaker than the former.

2.4 Slovak Rhythm

Slovak rhythm has been traditionally regarded by phoneticians as mora-timed (Trubeckoj, 1939, cited in Pauliny, 1968). Morae are the units which constitute the quantity of syllable. Short carrier of syllabicity equals one mora, long carrier of syllabicity equals two morae (Pauliny, 1968). The moraic character of Slovak

is supposed to be evident from the so-called "rhythmic law" which shortens the succeeding syllable if the previous one is long. This law applies to diphthongs as well (*mestá-miesta*). It follows that in Slovak language the length of two morae can be expressed not only by long vowel, but also by diphthong and that there may be maximum of three morae in two succeeding syllables. The "rhythmic law" has a number of exceptions in Slovak which are caused by the need to maintain the correct morphology. The fact that Slovak allows for concessions in this respect suggests that the conception of mora as the basic prosodic unit in Slovak language language remains somewhat obscure.

Standard literature on Slovak phonology (Kráľ & Sabol, 1989) categorizes Slovak rhythm as stress-timed. Recent study by Beňuš (2012a) claims that various quantitative analyses consistently placed Slovak rhythm in the vicinity of traditionally syllable-timed languages, e.g. French and Italian. However, phonemic vowel distinctions and the so-called "rhythmic-law" should increase V-intervals variability and push Slovak more towards stress-timed languages such as Czech, but the results failed to prove it (Beňuš, 2012a, p. 4)

2.4.1 Vowels

Slovak language is a West-Slavic language that has a phonemic distinction of vowel quantity in all five major vowel qualities (Beňuš, 2012a). There are five short Slovak vowels /i/, /e/, /a/ /o/, /u/ and corresponding long vowels /iː/, /ɜː/, /ɑː/, /ɔː/, /uː/. There are four diphthongs: /ie/, /ia/, /iu/, /uo/. The diphthongized short vowel 'ä' is very rare in everyday speech, used mostly in formal elevated discourse. Slovak does not contain triphthongs.

The duration of Slovak long vowels is approximately twice the short ones (Kráľ & Sabol, 1989, p. 200) it was noted that long /ɑː/ is more open than the short one. However the differences are so small that Slovak long vowels can be considered neither more closed nor more open than their short counterparts. Experiments of Beňuš and Mády (2010) showed, that Slovak long vowels are approximately 1.5-2 times longer than their short counterparts. The phonemic quantity contrast in Slovak is salient and minimally affected by lexical stress. Following the moraic conception of Slovak language, duration of Slovak diphthongs can be appropriately compared to long vowels. It is worth noting that the first part of the diphthong tends to be shorter than the second part.

2.4.2 Syllables

Paulíny (1968) offers a thorough study on the character of Slovak syllables. The nucleus is formed by short vowels, long vowels, diphthongs or syllabic consonants /r/, /l/, /m/, /n/ /ŕ/ or /Ĺ/. However, /l/ and /r/ can be syllabic only when they are surrounded by consonants. As in other languages, the most common syllabic structure is CV, V being sparse. Syllables in Slovak language are limited by maximum of three onset consonants and two coda consonants.

2.4.3 Slovak Stress

Slovak primary stress is phonologically fixed on the first syllable of word. Secondary stress is placed either on the third syllable or on the penultimate syllable of the words with more than 4 syllables. According to impressionistic accounts and Mocova (2012), some regional Slovak accents put stress on different syllables, e.g. some accents of Eastern Slovakia and Zemplín (Mocova, 2012, p. 38). In Slovak, vowels in both stressed and unstressed syllables maintain their acoustic characteristics and formant structure although stressed syllables in Slovak tend to be melodically higher than unstressed ones. (Kráľ & Sabol, 1989, p. 360)

2.5 Differences between Slovak and English rhythm

2.5.1 Ortography

English and Slovak utilize different concepts for the relationship between written and spoken language. Slovak sound system displays a high level of correspondence between spelling and its acoustic representation. On the contrary, there is a considerable lack of correspondence between spelling and pronounciation in English. This is caused by various historical and social events in the development of English language (Cenoz & Lecumberri, 1999). What is more important, however, is that it may contribute to the difficulties with the phonetic portrays of individual words and, subsequently, in connected speech with the L2 speech rhythm.

2.5.2 Vowels

Whereas vowels in English inventory are differentiated mostly by their quality, Slovak vowels are differentiated by their quantity. The category of quantity of English vowel is realized as mere allophonic variation when the vowel is preceded by either

lenis or fortis consonant. Concerning the production and perception of rhythm, English and Slovak vowel systems differ substantially in the realization of vowel reduction. English employs vowel reduction widely and its most frequent vowel is schwa (see section 2.3.1), but Slovak resists the vowel reduction and its most frequent vowel is short /a/ (Bilá & Zimmermann, 1999, p. 3).

There is also a great disproportion between Slovak and English diphthongs. Whereas English uses eight diphthongs (see section 2.3.1) Slovak uses only four (see section 2.4.1). In English, the first part of the diphthong is much longer and stronger than the second one (Roach, 1991, p. 21) – for example the /e/ sound in the word *may* is considerably longer and stronger than /ɪ/ sound in the diphtong /eɪ/. In Slovak diphthongs it is the second part which is longer and more prominent (Pauliny, 1979, p. 132) – for example the /a/ sound in the word *viac* is longer and stronger than /i/ in the diphthong /ia/. The Slovak diphthongs are rising as opposed to the English diphthongs which have a falling tendency.

2.5.3 Prosody

As Metruk (2012, p. 57) noted, segmental mistakes made by Slovak learners of English are more perceptually distinctive, but from the point of intelligibility, they are less significant than suprasegmental mistakes. The different approach to stress placement in Slovak and English language permit different metric arrangement of poetry. From the Slovak convention of placing stress on the first syllable of the word, it follows that dactyl and trochee are inherently typical feet for the Slovak poetic rhythm (Sabol, 1979, p. 159). Iamb, the natural English foot, was brought into Slovak poetry in 19th century by *Hviezdoslav's* generation of poets. Iamb automatically created tension with the natural rhythm of Slovak and was perceived to belong to "elevated style" (Bakoš, 1968, p. 177).

2.5.4 Stress

Between English and Slovak stress, there are considerable differences in both durational and magnitudinal scale. Concerning the stress strength, English word stress ranks among the strongest whereas the Slovak stress is one of the weakest among European languages (Kráľová, 2005, p. 24). The difference in quantity of stressed and unstressed syllables of native and non-native L2 English speaker was researched by Bilá and Zimmerman (1999). They hypothesized that Slovak L2 speakers of English

would exhibit a smaller distinction between the duration of stressed and unstressed syllables than native speakers. The assumption was based on the fact that whereas English stressed syllables are 1.5 times longer than unstressed ones, Slovak stressed syllables are only 1.2 times longer than unstressed ones. Three native English speakers and five Slovak English L2 speakers – university students of English and American literature – were recorded and the differences between quantity of stressed and unstressed syllables were calculated. The analyzed material comprised 22 minutes of spontaneuous picture description. In order to determine whether the syllable was stressed or not an English dictionary was used. From the material, 2988 syllables were extracted – including diphthongs, triphthongs and long vowels – and the quantitative distinctions between the duration of stressed and unstressed syllables were calculated for every speaker. Further, aritmetic mean, standard deviation, maximum, minimum and coefficient of variation were computed. The results confirmed that whereas the native speakers maintain the same proportion between the quantities of stressed and unstressed syllables, the L2 speakers display significantly different proportions between the quantities. The only L2 speaker who approximated the results of the native speakers was a student who lived in English enviroment for seven years. Based on these observations, it can be assumed that Slovak L2 English will be less sensitive to the distinctions in strength and duration between stressed and unstressed syllables.

In addition, the simple Slovak system of word placement on the first syllable causes a great difficulty in acquiring complex English speech rhythm. English employs flexible yet predictable stress placement which can occur on any syllable in the word. English prepositions are always unstressed unless they are emphasized. Stress in Slovak tends to be transferred to the preceding one-syllable preposition, thus forming a unit typical for Slovak rhythm (see section 2.5.3). The most frequent in Slovak are falling *decrescendo* stress-groups and rising *crescendo* stress-groups are almost entirely nonexistent (Sabol, 1979, p. 195). For example, the phrase *ˈna život a ˈna smrť* is stressed on the prepositions *na.* In the expressions with a prepositions in English there is a tendency towards stressing the noun (*in the ˈtrain*), in Slovak the preposition (*ˈvo vlaku*) (Kráľová, 2005, p. 24).

The issue was emphasized in the Kráľová's study (2005), where the English-Slovak phonic interference was researched on both segmental and suprasegmental level. Fifteen native English speakers were asked to evaluate the pronounciation of sixty

Slovak L2 speakers – university students of English and American studies – who recorded a spontaneous autobiography-focused material. The native speakers were instructed to identify any pronounciation deviations in the recordings. The mistakes were assembled into groups and a frequency list was created. It is evident from the Kráľová's results that the stress placement for Slovak L2 learners of English unaccustomed to the possibility of stressing other syllable than the first might clearly pose a great problem; 47.06% of all the phonic mistakes made by Slovak learners of English were caused by misplacing the word stress (Kráľová, 2005).

2.6 Difficulties of Slovak learners with English rhythm

In order to have a perfect command of a foreign language, the task of acquiring its rhythm is indispensable. The L2 learners seem to constantly struggle with prosodic features of their L2 language. There are numerous factors influencing the effectivity of the process of L2 acquisition – general proficiency in L2, frequency of L2 use, age of L2 acquisition, affect and motivation, and similarities and differences between L1 and L2 (Piske et al., 2000). And above all, as we all have experienced, the phonetic aspect of L2 is frequently neglected in didactics. In most foreign language classrooms L2 pronounciation receives little attention, which causes the phonetic aspects of L2 to remain underdeveloped.

In my thesis, which aims to examine Slovak English L2 rhythm, only one factor, that of similarities and differences between L1 and L2, shall be taken into account as foundation for my hypotheses. Slovak English L2 rhythm can be influenced by the differences in the units which constitute the natural rhythm of language. On the segmental level, the difference in the perception of Slovak and English vowels may cause Slovak speakers emphasize vocalic quantity at the expense of vocalic quality. On the suprasegmental level, Slovak L2 speakers of English may frequently misplace the word stress on the 1st syllables of words as they are used to from their mother tongue (see section 2.5.4). And from the durational point of view, Slovak English may lack the durational difference between stressed and and unstressed syllable, thus distorting the typical English rhythm.

2.7 Hypotheses and research questions

The following experiment is founded on assumption that rhythm metrics are able to capture the concept of language rhythm classes. Because English language rhythm has been regarded as prototypically stressed-time and most of the liguists categorize Slovak rhythm as syllable-timed, we propose the following hypothesis:

H1: The rhythm metrics results will reveal a typological distinction between the English and Slovak language.

Following the conception that the recordings of Slovak L2 speakers ought to display signs of transition from one language rhythm type to another, we propose another hypothesis:

H2: The rhythm metrics results for L2 speakers of English (L2_ENG) should occur in the intermediate position between the results for L1 accents, while the L1 languages (L1_ENG and L1_SVK) will be placed on the opposite sides of the continuum.

Research questions:

Q1: Do the rhythm metrics confirm the Slovak language rhythm as syllable-timed?

Q2: Are the speakers of one mode consistent in their results? If not, why?

Q3: If the rhythm metrics succeed in differentiating the L1 and L2 speech, which ones are the most suitable for doing so?

Q4: Which end of the continuum does Slovak L2 English approximate – Slovak or English rhythm?

3. Method and Material

3.1 Recordings and the participants

The purpose of the experiment was to capture rhythmic properties of Slovak English as L2 language through rhythm metrics. In order to draw relevant conclusions about its rhythm, it was necessary to put Slovak English as L2 language into relation to both native and target L1 languages, Slovak and English. Hence three types of recordings had to be obtained: native L1 English (mode L1_ENG), Slovak English as L2 (mode L2_ENG) and native Slovak (mode L1_SVK).

For the recording of the native English speaker an excerpt from BBC news was chosen (see Appendix A). The BBC news readings of the period (cca. year 2000) were widely acknowledged as representative of the British Southern Standard. The politically-oriented text is narrated by a female BBC reporter JLA, the recording was chosen from Prague Phonetic Corpus. The text is narrated fluently in a most natural speech rate, without any hesitations or errors which might have interfered with natural speech rhythm.

The recordings of Slovak L2 speakers of English were obtained in the studio of the Institute of Phonetics at the Faculty of Arts of Charles University in Prague. The signal was recorded from the AKG C4500 B-BC condenser studio microphone directly into the sound card of the computer, using 32-kHz sampling rate. 25 university students of Slovak nationality aged from 19 to 26 were recorded. The participants were asked to fill out a consent form where they provided information on their background in studying English and longer stays in English-speaking countries. At least intermediate level of English was required. All participants were asked to read the same BBC news excerpt (see Appendix A). They had about 10 minutes to read the text and prepare difficult parts. During the recording process, they were asked to repeat the whole sentence or phrase if they made a significant error. All recorded readings were around 3 minutes and 30 seconds long. Subsequently, recordings of 3 male (CIBK, MIST, RADM) and 3 female (HORA, MEDA, PETA) speakers with similar level of fluency and speech rate were selected.

Recordings of two native Slovak speakers (BARB and GERN) were chosen from the traditional Slovak Radio (SRO) news (see Appendix B). The institution is generally considered to be representative of the standard Slovak pronounciation.

The text was politically-oriented and there were no fluency issues or mistakes that would disturb natural speech rhythm.

3.2 Data processing

All the selected recordings were analyzed in the computer programme Praat 5.3.63 (Boersma & Weenink, 2012), a useful tool for phonetic analyses. First, the recordings were divided into breath groups. The number and mean duration of individual speakers' breath groups are provided in Table 1.

Mode	Speaker	BG	Dur_mean
L1_ENG	JLA	36	3.98
L2_ENG	CIBK	26	6.15
	HORA	28	5.87
	MEDA	27	5.50
	MIST	25	5.89
	PETA	27	5.68
	RADM	26	5.08
L1_SVK	BARB	33	4.25
	GERN	31	4.25

Table 1. The speakers belong to one of three modes (L1_ENG, L2_ENG, L1_SVK – see section 3.1). The number of breath groups (BG) per speaker varies. *Dur_mean* is mean duration of all the speaker's breath groups.

Afterwards, pauses between intonation phrases as well as hesitations were excluded from the analysis. The segmentation of the speech sounds and determination of their boundaries followed the instructions of Machač & Skarnitzl (2009). In all the recordings, the dictionary forms (OALD[1]) of the words were preserved. In the next step, a point-tier was created to mark stressed vowels in the stressed syllables. The criteria for determining word stress for English stress (see section 2.3.3) and for Slovak stress (see section 2.4.3) were observed, and the tendencies for stress-placement in connected speech were followed.

The metrics %V, ΔV, ΔC, VarcoV, VarcoC, rPVI-V, rPVI-C, nPVI-V and nPVI-C (for detailed account of rhythm metrics see section 2.1.2) were calculated for all the breath groups for all speakers. Afterwards, weighted averages on the basis of duration of the intonation groups were calculated for every speaker, the data were assembled and relevant conclusions drawn.

[1] Oxford Advanced English Dictionary, http://www.oxfordlearnersdictionaries.com/.

4. Results and discussion

This chapter will analyze the data provided by the recordings. In section 4.1, the results for all the speakers and rhythm metrics are summarized. Section 4.2 describes a filter applied to data, and section 4.3 examines the variability of the results. In section 4.4, the results for the individual rhythm metrics are analyzed. The rhythm metrics which display the best discrimination abilities will be chosen for two-dimensional graphs in section 4.5. In section 4.6, the results will be compared to preceding research in the field and the position of Slovak L1 and Slovak L2 English within broader context of other languages will be examined.

4.1 Rhythm metrics results

The results of rhythm metrics for all the speakers are summarized in Table 2.

Mode	Speaker	Vocalic metrics					Consonantal metrics			
		%V	ΔV	VarcoV	rPVI-V	nPVI-V	ΔC	VarcoC	rPVI-C	nPVI-C
L1_ENG	JLA	39.02	50.41	64.31	55.22	66.22	63.66	53.43	75.63	62.75
L2_ENG	CIBK	34.89	41.32	57.1	44.08	56.56	67.89	53.19	78.1	60.1
	HORA	39.94	45.18	54.04	48.57	55.05	66.99	55.16	73.41	58.2
	MEDA	40.32	39.54	48.62	42.47	50.27	64.44	57.05	74.44	66.38
	MIST	38.38	39.17	52.46	41.16	51.63	64.66	56.32	73.45	64.45
	PETA	41.19	48.46	56.27	52.7	58.2	64.91	57.27	74.33	66.98
	RADM	36.42	33.85	52.39	35.85	52.96	59.8	55.62	72.65	70.25
L1_SVK	BARB	45.62	41.54	54.25	39.63	50.44	49.46	54.53	55.03	60.94
	GERN	45.55	50.67	61.78	46.39	52.08	54.68	57.4	63.35	65.96

Table 2. Mean values of vocalic and consonantal rhythm metrics for individual speakers of all three modes.

Mean values (Table 3) were calculated for the results of every mode (L2_ENG and L1_SVK in this case, L1_ENG consists of one speaker only). The results are plotted on a two-dimensional graph (Figure 4), highlighting the distinctions drawn by individual rhythm metrics.

Speaker	Vocalic metrics					Consonantal metrics			
	%V	ΔV	VarcoV	rPVI-V	nPVI-V	ΔC	VarcoC	rPVI-C	nPVI-C
L1_ENG	39.02	50.41	63.66	64.31	53.43	55.22	75.63	66.22	62.75
mean L2_ENG	38.53	41.25	53.48	44.14	54.11	64.78	55.77	74.4	64.39
mean L1_SVK	45.58	46.1	58.01	43.01	51.26	52.07	55.97	59.19	63.45

Table 3. Mean values of vocalic and consonantal rhythm metrics for the three modes (see section 3.1). Mode L1_ENG consisted of one speaker, hence no means were calculated. *mean L2_ENG* is average of all Slovak English speakers (mode L2_ENG: CIBK, HORA, MEDA, MIST, PETA, RADM), *mean L1_SVK* is average of native Slovak speakers (mode L1_SVK: BARB, GERN).

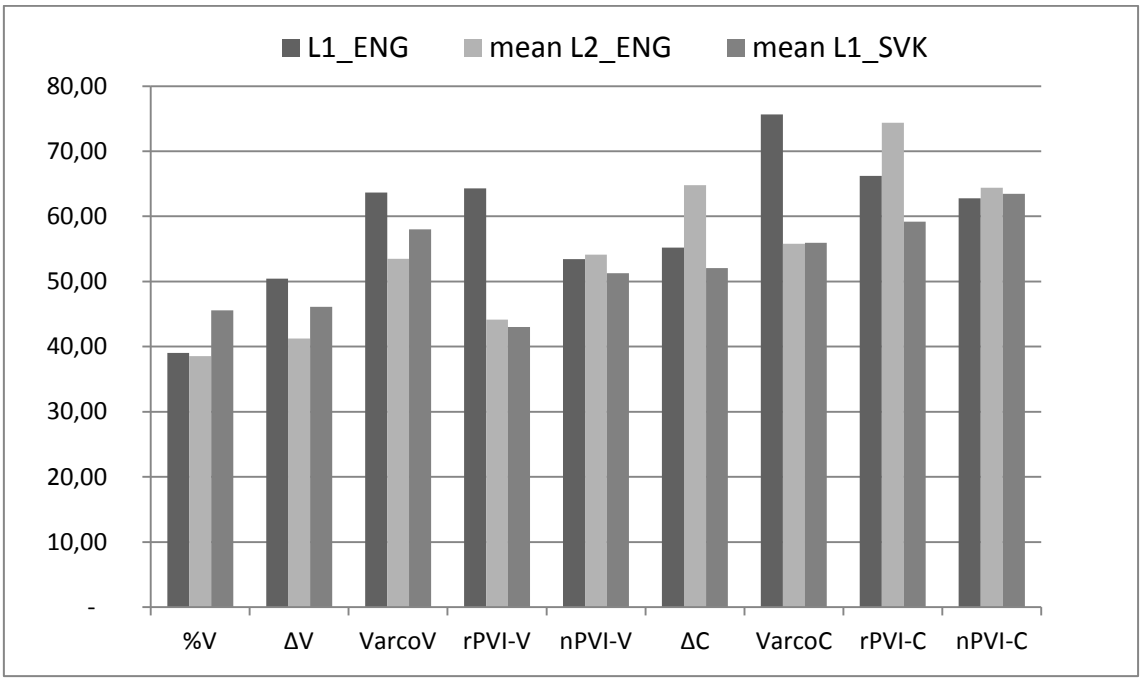

Figure 4. The mean rhythm metrics values from Table 3 for all three modes L1_ENG, L2_ENG, and L1_SVK.

Our hypotheses H1 and H2 (see section 2.6) predicted that Slovak and English native speaker's results would represent the two ends of a stress/syllable-timed rhythm continuum (see section 2.1.2) and the Slovak English L2 speakers' (L2_ENG) results would appear as intermediate between the two. It is apparent from the graph, however, that only one metrics (rPVI-V) out of nine succeeded to do so. All the other metrics kept positioning L2_ENG either below or above the boundaries setby the native languages. The metric which placed L2_ENG in the intermediate position is a non-normalized vocalic PVI which has tendency to be influenced by speech rate (Grabe & Low, 2002).

Nonetheless the results for normalized nPVI-V remain puzzling, as non-native L2_ENG exceeds the boundaries set by native languages.

Overall failure of the rhythm metrics to capture the basic distinction between native and non-native accent prompted us to re-examine raw data collected from the speech material. The observation of individual breath groups revealed that the most inconsistent values were provided by the breath groups with the shortest durations. With the decreasing duration of the breath groups the tendency to higher variation in results becomes greater. To validate this observation, the shortest and the longest breath group for each speaker (chosen from the mode L2_ENG for the sake of maximum diversity of results – six) was identified. The values were assembled in two tables (Table 4a for the shortest and Table 4b for the longest intervals). The standard deviations were calculated to assess the relationship of duration and variability, and plotted on a graph in Figure 5.

Speaker	Dur	%V	ΔV	ΔC	VarcoV	VarcoC	rPVI-V	rPVI-C	nPVI-V	nPVI-C
CIBK	0.8	38.73	10.35	54.23	13.37	55.36	7.47	51.58	9.22	59.64
HORA	1.18	42.46	13.6	78.62	10.82	57.69	10.98	48.99	8.73	33.98
MEDA	0.81	34.02	30.71	57.58	44.66	53.97	39.71	32.25	66.55	34.82
MIST	1.38	39.32	22.49	61.06	33.05	65.41	33.24	52.95	50.31	49.28
PETA	1.55	40.68	20.21	77.41	25.57	67.2	25.84	82.38	34.84	85.58
RADM	1.63	42.02	36.67	50.97	48.31	54.06	46.72	51.67	62.33	52.29
SD_ALL	-	4.23	9.18	10.86	16.19	5.10	16.02	9.60	29.31	12.33

Table 4a. The shortest breath groups with duration *Dur* were found for each speaker of L2_ENG mode with corresponding rhythm metrics values, and standard deviation SD_ALL from all the speakers's values for individual metrics was calculated.

Speaker	Dur	%V	ΔV	ΔC	VarcoV	VarcoC	rPVI-V	rPVI-C	nPVI-V	nPVI-C
CIBK	10.31	33.18	40.6	76.05	53.37	52.97	44.32	86.84	55.02	64.8
HORA	9.69	34.98	35.98	88.68	46.72	67.58	44.26	81.47	54.93	62.92
MEDA	8.49	42.92	41.8	47.44	53.94	46.03	38.96	68.12	44.59	66.91
MIST	9.33	36.83	35.25	69.27	48.22	58.76	30.65	83.04	39.24	74.98
PETA	8.71	38.9	38.32	80.84	47.49	72.88	44.41	78.29	52.66	65.91
RADM	8.03	33.39	29.59	65.05	52.97	59.59	31.27	78.3	49.78	80.08
SD_ALL	-	3.74	4.23	3.28	17.27	3.63	9.13	6.44	8.15	7.85

Table 4b. The longest breath groups with duration *Dur* were found for each speaker of L2_ENG mode with corresponding rhythm metrics values, and standard deviation SD_ALL from all the speakers's values for individual metrics was calculated.

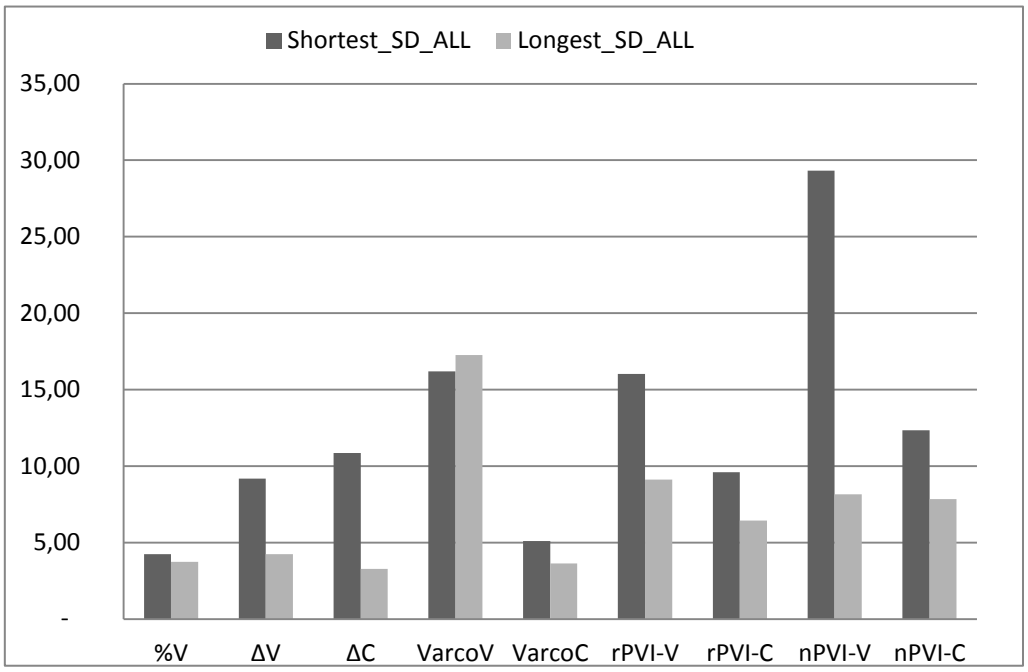

Figure 5. Comparison of standard deviations for the shortest (*Shortest_SD_ALL*) and longest (*Longest_SD_ALL*) breath groups of individual L2_ENG speakers for individual metrics taken from Table 4a and Table 4b.

The comparison of Table 4a and Table 4b values in Figure 5 shows that eight of nine standard deviations for the shortest breath groups are higher than for the longest breath groups. The standard deviations of ΔV, ΔC for the shortest breath groups were more than twice as high than those for the longest breath groups, and more than thrice as high for nPVI-V. In order to stabilize the results and give them higher transparency, we arbitrarily decided to apply filter to breath groups; those with the duration below three seconds were excluded from further analysis.

4.2 Data after filtering

After applying the filter, the amount of breath groups per speaker was reduced and the mean duration increased. As can be seen in Table 5, all the recordings contained after the selection approximately the same number of the breath groups:

Mode	Speaker	BG	Dur_mean
L1_ENG	JLA	23	5.29
L2_ENG	CIBK	21	7.13
	HORA	22	6.86
	MEDA	20	6.70
	MIST	21	6.65
	PETA	22	6.48
	RADM	22	5.68
L1_SVK	BARB	22	5.50
	GERN	22	5.30

Table 5. Speakers belong to one of three modes (L1_ENG, L2_ENG, L1_SVK – see section 3.1). The number of breath groups (BG) per speaker is approximately the same. *Dur_mean* is mean duration of all the speaker's breath groups.

With the modification of the data, the values for rhythm metrics were recalculated too. The new results for rhythm metrics for all the speakers are summarized in Table 6.

Mode	Speaker	Vocalic metrics					Consonantal metrics			
		%V	ΔV	VarcoV	rPVI-V	nPVI-V	ΔC	VarcoC	rPVI-C	nPVI-C
L1_ENG	JLA	38.57	49.07	63.02	53.84	65.38	64.34	53.30	76.06	61.80
L2_ENG	CIBK	34.90	41.82	57.52	44.60	56.88	68.41	53.31	78.26	59.86
	HORA	40.01	45.55	54.92	48.77	55.72	65.51	54.93	72.67	58.71
	MEDA	40.63	40.14	49.03	42.83	50.14	64.69	57.24	74.24	66.44
	MIST	38.47	39.51	52.76	41.32	51.62	65.51	56.88	74.70	65.35
	PETA	41.23	49.76	57.66	53.37	58.51	65.50	57.61	75.02	67.06
	RADM	36.43	34.38	53.19	36.06	53.15	59.73	55.40	73.12	70.33
L1_SVK	BARB	45.77	42.77	55.29	40.68	51.29	50.11	55.10	54.60	60.43
	GERN	45.80	51.49	61.75	47.37	52.02	55.48	57.55	64.46	66.26

Table 6. Mean values of vocalic and consonantal rhythm metrics for individual speakers of one of three modes: L1_ENG, L2_ENG and L1_SVK (see section 3.1).

Mean values (Table 7) were calculated for the results of modes L2_ENG and L1_SVK, since L1_ENG consists of one speaker only. The results are plotted on a two-dimensional graph (see section 4.4, Figure 6), highlighting the distinctions drawn by individual rhythm metrics.

	Vocalic metrics					Consonantal metrics			
	%V	ΔV	VarcoV	rPVI-V	nPVI-V	ΔC	VarcoC	rPVI-C	nPVI-C
L1_ENG	38.57	49.07	63.02	53.84	65.38	64.34	53.30	76.06	61.80
mean L2_ENG	38.61	41.86	54.18	44.49	54.34	64.89	55.89	74.67	64.63
mean L1_SVK	45.79	47.13	58.52	44.03	51.65	52.80	56.32	59.53	63.35

Table 7. Mean values of vocalic and consonantal rhythm metrics for the three modes (see section 3.1). Mode L1_ENG consisted of one speaker, hence no means were calculated. *mean L2_ENG* is average of all Slovak English speakers (mode L2_ENG: CIBK, HORA, MEDA, MIST, PETA, RADM), *mean L1_SVK* is average of native Slovak speakers (mode L1_SVK: BARB, GERN).

4.3 Variability of rhythm metrics within modes

The reliability of results should be supported by observation of variability in the results within the modes which comprise more than one speaker (L2_ENG and L1_SVK in this case). Because there was only one speaker for English, no variation could be detected. For all the metrics, standard deviation was calculated for both modes. Whereas L2_ENG mode contains recordings of the six Slovak L2 English speakers, L1_SVK mode comprises two native Slovak speakers. The results are shown in Table 8.

	Vocalic metrics					Consonantal metrics			
	%V	ΔV	VarcoV	rPVI-V	nPVI-V	ΔC	VarcoC	rPVI-C	nPVI-C
SD L2_ENG	2.51	5.30	3.27	6.02	3.23	2.83	1.65	1.98	4.47
SD L1_SVK	0.03	6.17	4.57	4.73	0.51	3.80	1.73	6.97	4.12
avg_SD	1.27	5.73	3.92	5.38	1.87	3.32	1.69	4.48	4.30

Table 8. Standard deviations calculated for the modes consisting of more than one speaker. *SD L2_ENG* is the standard deviation of all Slovak English speakers (mode L2_ENG: CIBK, HORA, MEDA, MIST, PETA, RADM), *SD L1_SVK* is the standard deviation of native Slovak speakers (mode L1_SVK: BARB, GERN), *avg_SD* is the mean standard deviation of the two.

The greatest variation was found in ΔV (avg_SD = 5.73), rPVI-V (avg_SD = 5.38), nPVI-C (avg_SD = 4.30) and rPVI-C for L1_SVK only (SD = 6.97). The high level of variation in these metrics is not at all unexpected. ΔV is subject to numerous factors influencing its results such as vowel reduction, contrastive vowel length and vowel lengthening (Ramus et al., 1999). rPVI-V is a vocalic pairwise variability index which is based on syntagmatic comparisons of vowel durations, and because it is non-normalized it is very sensitive to the nature of individual utterances (White & Mattys, 2007a). The highest amount of variation for intervocalic nPVI-C might be explained by the fact that the intervocalic intervals often comprise variety of consonants which might change differently in various speech-rates (Grabe & Low

(2002)). The variability of rPVI-C in mode L1_SVK is unexplained and probably caused by minimal number of speakers. The most stable results with the least amount of variation were found for speech-rate-insensitive %V which are in line with majority of research (e.g. Ramus, 1999; Grabe & Low, 2002; Beňuš, 2012a).

4.4 Analysis of the rhythm metrics values

Our hypotheses H1 and H2 (see section 2.6) predicted that Slovak and English native speaker's results would represent the two ends of a stress/syllable-timed rhythm continuum (see section 2.1.2) and the Slovak English L2 speakers' results would appear as intermediate between the two. It is apparent from Figure 6, however, that not all the metrics succeeded in this task. In the following two sections, we shall analyze the values for individual vocalic and consonantal rhythm metrics and evaluate their significance.

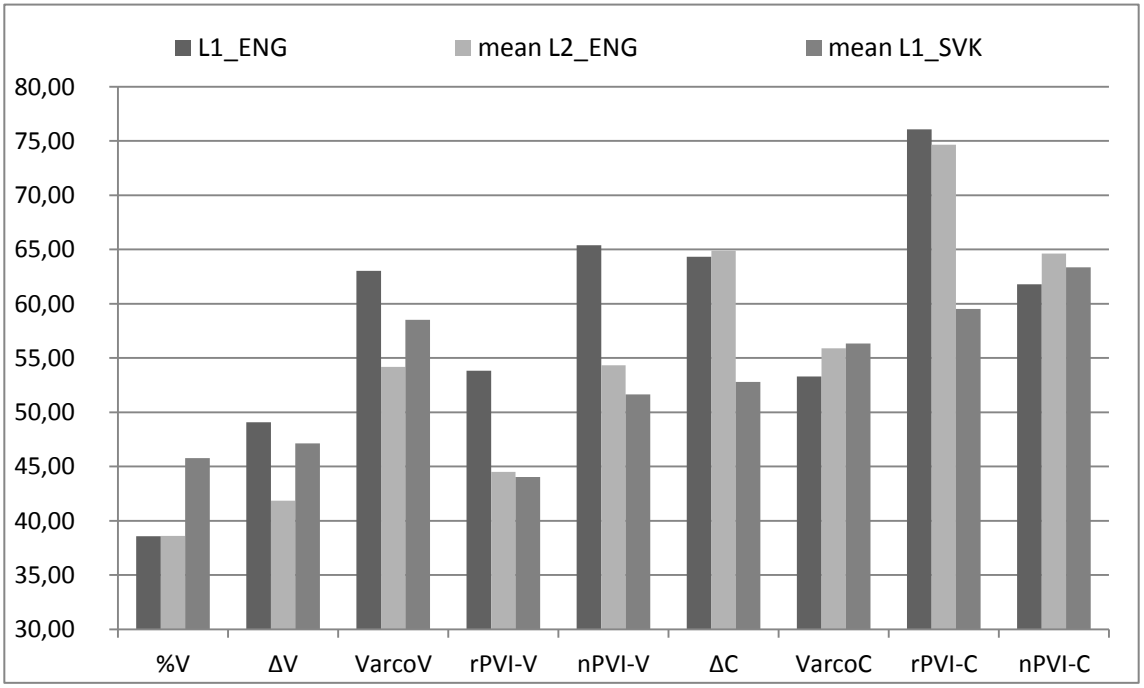

Figure 6. Mean rhythm metrics values for the three modes from Table 7 (see section 4.2).

4.4.1 Vocalic rhythm metrics

For **%V**, the results clearly distinguished native L1_SVK and L1_ENG ($F(2,192) = 56,69$; $p < 0,001$), and L2_ENG is found very close to the latter. The values of **ΔV** cannot be interpreted transparently, since the results for L2_ENG dropped massively below the boundaries set by native languages. Moreover, a high difference in ΔV results ($F(1,42) = 4,77$; $p < 0,05$) was found even among the two Slovak speakers BARB and GERN (SD = 6,17). As Ramus (1999) noted, the variability of vocalic intervals is influenced by several phonological factors such as vowel reduction, vowel lengthening and contrastive vowel length. **VarcoV** displayed the same issues as ΔV, the results for the Slovak English L2 accent are distinctly below both Slovak and English native accent. Both vocalic **nPVI a** vocalic **rPVI** displayed significant differentiation of L1_SVK and L1_ENG ($F(2,192) = 18,11$; $p < 0,001$ for nPVI and $F(2,192) = 5,59$; $p < 0,01$ for rPVI) and the results for the non-native L2_ENG approximate the former. Since the results of Grabe & Low (2002) confirmed that normalization of intervals is desirable especially for vocalic rhythm metrics, the values for normalized version of vocalic PVI will be used in further analyses.

4.4.2 Consonantal rhythm metrics

The results for **ΔC** clearly differentiate ($F(2,192) = 16,34$; $p < 0,001$) between native L1_SVK and L1_ENG, and the Slovak L2 English has approached and slightly overreached the native accent. This finding might be attributed to the fact that ΔC values are influenced by speech rate (Beňuš, 2005). Values of L1_ENG for **VarcoC were** lower than those of L1_SVK, with L2_ENG approaching the latter, but they were not significant ($F(2,192) = 0,67$; $p < 0,48$ for L1_ENG/L2ENG, $p < 0,59$ for L1_ENG/L1_SVK and $p < 0,99$ for L2_ENG/L1_SVK). From intervocalic PVIs, only rPVI yielded significant results. Whereas the distinctions in **nPVI-C** were not significant ($F(2,192) = 1,46$; $p < 0,28$ for L1_ENG/L2ENG, $p < 0,8$ for L1_ENG/L1_SVK, $p < 0,54$ for L2_ENG/L1_SVK) and probably blurred by the redundancy of normalization (see section 4.2), **rPVI–C** differentiated between native L1_ENG and L1_SVK clearly ($F(2,192) = 23,11$; $p < 0,001$), with L2_ENG approximating the former.

4.5 Rhythm classification of Slovak English

Based on (1) the results of the present study, (2) suggestions of Dellwo (2010) and Beňuš (2012a) that %V and PVI-C best separate stress-timed and syllable-timed languages, and (3) claims of Gut (2003) and Stockmal (2005) that PVI-V and ΔC were the only metrics which succeeded in differentiating native and L2 rhythm, we will propose two-dimensional graphs built on four rhythm metrics: %V/ΔC, and nPVI-V/rPVI-C. Our results for %V and ΔC corresponded to the findings or Ramus et al. (1999). Leaving ΔV with high level of variability (see section 4.2) aside, these two metrics are congruent with the notion of rhythm classes whereby stress-timed languages have significantly lower %V and higher ΔC than syllable-timed languages. The values are plotted on two-dimensional graph in Figure 7. L1_ENG has significantly lower %V ($F(2,192) = 56{,}69$, $p < 0{,}001$) and higher ΔC ($F(2,192) = 16{,}34$; $p < 0{,}001$) values than L1_SVK. The values of both %V and ΔC for non-native Slovak English (L2_ENG) are distinct from the native Slovak (L1_SVK), in fact they are almost identical with native English (L1_ENG). This might point to a relatively high level of proficiency of the Slovak L2 speakers and acquisition of English rhythm (or to the inability of rhythm metrics to reflect the L2 accent).

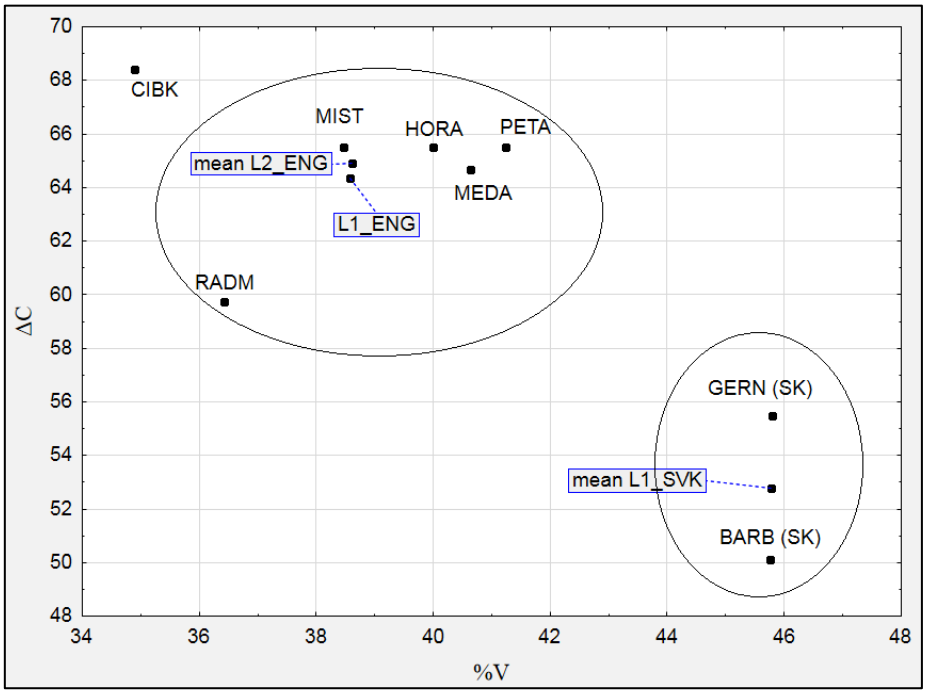

Figure 7. Scatterplot of %V/ΔC mean values for all speakers (see section 4.2, Table 6) and modes L2_ENG and L1_SVK (see section 4.2, Table 7). Black ellipses were drawn to roughly group together the results for speakers of modes L2_ENG and L1_SVK (see section 3.1).

The vocalic Pairwise Variability Indices – nPVI and rPVI – were particularly successful at differentiating native English and Slovak rhythm. The results are in agreement with those of Grabe & Low (2002) who predicted high values of the vocalic PVI indices for stress-timed languages, and follow Low et al. (2000) who suggested combination of vocalic and intervocalic PVI for better discrimination between rhythm classes. In Figure 8, vocalic *nPVI* values are plotted on the vertical axis against intervocalic *rPVI* values on the horizontal axis. However, the two metrics differ in the positioning of non-native Slovak English. Whereas nPVI-V values indicate its affinity with L1_SVK, rPVI follows the values of %V and ΔC which group non-native L2_ENG with native L1_ENG.

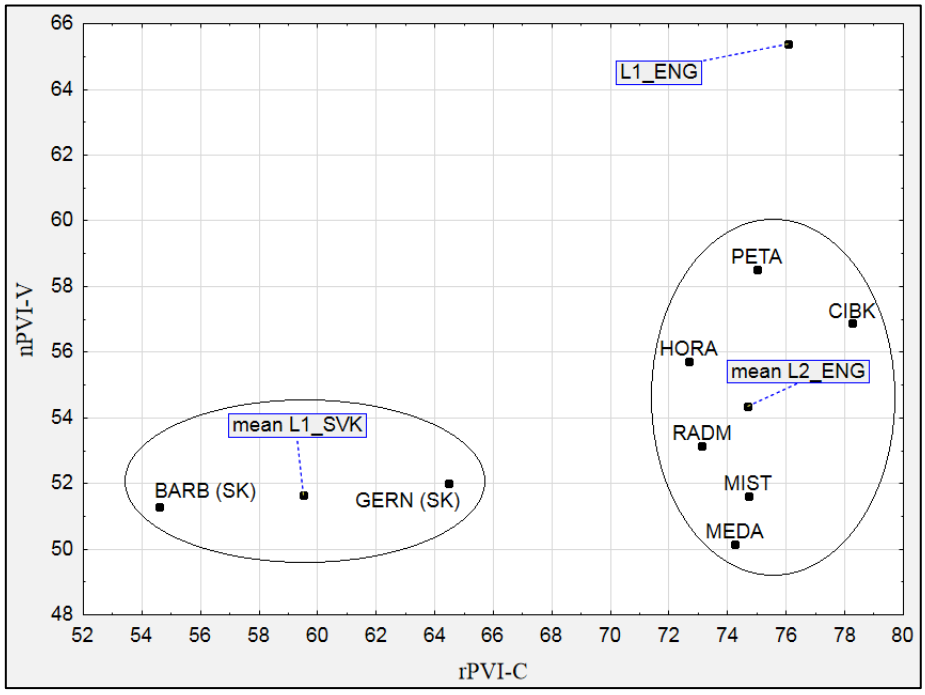

Figure 8. Scatterplot of nPVI-V/rPVI-C mean values for all speakers (see section 4.2, Table 6) and modes L2_ENG, L1_SVK (see section 4.2, Table 7). Black ellipses were drawn to roughly group together the results for speakers of modes L2_ENG and L1_SVK (see section 3.1).

4.6 Rhythm classification of Slovak

To provide a frame of reference for the values of Slovak and Slovak English provided by the experiment, the results were related to other studies that used the same rhythm metrics. The core metrics %V, ΔC, vocalic nPVI and intervocalic rPVI were used. Since the other metrics are not widely used they are omitted from the comparison. Values of the rhythm metrics for English language

were assembled. Spanish was chosen as a representative of syllable-timed languages, Japanese as a representative of mora-timed language and Polish as the language with presumably mixed rhythm. In addition, our values for non-native Slovak English were added. The data are summarized in Table 9.

Language	Study	Code	%V	ΔC	nPVI-V	rPVI-C
English	**present study (L1_ENG)**	**JK (L1_ENG)**	38.57	64.34	65.38	76.06
	Ramus et al. (1999), p.272	RAM (ENG)	40.1	53.5	-[2]	-[2]
	Grabe & Low (2002), p.41	G&L (ENG)	41.1	56.7	57.2	64.1
	White & Mattys (2007a), p.242	W&M (ENG)	38	59	73	70
	Arvaniti (2012), p.25	ARV (ENG)	45.7	60	59.9	68.9
L2 English	**present study (mean L2_ENG)**	**JK (L2_ENG)**	38.61	64.89	54.34	74.67
Slovak	**present study (mean L1_SVK)**	**JK (L1_SVK)**	45.79	52.8	51.65	59.53
	Beňuš (2012a), p.3	BEN (SVK)	47.7	47	38.8	44.8
Spanish	Ramus et al. (1999), p.272	RAM (SPA)	43.8	47.4	-[2]	-[2]
	Grabe & Low (2002), p.41	G&L (SPA)	50.8	47.5	29.7	57.7
	White & Mattys (2007a), p.242	W&M (SPA)	48	40	36	43
	Arvaniti (2012), p.25	ARV (SPA)	49.2	46.6	49.1	53.7
Japanese	Ramus et al. (1999), p.272	RAM (JAP)	53.1	35.6	-[2]	-[2]
	Grabe & Low (2002), p.41	G&L (JAP)	45.5	55.8	40.9	62.5
Polish	Grabe & Low (2002), p.41	G&L (POL)	42.3	71.4	46.6	79.1

Table 9. Overview of %V, ΔC, nPVI-V and rPVI-C values for several languages from other studies providing frame of reference for the results of present study (see section 4.2, Table 7).

The summary of values was plotted on two-dimensional graph. The variables are identical with those from section 4.4 – %V against ΔC is plotted in Figure 9, nPVI-V is plotted against rPVI-C in Figure 10.

[2] Ramus et al. (1999) didn't calculate PVIs as they weren't invented yet.

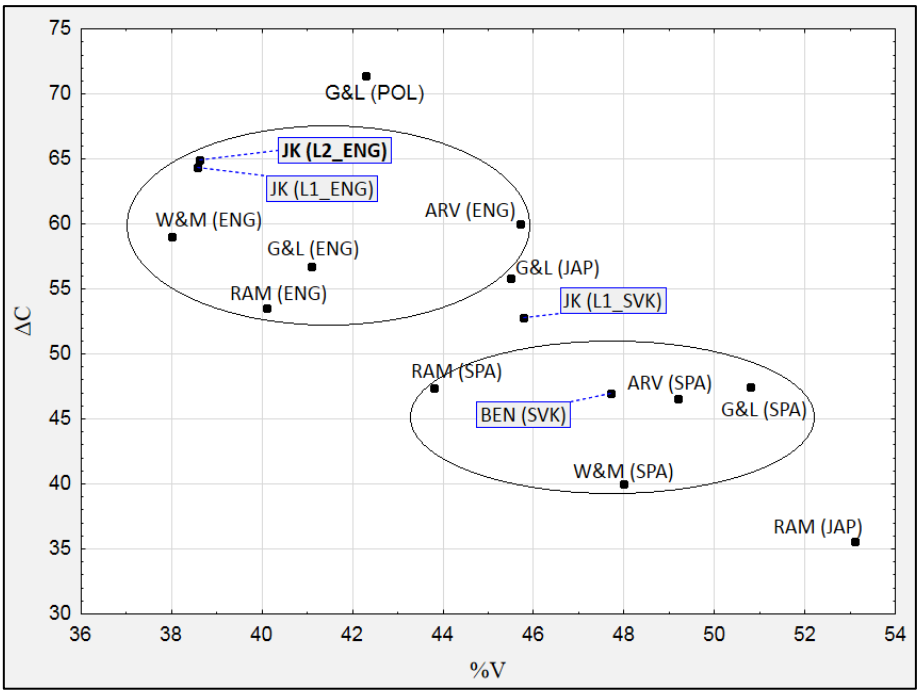

Figure 9. Scatterplot of %V/ΔC values from Table 9. Black ellipses were drawn to roughly group together the results for speakers of English (*ENG*) and Spanish (*SPA*).

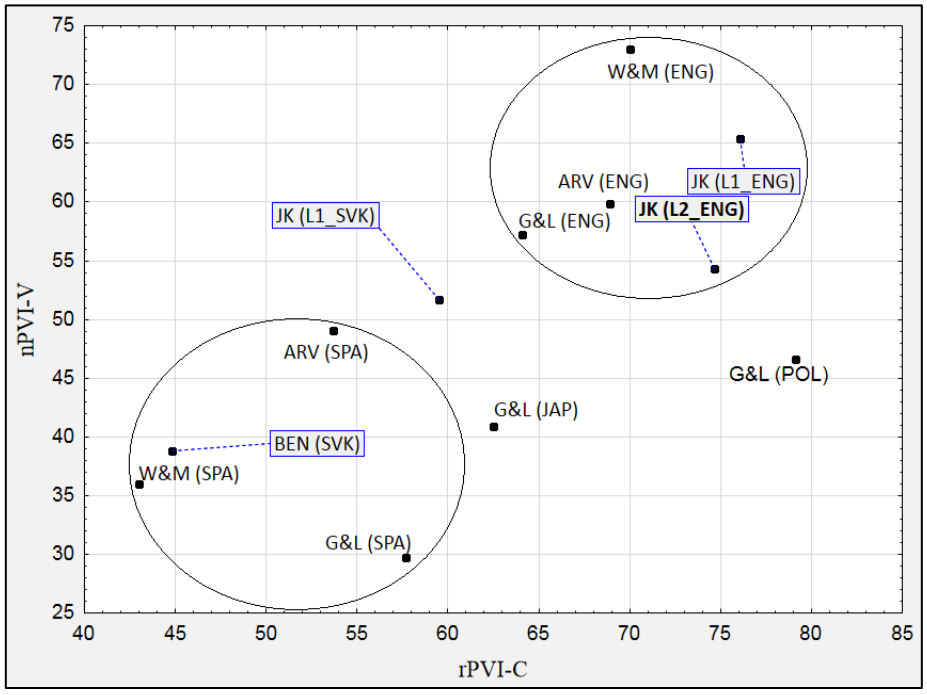

Figure 10. Scatterplot of nPVI-V/rPVI-C values from Table 9. Black ellipses were drawn to roughly group together the results for speakers of English (*ENG*) and Spanish (*SPA*).

As Grabe & Low (2002) pointed out, vocalic and intervocalic PVIs capture complementary properties of speech. Whereas rPVI-C is concerned with intervocalic variability (complexity of consonant cluster), nPVI-C measures vocalic variability. High levels of both vocalic and intervocalic variability are expected in stress-timed languages such as English, and low for syllable-timed languages such as Spanish. This allows the languages with mixed rhythm such as Polish to be low on vocalic axis and high on intervocalic axis (or Catalan with inverted values).

Whereas the results of Beňuš (2012a) for Slovak (BEN (SVK)) both in Figure 9 and Figure 10 point to a stronger syllable-timed character of Slovak close to Spanish, the values provided by the present study place Slovak in the intermediate position between Spanish and English. This finding is supported by the facts that Slovak uses phonemic length distinctions for vowels and employs so-called rhythmic-law (see section 2.4) which both increase variability of vocalic intervals and push Slovak towards the stress-timed end of the continuum. (see section 2.1.2) The results of present study with combined with the values of Beňuš (2005) point to mixed system of Slovak rhythm with features of both syllable and stress-timed languages. The results of Japanese for %V and ΔC in Ramus et al. (1999) differ greatly from those in Grabe & Low (2002), which points to uncertainty about the method used for the measurements.

5. General discussion and conclusion

The study of Slovak rhythm has largely been theoretical so far, with the quantitative researches performed only by Kráľová (1995), Bílá & Zimmerman (1999) and Beňuš (2012a). The descriptions of Slovak language rhythm are usually made by comparison and contrast with other rhythmically-related and already researched languages such as Czech, Polish and Japanese, but concise empirical studies have been missing. The present study aims to address the issue by assembling relevant speech material and applying well-known and widely used rhythm metrics to Slovak language.

The first part of the thesis provides a theoretical background on the problem of rhythm and language rhythm in particular, outlines history of its research and summarizes relevant studies in the field, describes Slovak and English rhythm of speech in detail, and suggests factors potentially influencing the non-native L2 language rhythm. The purpose of the thesis was to draw relevant conclusions about the character of non-native Slovak English speech rhythm and propose the rhythm metrics that would best discriminate between the accents concerned. The experiment was conducted in which recordings of the native languages – Slovak and English – were chosen as a reference framework for defining the L2 rhythm.

The research was based on two hypotheses (see section 3.3). H1 presumed that the rhythm metrics will reveal a clear distinction between the different rhythm types of English and Slovak language, and the Q1 considered the possibility of Slovak being a syllable-timed language. This hypothesis and research question was not confirmed as the results for the Slovak are different from syllable-timed Spanish and actually indicate that Slovak represents a language with mixed rhythm. The results placed Slovak in the intermediate position between syllable-timed Spanish and stress-timed English.

The second hypothesis estimated that the rhythm metrics will place non-native Slovak English between the native accents, that Slovak English will represent a transitional phrase from native Slovak towards native English. This hypothesis was only partly confirmed, as the results were not unequivocal. Only for six metrics[3] out of nine – %V, rPVI-V, nPVI-V, ΔC, VarcoC, rPVI-C – does non-native Slovak English maintain its intermediate position but when it succeeds it approximates

[3] In case we overlook the small overlap of %V and ΔC beyond the limits set by native accents.

the results for native English rhythm (research question Q3). The exception was nPVI-V, which displayed the affiliation of Slovak English with the mother tongue Slovak rather than with the targeted English. As for Q4, we could observe that the combination of vocalic and intervocalic PVIs provided a better differentiation of L1 and L2 accent than %V/ΔC combination which almost merged them. Q2 was addressed in section 4.2; the consistency of results was lower for vocalic metrics which were sensitive to speech-rate. The consistency of modes L1_SVK and L1_ENG comes into question too because of a limited amount of recordings which were examined.

There were several factors which influenced the results. The reliability of the values was affected by the limited number of speakers available for the study. In addition, most of the metrics are not resistant to speech-rate, the aspect which was beyond the limits of the present study. A deeper research comprising more data together with securing the balance of speech-rate is recommended in future sstudy of native and non-native language rhythm. After decades of developing rhythm metrics for capturing the elusive pattern of speech rhythm, it is questionable whether rhythm metrics provide a satisfactory answer to the language rhythm-classes hypothesis. Important fact which should definitely not be neglected is the auditory character of rhythm, and the suggestion that experimental research be complemented by perceptional aspect comes into play.

Bibliography

Abercrombie, D. (1967). *Elements of General Phonetics.* Chicago: Aldine.

Adams, C. (1979). *English Speech Rhythm and the Foreign Learner*. The Hague: Mouton.

Arvaniti, A. (2012). "The usefulness of metrics in the quantification of speech rhythm." *Journal of Phonetics,* 40, 351-373.

Roach, P. (1991). *English Phonetics and Phonology*. Cambridge: Cambridge University Press.

Bakoš, M. (1968). *Vývin Slovenského Verša od Školy Štúrovej*. Bratislava: Vydavateľstvo SAV.

Barry, W. J., et al. (2003). "Do Rhythm Measures Tell Us Anything about Language Type?" *Proceedings of ICPhS 2003*. Barcelona, Spain.

Beňuš, Š. & Mády, K. (2010). "Effects of lexical stress and speech rate on the quantity and quality of Slovak vowels." *Proceedings of the 5th International Conference on Speech Prosody, Chicago 100185*, 1–4.

Beňuš, Š. & Pouplier, M. (2011). "On the phonetic status of syllabic consonants: Evidence from Slovak." *Journal of Laboratory Phonology*, 2, 243-273.

Beňuš, Š & Šimko, J. (2012a). "Rhythm and tempo in Slovak." *Proc. 6th International Conference on Speech Prosody.* Shanghai, China.

Beňuš, Š. & Mády, K. (2012b). "Stress and phonemic length in the perception of Slovak vowels." *Proc. 6th International Conference on Speech Prosody.* Shanghai, China.

Bertrán, A. P. (1999). "Prosodic typology: on the dichotomy between stress-timed and syllable-timed languages." *Language Design, 2*, 103-130.

Bílá, M. & Zimmerman, J. (1999). "Slovensko-anglická jazyková interferencia v oblasti rytmu." In: Slovenčina v kontaktoch a konfliktoch s inými jazykmi. *Sociolinguistica Slovana,* 1999, 4, 107 – 116 .

Boersma, P. & Weenink, D. (2012). Praat: doing phonetics by computer, version 5.3.11., www.praat.org.

Brown, W. (2013). *Time in English Verse Rhythm*. London: Forgotten Books. (Original work published in 1908).

Cenoz, J. & Lecumberri L. G. (1999). "The acquisition of English pronunciation: learner's views." *International Journal of Applied Linguistics 9*, no. 1, 3-15.

Crystal, D. (1996). "The past, present and future of English rhythm." *Speak Out, Newsletter of the IATEFL Pronunciation Special Interest Group, 18,* 8-13

Cummins, F. (2009). "Rhythm as an affordance for the entrainment of movement." *Phonetica*, 66 (1–2),15–28.

Dauer, R. M. (1983). "Stress-timing and syllable-timing reanalyzed." *Journal of Phonetics*, 11.

Dauer, R. M. (1987). "Phonetic and phonological components of language rhythm." *Paper presented at the 11th International Congress of Phonetic Sciences*, vol. 5, (447±450). Tallinn.

Dellwo, et al. (2005). "Influence of L1 on rhythm L2." Workshop at *Universität des Saarlandes, Saarbrücken.*

Dellwo, V. & Wagner, P. (2003). "Relations between language rhythm and speech rate." In *Proceedings of the 15th international congress of phonetics sciences (471–474). Barcelona.*

Gass, S. M. & Selinker, L. (2008). *Second Language Acquisition: an Introductory Course.* New York and London: Routledge. Third edition.

Gibbon, D., & Gut, U. (2001). "Measuring speech rhythm." In *Proceedings of Eurospeech* (pp. 91–94). Aalborg.

Gimson, A. C. (1975). *A practical Course of English Pronounciation: A Perceptual Approach*. London : Edward Arnold.

Grabe, E. & Low, E. L. (2002). "Durational variability in speech and the rhythm class hypothesis." In N. Warner, & C. Gussenhoven (Eds.). *Papers in laboratory phonology 7*. Berlin: Mouton de Gruyter.

Guilbault, C. (2002). *The Acquisition of French Rhythm by Second Language Learners*. PhD thesis, University of Alberta.

Gut, U. (2011). *Rhythm in L2 Speech*. University of Munster, Germany.

Kohler, K. J. (2009a). "Whither speech rhythm research?" *Phonetica, 66,* 5-14.

Kohler, K. J. (2009b). "Rhythm in speech and language. A new research paradigm." *Phonetica, 66,* 29-45.

Kráľ, Á. (1983). *Pravidlá Slovenskej Výslovnosti*. Bratislava: Slovenské pedagogické nakladateľstvo.

Kráľ, Á. & Sabol, J. (1989). *Fonetika a Fonológia*. Bratislava: Slovenské pedagogické nakladateľstvo.

Kráľová, Z. (2005). *Slovensko-anglická Zvuková Interferencia*. Žilina: Žilinská univerzita, Fakulta prírodných vied.

Lai, C., et al. (2013). "Applying rhythm metrics to non-native spontaneous speech." In *Proceedings of SLaTE 2013, Grenoble, France*.

Lehiste, I. (1977). "Isochrony reconsidered." *Journal of Phonetics*. *5,* 253–263.

Lloyd James, A. (1940). *Speech Signals in Telephony.* London: Pitman & Sons.

Machač, P. & Skarnitzl, R. (2009). *Principles of Phonetic Segmentation*. Praha: Epocha.

Metruk, R. (2012). "Review of Slovak-English Phonic Interference" (Zdena Kráľová). *Acta Technologica Dubnicae,* vol. 2.2.

Mocová, Z. (2012). "Comparison of Slovak and English word stress." *Communications. Scientific letters of the university of Zilina,* 13.

Nooteboom, S. G. (1997). "The prosody of speech: Melody and rhythm." In W.J. Hardcastle & J. Laver (Eds.), *Handbook of Phonetic Sciences* (pp. 640-673). Oxford: Blackwell.

Pauliny, E. (1975). "Členenie slov na slabiky v slovenčine." *Slovenská Reč,* 40, 321-331.

Pauliny, E. (1978). "Vnútorná väzba slabiky a jej hranice v slovenčine." *Slovenská Reč*, 4, 193-209.

Pauliny, E. (1979). *Slovenská Fonológia.* Bratislava: Slovenské pedagogické nakladateľstvo.

Pike, K. L. (1945). *The Intonation of American English*. University of Michigan Press: Ann Arbor.

Piske, T. et al. (2000). "Factors affecting degree of foreign accent in l2." *Journal of Phonetics*.

Ramus, F., et al. (1999). "Correlates of linguistic rhythm." *Cognition* 73, 265±292.

Ramus, F., et al. (2003). "The psychological reality of rhythm classes." *Proceedings of ICPhS 2003*. Barcelona, Spain.

Roach, P. (1982). "On the distinction between stress-timed and syllable-timed languages." Originally published in *Linguistic Controversies*, ed. D. Crystal, 1982, 73-79.

Roach, P. (1991). *English Phonetics and Phonology*. Cambridge: Cambridge University Press. Second edition.

Stockmal, V., Markus, D. & Bond, D. (2005). "Measures of Native and Non-Native Rhythm in a Quantity Language." *Language and Speech* 48, 55–63.

Sabol, J. (1979). "Rytmický ráz slovenčiny." *Kultúra Slova*, 13, 193-196.

Sabol, J. (1986). "Prízvuk v slovenčine." *Studia Academia Slovaca*, 391-412.

Sabol, J. (1993). "K teórii jazykovej interferencie." *Jazykovedný časopis*, 44, 87-91.

Volín, J. (2002). *IPA-Based Transcription for Czech Students of English.* Praha: Karolinum.

Volín, J. (2007). *Statistické Metody ve Fonetickém Výzkumu*. Praha: Epocha.

Volin (2010). "On the significance of the temporal structuring of speech." [4]

White, L. & Mattys, S. L. (2007a). "Rhythmic typology and variation in first and second languages." In P. Prieto, J. Mascaró , & M.-J. Solé (Eds.), Segmental and prosodic issues in romance phonology. *Current issues in linguistic theory series*. Amsterdam, Philadelphia: John Benjamins.

White, L. & Mattys, S. L. (2007b). "Calibrating rhythm: First language and second language studies." *Journal of Phonetics, 35*, 501-522.

White, L. & Mattys, S. L. (2008). "That elusive rhythm. Pros and cons of rhythm metrics." *Laboratory Phonology, 11*.

[4] The study is yet to be published.

Appendix

Appendix A: The text read by the native English speaker (JLA_ENG) and by all the Slovak English speakers (CIBK, HORA, , MEDA, MIST, PETA, and RADM).

BBC news with Jackie Leonard.

The former United States president, Jimmy Carter, is in the Cuban capital Havana for a five-day visit. He is the first acting or former president to visit Cuba since the country's communist leader, Fidel Castro, came to power in 1959. Daniel Schweimler reports from Havana.

The main political party in the Israeli coalition government, Likud, is discussing whether it should block any future attempts to declare an independent Palestinian state. But the Israeli Prime Minister Ariel Sharon has urged members of his party not to vote on the resolution. He said it would be against Israel's interests to rule out any future settlement, which included the creation of a Palestinian state. From Jerusalem, Michael Voss reports.

A terminally ill British woman, who lost a high-profile legal battle to allow her husband to help her commit suicide, has died. Diane Pretty, who was forty-three, had been suffering with motor-neural disease for several years. The family says she began experiencing breathing difficulties ten days ago and died at a hospice on Saturday. Dianne Pretty took her case all the way to the European Court of Human Rights in an attempt to gain permission for her husband to help end her life.

You are listening to the news from the BBC in London.

There have been outbreaks of ethnic violence in Madagascar as the political deadlock continues between the newly declared president Marc Ravalomanana
and his rival, the long-standing president Didier Ratsiraka, who's refusing to step down. A human rights group says six people have been killed in a town in the west of Madagascar, from where Alastair Leithead reports.

The Russian government has sent a specialist civil emergency team to the Baykonur Space Centre in Kazakhstan to reach some eight people trapped after a part of the building collapsed. They were repairing the roof of one of the hangars used for assembling and testing space vehicles, when part of it crashed eighty metres to the ground.The space centre dates from the nineteen fifties and was the place where the Soviet Union launched the first man-made satellite, Sputnik.

The International Press Institute has criticized governments around the world for limiting civil liberties in the name of fighting terrorism. Delegates meeting in Slovenia issued a statement saying it was dangerous to limit civil liberties under the pretext of combating terrorism.The statement also said the struggle against international terrorism had left governments seeking dangerous controls over the free flow of information and freedom of expression.

Delegates at a conference in Bangladesh aimed at preserving one of the world's largest mangrove forests, the Sunderbans, have agreed to cooperate with conservation efforts. The Sunderbans, home to the royal Bengal tiger, is described as one of the last great coastal wetlands, but it's seriously threatened by pollution and human encroachment. The forest straddles the border between India and Bangladesh.

BBC news.

Appendix B: The news bulletins read by native Slovak speakers (BARB_SK and GERN_SK).

BARB_SK:
Exminister národniarov, Igor Štefanov v kauze nástenkového tendra zatiaľ o imunitu nepríde. Zastupujúci generálny prokurátor Ladislav Tichý pred necelou hodinou totiž vrátil vyšetrovací spis Úradu špeciálnej prokuratúry na došetrenie. Parlament tak zatiaľ nebude rozhodovať o vydaní poslanca Štefanova na trestné stíhanie. S aktuálnymi informáciami prišiel do štúdia Filip Domovec.

Lekárski odborári hrozia hromadnými výpoveďami. Pristúpia k nim v prípade, že im vláda nevyjde v ústrety a nesplní ich požiadavky. Je medzi nimi dodržiavanie zákonníka práce, dofinancovanie nemocníc, zákaz ich transformácie a vyššie platy. Podľa šéfa lekárskych odborov, Michala Policiana s prípravou hromadných výpovedí už začali. Informuje Jana Pospíšilová. Medzinárodná teroristická sieť Al-Káida plánovala ďalšie útoky v Spojených štátoch. Američania tvrdia, že informácie pochádzajú z materiálov, ktoré zhabali z domu Usámu Bin Ládina po jeho likvidácii. Podrobnosti má Jozef Šajner.

Líbyjská vláda odmietla plány USA odblokovať jej zmrazené aktíva a dať ich povstalcom, ktorí bojujú proti lídrovi Muammarovi Kaddáfímu. Tripolis doslova vyhlásil, že ide o pirátstvo a podkope to globálny finančný systém. Pokračuje Roman Kebísek.

Sýriu dnes čaká deň vzdoru. Opozícia vyzýva na mierové protesty po skončení piatkových modlitieb no vládne sily už výrazne posilnili svoju prítomnosť v uliciach miest. Armáda síce stiahla vojakov z nepokojného mesta Dará, vyslala však tanky do ďalších oblastí. Viac povie Nina Krajčovičová.

Taliansko ochromil generálny štrajk. Ako protest proti vláde premiéra Berlusconiho zorganizovali najväčšie odborové organizácie Apeninského polostrova. Kritici mu vyčítajú zhoršujúce sa životné podmienky zamestnancov a vôbec celej spoločnosti. Podrobnosti ponúka Viliam Hauser. Až osemdesiatpäť percent Slovákov sa už vo svojom okolí stretlo aspoň s jedným podvodom a vyše deväťdesiatšesť percent si myslí, že ak na to máme za príležitosť, tak určite alebo pravdepodobne podvádzame. Vyplýva to z prieskumu agentúry GFK na vzorke päťsto respondentov.

V spoločnosti podľa neho panuje názor, že podvádzať a neplatiť je normálne. Informuje Oto Gerner. Po šiestich rokoch reštaurátorských prác sa dnes vrátil do Baziliky svätého kríža v Kežmarku hlavný oltár. Ide o jedinečný počin, keďže dielo bolo v minulosti

niekoľkokrát prestavané a presadrované. V kostole bola aj Ivana Ratkovská. Slovné prekáračky, zmierlivé úvahy o fandení pre oboch ale aj strhnutá slovenská vlajka v krčme. Zaujímavé to nepochybne bude najmä v zmiešaných rodinách. Zároveň však všan fanúšikovia tvrdia, nech vyhrá ten lepší. V Sidónii nahrával Ctibor Michalka.

GERN_SK:
Slovenská ekonomika tento rok porastie tri a pol percentným tempom. Predpovedá to Európska komisia. Silnejší ťah v rámci eurozóny má len Estónsko a Fínsko. Naopak v hlbokej recesii ostáva grécka a portugalská ekonomika. Ďalšie detaily má bruselská spravodajkyňa Renata Goldírová. Dva bombové útoky v Pakistane zabili najmenej osemdesiat ľudí a šesťdesiat zranili. K zodpovednosti sa prihlásilo fundamentalistické hnutie Taliban, ktoré sa takto pomstilo za nedávnu smrť vodcu teroristickej siete Al-káida, Usámu Bin Ládina. Podľa miestnej polície bomby odpálili samovražední útočníci. Podrobnosti má Roman Kebísek.

Pozícia dočasnej národnej rady líbyjských povstalcov na medzinárodnom poli sa posilňuje. V Londýne otvorí svoje zastupiteľstvo. Jej predstaviteľov tiež príjme americký prezident Barack Obama. Povstalci chcú požiadať Spojené štáty, aby ich uznali za jediných a legitímnych vodcov Líbye. Viac povie Nina Krajčovičová.

Budapešť dostala od Rady OSN stoštyridsaťsedem podnetov k ľudským právam v Maďarsku. Vláda premiéra Orbána do Ženevy odkázala, že už chystá odpoveď, ktorá bude spoločnou reakciou na všetky pripomienky. Niektoré sú podľa maďarského kabinetu akceptovateľné, iné nie. Zaznamenal Viliam Hauser. Poistenci najväčšej Všeobecnej zdravotnej poisťovne si na jej internetovej stránke môžu overiť na aký rozsah zdravotnej starostlivosti majú nárok. Závisí od toho, či majú včas a riadne zaplatené zdravotné poistenie. Informuje Erik Potocký.

Na dofinancovanie zariadení sociálnych služieb žiada samospráva štrnásť miliónov eur. Ide o peniaze, ktoré obciam a mestám chýbajú na riadny chod zariadení pre starších ľudí, rôznych stacionárov, či opatrovateľské služby. Minister práce posunul požiadavku rezortu financií. Rozhodovať o nej by sa malo už v najbližších dňoch. Pokračuje Jaroslav Barborák.

Minister pôdohospodárstva a rozvoja vidieka, Zsolt Simon opäť rokoval s výrobcami bryndze o nových podmienkach jej označovania. Väčšina z nich nové pravidlá rezortu schválila, no našli sa aj takí, ktorí tvrdia, že ministerstvo takýmito krokmi ničí bryndziarstvo. Podrobnejšie Peter Valovič.

Noc múzeí a galérií sa na Slovensku stala dobrým zvykom. Múzeá a galérie, ktoré takto tradične oslavujú svoj medzinárodný deň po roku opäť pripravili množstvo aktivít, ktoré oživujú klasiku výstav a expozícií. Mnohé z nich budú v sobotu otvorené do neskorých nočných hodín. Slovo má Katarína Ottová.

Zhrnutie

Cieľom tejto bakalárskej práce bolo preskúmať cudzinecký prízvuk slovenskej angličtiny. Problematika osvojovania si cudzieho jazyka (SLA – second language acquisition) je obsiahla téma, ktorá zapája do spolupráce viaceré sféry jazyka ako morfológiu, syntax, lexikológiu, ortografiu a fonetiku. Ako lektor anglického jazyka používam jazykové učebnice, ktoré sú väčšinou štrukturované na päť typov úloh: čítanie, počúvanie, písanie, rozprávanie a výslovnosť. Tieto časti by mali dostávať vyváženú pozornosť vo výuke, pretože sa venujú rôznym oblastiam jazyka. Ako je však známe z každodennej praxe, práve fonetickej stránke jazyka sa dostáva príliš malá pozornosť a prednosť dostáva dobrá znalosť gramatiky a slovnej zásoby. Takým spôsobom na školách vyučujú učitelia s biednou výslovnosťou a dôsledkom je, že fonetická stránka jazyka býva často až tým posledným krokom v zdokonaľovaní jazykovej kompetencie. Z hľadiska fonetického je výuka výslovnosti na segmentálnej úrovni prvým krokom, ktorý má vyústiť do výuky prozódie reči. Práve prozodické vlastnosti angličtiny sú veľkou prekážkou pre mnohých študentov, a to nielen v produkcii ale aj v percepcii. Práve zanedbávanie tejto dôležitej súčasti reči v didaktickej praxi ma viedlo k skúmaniu slovenskej angličtiny, a to v oblasti rytmu.

Skúmanie rytmu reči je pomerne moderná záležitosť, ktorú otvorili v polovici dvadsiateho storočia priekopníci Lloyd James a Kenneth Pike. Z hľadiska rytmu reči boli jazyky najprv percepčne rozdelené do dvoch kategórii – s prízvučným alebo slabičným rytmom. Neskôr boli tieto dve kategórie označené za dva extrémy, medzi ktorými sa pohybujú jazyky sveta, obsahujúc prvky z jednej aj druhej skupiny. Snaha vedcov sa zamerala na zachytenie rytmu reči a dvoch rytmických kategórii empirickým spôsobom. Ramus et al. (1999) vyvinuli matematické vzorce na výpočet pomeru vokalických intervalov %V, ΔV na vokalickú a ΔC konsonantickú variabilitu. Neskôr boli vyvinuté čisté a normalizované párové indexy variability rPVI a nPVI pre konsonanty aj vokály a pre tempo reči normalizované vzorce konsonantickej a vokalickej variability VarcoC a VarcoV. Tieto vzorce boli aplikované ako na materinskú reč, tak aj na cudziu (L2).

Rytmus angličtiny je snáď najpreskúmanejší zo svetových jazykov. Nie náhodou je považovaný za prototyp jazyka s prízvučným rytmom. Dve základné vlastnosti tomu nahrávajú: Angličtina uplatňuje redukciu samohlások v neprízvučných slabikách, čo zvyšuje vokalickú variabilitu, a zároveň umožňuje realizáciu relatívne komplexných

konsonantických skupín, čo zvyšuje variabilitu intervokalických intervalov. Rytmicky prízvučný charakter angličtiny potvrdzujú tieto vlastnosti – prízvučné jazyky sa vyznačujú nízkym %V, vysokou konsonantickou variabilitou ΔC, a vysokým hodnotami párových indexov variability PVI, či už vokalického alebo intervokalického.

Štúdiom rytmu slovenčiny sa teoreticky zaoberali Paulíny (1979), Sabol (1979) a Kráľ & Sabol (1989); empiricky skúmali rytmus slovenčiny Kráľová (1995), Bílá & Zimmerman (1999) a pomocou rytmických vzorcov Beňuš (2012). V histórii sa vystriedalo viacero pohľadov na to, ako kategorizovať rytmus slovenčiny, ktorá bola tradične klasifikovaná ako jazyk s mórovým rytmom (Trubeckoj, 1939). Neskôr bola zaradená medzi jazyky s prízvučným rytmom (Kráľ & Sabol, 1989). Podľa Beňuša (2012) je naopak slovenčina jazyk so slabičným rytmom. Zdá sa však, že slovenčina obsahuje vlastnosti jednej aj druhej rytmickej skupiny. Na jednej strane, zákon rytmického krátenia zvyšuje vokalickú variabilitu slovenčiny a posúva jej rytmus k jazykom s prízvučným rytmom, na druhej strane zas slovenčina obsahuje kvantitatívny rozdiel pre dlhé a krátke samohlásky, čo nahráva slabičnému rytmu.

Aby som mohol podrobiť rytmus slovenskej angličtiny analýze, potreboval som ju zasadiť do širšieho kontextu, a to materinského a cieľového jazyka. Pre experiment boli preto zvolené tri typy nahrávok – angličtiny, anglickej slovenčiny a slovenčiny. Pre dosiahnutie čo najvernejších výsledkov boli vybrané reprezentatívne skupiny hovoriacich. Nahrávka v angličtine bola vybraná zo spravodajstva britskej rozhlasovej stanice BBC, aby čo najvernejšie reprezentovala výslovnosť južného britského štandardu (SBS – Southern British Standard). Nahrávka v slovenčine bola paralelne vybraná z verejnoprávneho slovenského rozhlasu SRO. Nahrávky slovenskej angličtiny boli realizované slovenskými študentami s vysokou úrovňou angličtiny na katedre Fonetiky Filozofickej Fakulty na Karlovej Univerzite v Prahe.

Nahrávky boli segmentované vo fonetickom softvéri Praat a rozdelené na výdychové skupiny. Boli v nich označené prízvučné slabiky a ich vokály. Na nahrávky boli aplikované matematické vzorce pre výskum rytmu reči %V, ΔC/V, VarcoC/V, nPVI-C/V, rPVI-C/V. Boli vytorené priemerné hodnoty výsledkov z nahrávok slovenčiny (2 hovoriaci) a slovenskej angličtiny (6 hovoriaci). Tieto priemerné hodnoty spolu s hodnotami individuálných hovoriacich boli prehľadne usporiadané do tabuliek a nanesené do stĺpcových grafov. Ako vzorce účinné pri rozlišovaní rytmických typov jazykov a materinského od cudzieho prízvuku sa ukázali %V, ΔC, nPVI-V a rPVI-C. Tieto zistenia boli v súlade s predchádzajúcimi štúdiami

Ramusovej et al. (1999), Dellwa (2010) a Beňuša (2012), ktoré vyhodnotili %V a ΔC za rytmické vzorce najvhodnejšie pre rozlišovanie medzi jazykmi s prízvučným a slabičným rytmom, a so štúdiami Guta (2003) a Stockmala (2005), ktoré označili PVI-V a ΔC za vzorce schopné rozlíšenia rytmu materinského a cudzieho prízvuku. Po vzore predošlých štúdii Ramus et al. (1999) a Grabe & Low (2002) boli vytvorené dvojdimenzionálne grafy s nanesenými hodnotami %V/ΔC a nPVI-V/rPVI-C.

V prvej dvojici grafov (sekcia 4.5) sme sa zaoberali polohou slovenskej angličtiny vzhľadom na materinskú slovenčinu a cieľovú angličtinu. Naše zistenia poukázali na to, že všetky použité rytmické vzorce dokázali oddeliť slovenčinu a angličtinu. Tri vzorce zo štyroch – %V, ΔC a rPVI-C – umiestnili slovenskú L2 angličtinu blízko L1 angličtiny. Hodnoty vokalického nPVI slovenskú angličtinu ponechali v blízkosti materinskej slovenčiny.

V druhej dvojici grafov (sekcia 4.6) sme výsledky našej štúdie vztiahli na predchádzajúci výskum v oblasť rytmických vzorcov aplikovaných na rôzne svetové jazyky. Vybrali sme angličtinu ako zástupcu jazykov s prízvučným rytmom, španielčinu ako zástupcu jazykov so slabičným rytmom, japončinu s predpokladaným mórovým rytmom, a poľštinu s nedefinovaným/zmiešaným rytmom. K našim výsledkom boli pripojené výsledky Beňuša (2012) pre slovenčinu. Zo všetkých štúdii boli vybrané dáta pre štyri najpoužívanejšie rytmické vzorce %V, ΔC, nPVI-V a rPVI-C. Bola vytorená prehľadná tabuľka s hodnotami, ktoré boli nanesené na bodové grafy %V/ΔC a nPVI-V/rPVI-C.

Naše výsledky pre rytmicky prízvučnú angličtinu zdieľali podobné hodnoty s výsledkami ostatných štúdii. Okrem toho, výsledky slovenskej L2 angličtiny v oboch grafoch potvrdili jej rytmickú príbuznosť s L1 angličtinou. Výsledky pre slovenčinu sa nachádzali približne v strede medzi hodnotami rytmicky prízvučnej angličtiny a rytmicky slabičnej španielčiny. Tieto výsledky poukazujú na nejednoznačné umiestnenie slovenčiny a nabádajú k opatrnosti pri kategorizácii jej rytmu ako slabičného alebo prízvučného. Výsledky rytmických vzorcov len potvrdili, že slovenčina obsahuje prvky z oboch rytmických typov jazykov a vytvára tzv. rytmicky zmiešaný typ jazyka (podobne ako poľština, viz. sekcia 4.6). Otázka príbuznosti s rytmicky mórovou japončinou ostáva otvorená.

Náš výskum bol postavený na dvoch hypotézach. Prvá, ktorá predpokladala, že rytmické vzorce jasne vymedzia slovenčinu a angličtinu ako dva jazyky s rozličným typom rytmu, sa nepotvrdila. Obzvlášť v porovnaní s ostatnými svetovými jazykmi,

slovenčina bola výrazne posúvaná smerom k rytmicky prízvučnej angličtine a výsledky rytmických vzorcov poukázali na jej zmiešaný charakter podobný poľštine a možno japončine. Druhá hypotéza skúmala rytmus slovenskej angličtiny vzhľadom na L1 jazyky. Predpokladala, že výsledky slovenskej angličtiny budú predstavovať rytmicky prechodnú fázu medzi slovenčinou a angličtinou. Táto hypotéza sa nám potvrdila len čiastočne, výsledky neboli jednoznačné. Len päť z deviatich rytmických vzorcov umiestnilo výsledky slovenskej angličtiny medzi slovenčinu a angličtinu. Na druhej strane však tieto vzorce umiestňovali slovenskú L2 angličtinu spravidla v tesnej blízkosti L1 angličtiny, čo môže poukazovať navysokú úroveň osvojenia si rytmu anglického jazyka zo strany hovoriach.

Viacero faktorov ovplyvnilo jednoznačnosť našich výsledkov. Spoľahlivosť našich hodnôt bola obmedzená nízkym počtom hovoriach dostupných pre experiment, predovšetkým angličtiny a slovenčiny. Táto nevýhoda bola kompenzovaná porovnávaním výsledkov s ostatnými relevantými štúdiami. Vzhľadom na to, že nie všetky rytmické vzorce sú odolné voči zmenám tempa reči, boli hovoriaci slovenskej angličtiny dôkladne vybraní z korpusu 25 hovoriacich so zreteľom na jednotnosť ich tempa reči. Úplná normalizácia a úprava nahrávok vzhľadom na tempo reči však bola mimo rozsahu a možností tejto štúdie. Ďalší výskum v oblasti rytmu si zasluhuje prácu s väčším objemom dát a dôkladné zaistenie vyváženosti tempa reči u hovoriacich.

Po niekoľkých desaťročiach vývoja rytmických vzorcov určených k zachyteniu prozodických vlastností jednotlivých jazykov však stále ostáva hypotéza o rytmickej typológii jazykov otvorená. Rytmus reči je záležitosťou produkčnou tak ako aj perčepčnou. Preto je dôležité zobrať do úvahy, ako čoraz viacero významných fonetikov podotýka, že výskum rytmu reči si okrem rytmických vzorcov vyžaduje oporu v štúdiach percepčných.