

Univerzita Karlova

Filozofická fakulta

Fonetický Ústav

Bakalářská práce

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**Glottalization patterns in the L2 speech of Czech and Slovak
speakers of English**

Praha 2023

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Prohlášení:

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V Praze, dne 11. srpna 2023

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Abstract

The theme of this bachelor thesis is a research study of glottalization patterns in English as the second language (L2) of Czech and Slovak speakers. The thesis starts with a theoretical part, in which the phenomenon of glottalization and linking is described. Different possible types of linking and glottalization are represented, using different examples from various languages. Further on, the linking and glottalization are described separately in relation to the Czech language, the Slovak language, and lastly the English language. Various types of glottalization and linking of those languages are described. The languages are compared with each other, combined with the analysis of prosodic differences between the Czech and Slovak language. Speech production in English as L2 is then described. All of these findings are then applied to a practical study. The recording of 6 Czech and 8 Slovak speakers is analysed with respect to different aspects, that affect linking and glottalization. The results are then discussed, alongside with the suggestions for further study.

Key words: glottalization, glottal stop, linking, rhythm, stress, prosody, Czech English, Slovak English

Abstrakt

Tématem této bakalářské práce je výzkumná studie glotalizačních vzorů v Angličtině jako druhém jazyku (L2) českých a slovenských mluvčích. Práce začíná teoretickou částí, ve které je popsán fenomén glotalizace a vázání. Popsány jsou i různé typy v kontextu různých jazyků. Dále je vázání a glotalizace popsána odděleně v kontextu českého, slovenského a nakonec anglického jazyka. Charakterizovány jsou i různé typy glotalizace a vázání, které jsou pro tyto jazyky typické. Tyto jazyky jsou vzájemně porovnány, v kombinaci s analýzou prosodických rozdílů mezi češtinou a slovenštinou. Poté je popsána produkce řeči v angličtině jako L2. Všechny tyto poznatky jsou následně aplikovány na praktickou studii. Nahrávka šesti českých a osmi slovenských mluvčích je zanalyzována s ohledem na různé aspekty, které ovlivňují spojování a glotalizaci. Výsledky jsou následně diskutovány spolu s návrhy na další studii.

Klíčová slova: glotalizace, ráz, vázání, rytmus, přízvuk, prosodie, česká angličtina, slovenská angličtina

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1. Introduction

The aim of this BA thesis is to describe and define the problematics of linking and glottalization patterns in the L2 speech of Czech and Slovak speakers of English. The glottalization and linking patterns are different for every spoken language. Various factors, besides what language is being used, influence the way glottalization and linking are used, such as, for example, gender or even the circumstances under which the speaker is performing his speech – whether they are with family or talking to their superior. Women and men use these patterns differently, and when a professional reads weather broadcasts, it may differ from when they are talking to friends informally (Volín, 2012).

The theoretical part of this bachelor thesis consists of one chapter, which includes eight sub chapters. The practical part then consists of three chapters (Chapter 3 to Chapter 5). Chapter 2 presents the theoretical background to the study. Section 2.1 takes on the goal of defining what glottalization and linking is. In sections 2.2 and 2.3, glottalization and linking is related to the way it is used firstly in Czech, then in Slovak. Section 2.4 described the way glottalization and linking is used in English language. In section 2.5, prosodic differences between the Czech and Slovaks are described. Stress, glottalization, voicing assimilation and rhythm are all described in relation to Czech and Slovak. Section 2.6 then describes speech production in English as L2.

Chapter 3 describes the material and method used. In section 3.1, the audio material is presented in greater detail, as well as the criteria for the chosen subjects. Section 3.2 then provides greater detail about how the segment boundaries of all the recordings were determined, along with different examples. Section 3.3 talks about how the recordings were analysed and provides information about how the TextGrid was handled, and in what manner it was processed.

Finally, the last chapter – Chapter 4 – analyses the results. The first segment 4.1 talks about the percentage of linking based on these factors subsequently: the nationality of the speakers, the word status – either lexical or grammatical, whether there was stress on the initial vowel, and lastly whether the analysed word was preceded by a prosodic break. In segment 4.2, the results for all of the speakers are shown and commented. The segment 4.3 consists of a

discussion of the results, possible factors that could have affected the work, and different proposals for further studies.

2. Theoretical Background

2.1 Defining Linking and Glottalization

In written language, words are separated by spaces and are situated next to each other as distinct units, making it easier for the readers to understand the text. With spoken language, however, the division of words functions somewhat differently – especially in words that start with a vowel. While, at first, it may seem to some that when speaking, the borders between different words are easily recognizable, the matters are more complicated from a phonetic point of view. A person can either link vowel-initial words and syllables together or, in some instances, make the borders between those words slightly more apparent by using something called ‘glottalization’.

2.1.1 Linking

In *Gimson's Pronunciation of English*, linking is described as an ‘absence of break’ (Cruttenden, 2014: 33). In spoken language, linking can be used to make the speech flow more smoothly. It can also prevent unnecessarily excessive disruptions, which are created by production of an audible stop after each word. Instead of using vocal cords to produce an audible boundary between words, the speaker just attaches the end of the first word to the beginning of the second one. To understand linking more thoroughly, we can look at two Czech constructions – *proč asi* and *pro časy*.

During linking, there is no audible difference between saying [proč_̣asi] and [pro_̣časi] and the only way to deduce the semantic meaning is either by understanding the context of the whole sentence or by listening to the tone of the voice of the speaker (Volín, 2012: 52). This type of linking is one of many – it takes the final consonant and attaches it to the beginning of the second word, which starts with a vowel.

A. E. Heike describes linking in terms of absorption. Absorption happens when one or more sounds are erased from speech. That occurs during numerous speech processes, and while during some, the change is more prominent, during others, it is more subtle (such as linking) (A. E. Heike, 1984: 343).

(1) *an elephant* [ən ʔel.ɪ.fənt]

(2) *an elephant* [ə.nel.ɪ.fənt]

The phonetic transcription of the exemplary phrase *an elephant* can look different based on whether linking was applied or not. If the consonant and vowel stay separate and hence are not linked together, the phonetic transcription looks like the one in example (1). In the phonetic transcription in example (2), on the other hand, the final consonant is linked to the initial vowel, making it sound like one word. As can be seen, there is a glottal stop before the initial vowel in (1), which is missing in (2). This glottal stop is the sound that gets erased, or in other words absorbed, by the linking. As there are various kinds of linking, A. E. Heike calls the process of linking a consonant onto a stressed syllable starting with a vowel a ‘Consonant-Attraction’ (Heike, 1984: 347).

Similar to Consonant-Attraction is another linking process called ‘hiatus’. While for Consonant-Attraction, a consonant and a vowel are needed, hiatus refers to the linking of two vowels, one final and one initial, together (Skarnitzl et al., 2021: 4). Further on, both the final and initial vowels can be part of a diphthong.

(3) *una hora* [una_ora]

(4) *so old* [səʊ^wəʊld]

(5) *very old* [verɪ^jəʊld]

Again, hiatus is not specific for only one language. While the first phonemic transcription (3) is an example of a Spanish phrase, the other two, (4) and (5), are examples of two different English phrases. While during Consonant-Attraction linking, the glottal stop is absorbed, and the sound simply disappears, in vowel-to-vowel linking, the sound is replaced by either a linking [j] or linking [w]. Whether the former or the latter is used depends on what the final vowel in the first word is. When the final vowel is a back close or close-mid vowel, like in the phrase *so old*, the glottal stop becomes a linking [w]. Linking [j] occurs in phrases in

which the first word ends with a front close or close-mid vowel, just like in the phrase *very old* (Cruttenden, 2014: 152).

For the last linking strategy, the presence of the rhotic consonant /r/ is crucial. This type of linking, otherwise also called liaison (Cruttenden, 2014: 315), is typical for non-rhotic English accents.

(6) *car* [kɑ:]

(7) *bear* [beə]

In some words, such as *car* or *bear*, the ‘r’ is written, however, in non-rhotic accents, as can be seen in the phonetic transcriptions in examples (6) and (7), the sound is dropped and the ‘r’ is silent (Volín, 2002: 64). The silent ‘r’ can only materialize as [r] after certain vowel endings, two of which can be seen in the examples (8) and (9) – /ə,ɑ:/. Other than that, the words in which the ‘r’ is silent can also end with vowels /ɛ:,ɔ:,ɜ:,ʊə,ɪə/ (Cruttenden, 2014: 316).

Sometimes, though, a word with a silent ‘r’ at the end can be followed by a word that has a vowel in its initial position. In that case, the ‘r’ reappears and becomes the linking element of these two words, hence the name linking ‘r’ (Volín, 2002: 64).

(8) *The bear growled.* [ðə. beə. graʊ.ləd]

(9) *The bear entered.* [ðə. beə. ren.təd]

As can be seen in example (8), while the ‘r’ appears in the orthographic word, in the phonetic transcription, the word *bear* ends with a schwa. In example (9), on the other hand, the word following *bear* begins with the vowel [e] and linking ‘r’ appears. As can be seen in the phonetic transcription in example (9), similarly to when a consonant is linked to a vowel during consonant-attraction, the linking ‘r’ also becomes part of the first syllable in the following word.

The consonant [r] can also link words ending with a vowel with words beginning with a vowel while no [r] sound is initially expected at the end of the first word. Such phenomenon differs from the linking ‘r’ and is called an intrusive ‘r’. Cruttenden also notes that while the linking ‘r’ is historically justified, as the /r/ sound was present in the past, the intrusive ‘r’ is not (Cruttenden, 2014: 316).

(10) *law* [lɔ:]

(11) *media* [mi:diə]

In examples (10) and (11), no orthographic [r] is present, and hence no /r/ sound can be expected to appear. Yet still, when such a word is put in front of a word that begins with a vowel, people may insert the [r] sound in between them.

The intrusive ‘r’ is relatively more restrictive about which vowels it can follow than the linking ‘r’. There is only one vowel besides the already mentioned /ɔ:/ and /ə/, and that is /ɑ:/ (Volín, 2002: 65).

(12) *law and order* [lɔ:rən ə:də]

(13) *media attention* [mi:diə rə.ten.ʃən]

As the phonemic transcriptions in examples (12) and (13) show, the [r] sound again becomes part of the initial syllable of the second word. As Cruttenden points out, however, the intrusive ‘r’ is often deemed undesirable in speech, and many people try to avoid it, abandoning the linking ‘r’ along with it as a side effect. In addition to that, people speaking rhotic accents also favour glottal stops over liaison because of the need to differ between words such as *paw* and *pour* (Cruttenden, 2014: 316).

2.1.2 Glottalization

While linking is a standard process implemented in fluent speech and can sometimes distinguish fluent speakers from beginners, there are certain situations in which it is undesired and sometimes even impossible to do. Since two different syllables are needed in order for linking to happen, it is impossible to link words together when there is any kind of pause in the speech. The absence of linking can also be used to highlight the importance of a particular word in an utterance. By using a glottal stop, the word is emphasized and detached from the other words, while if linking was used, it would not stand out from the text, and people could easily miss it (Heiki, 1984: 346).

(1) *An asparagus* [ə.nə.spær.ə.gəs]

(2) *Ten asparagus* [tɛn ʔaspara:gus]

As was already mentioned, the frequency of usage of linking also differs from language to language – some languages prefer linking, while others prefer glottalization. An example of that is the Czech language compared to the English language. In the first example (1), the phrase *an asparagus* and its phonetic transcription according to IPA can be seen. An advanced English speaker would, most likely, say the phrase using linking. In the second example (2), there is the Czech equivalent *ten asparagus* (“that asparagus”) along with its phonetic transcription. Most advanced Czech speakers would not link the two words together, as the Czech language is more prone to glottalization than to linking (Skarnitzl et al., 2021: 2).

To fully understand the absence of linking, it is necessary to describe the way it is created in the vocal tract. Even when fully opened, the glottis, or in other words the opening between vocal folds, is the narrowest point in the vocal tract, and causes the greatest resistance to the air flow (Laufer, 1991: 91).

Through an open glottis, voiceless sounds can be produced. An example of that is the voiceless alveolar fricative [s], which can be heard, for example, in the word *smile*, or the voiceless bilabial plosive [p], as in the word *prawn*.

The process of when a person tries to push air through either partially or fully closed vocal folds, which causes the air passage to be even more restricted than when the glottis is in phonatory mode (Roach, 2009: 56), is called ‘**glottalization**’. It is up to the speaker whether they want to use glottalization or not in their speech; however, in most languages, glottalization occurs to some degree (Volín et al., 2012: 173). As was already mentioned, glottalization can be produced by either closing the vocal folds completely shut together, or by keeping the vocal folds only partially opened. Based on the way the vocal folds are positioned, different sounds are produced by the vocal tract, hence also producing different ‘glottal elements’ – from glottal stops to creaks (Volín et al., 2012: 174).

The **glottal stop** is one type of glottalization and according to Skarnitzl et al. it is the most extreme, as well as the most demanding realization of glottalization from the articulatory point of view (Skarnitzl, 2021: 4). It happens when the air that is restricted from passing through the vocal folds by holding the glottis closed is suddenly released, which gives way to the creation of the glottal plosive [ʔ] sound (Roach, 2009: 36). Macaulay and Salmons

describe the glottal stop as problematic in the matters of its definition. Besides the restrictions regarding its placement, the phonetic definition of a glottal stop is complicated as well. In some languages, it is not even determined whether a glottal stop possesses more consonantal or vocalic properties (Macaulay and Salmons, 1995: 38). While, as mentioned before, voiceless sounds are produced with an opened glottis, the glottal stop is also regarded as voiceless, even if the vocal folds are completely closed. For voiced consonants, a vibration of the vocal folds is necessary, which does not happen when the [ʔ] sound is produced (Gimson, 1994: 154).

The glottal stop is present in many languages. For instance, it is the most common realization of glottalization in the Chalcatongo Mixtec language (Macaulay and Salmons, 1995: 40). In Nahuatl grammar, there is something called ‘saltillo’ [ʔ], a term which can be translated as “a little stop” or “a little hop”, and which describes a similar sound to the glottal stop [ʔ] (H. Gerfen, 1999: 152).

(3) *más alto* [ma ʔalto]

In the Spanish language, /s/ has many different variations, including its weakening, or even complete deletion (Núñez-Méndez, 2022: 1). In Puerto Rican Spanish, the /s/ becomes more often substituted by the glottal stop [ʔ] (Núñez-Méndez, 2022: 6). As can be seen in the phonetic transcription of the word *más alto* (“higher”) in example (3), there is an ‘s’ in the orthographic word *más*; however, in the phonetic transcription, the [s] sound disappears, and a glottal stop is substituted instead of it.

(4) *arm* [ʔaRM]

(5) *Sehr arm* [ze:R_ aRM]

Another language, in which a glottal stop may be used, is German. As can be seen in the phonetic transcription of the word *arm* (“poor”) in example (4), the glottal stop stands before the initial vowel [a]. However, the glottal stop is not required, the word *arm* can also be pronounced without it (example (5) (Hall, 1992: 58). Using a glottal stop usually helps to put emphasis or stress on a certain word, though it must be a word that begins with a vowel (Ježek, 2006: 14). Besides that, in the Nhandá language, the glottal stop can also help mark an “irrealis” mood, carrying a morphological function (Blevins and Marmion, 1995: 143).

When the vocal folds open a little bit and are configured in a certain way, what happens instead of a glottal stop is a creak. As Cruttenden states, during modal voice, the vocal folds vibrate at a faster rate, while the opening phase is shorter than the closing phase. When a creak is being produced, however, the rate of vibration is very low, which contributes to the creation of a vocal fry (Cruttenden, 2014: 11).

Creaks can be divided into three subcategories, depending on how glottal pulses accompany it. If the glottal pulses are continuous with no stop before or after, it is called a ‘continuous creak’. Sometimes, glottal pulses may come after a hold phase, hence the name ‘creak with a hold’, and sometimes the glottal pulses may ‘surround’ a hold phase – the glottal pulses come before and after the hold phase, which is called a ‘barbell creak’ (Skarnitzl et al., 2004: 62). While glottal plosives follow voiced and voiceless contexts in an even ratio, a creak is more frequent after voiced contexts (Skarnitzl et al., 2004: 66), as well as in syllables which stand at the end of an utterance (Redi and Shattuck-Hufnagel, 2001: 408).

The final type of glottalization was named by Redi and Shattuck-Hufnagel as ‘**glottal squeak**’. Before the term was coined by them in 2001, it was believed to be undescribed (Redi and Shattuck-Hufnagel, 2001: 414). It can be described as a breathy phonation (Skarnitzl, 2021:4), or in other words also as a type of ‘nonmodal phonation in normal speakers’ as Redi and Shattuck-Hufnagel describe it (Redi and Shattuck-Hufnagel, 2001: 414). Glottal squeak can sometimes stand before word-initial vowels instead of a glottal stop (Skarnitzl, 2021: 4). What is understood under the term is a sudden change from low frequency to a high one, while still maintaining the low amplitude voice quality. This process, however, rarely happens on its own, as it is usually accompanied by another type of glottalization, and is very rare in one’s speech overall. The reason why a person’s voice may do this is presumably the shift from one’s modal register to falsetto register (Redi and Shattuck-Hufnagel, 2001: 417).

2.2 Linking and Glottalization in the Czech language

As Rubach points out, one thing that differentiates the Czech language from other Slavic languages is the fact that the rules for glottal stop insertion have been described in a lot of detail (Rubach, 2000: 297). In the Czech language, words can be separated by different means – a pause, intonation, or a specific sound, such as a glottal stop (Krčmová, 2008: 126). Because the glottal stop functions as a boundary between two words, it is sometimes not deemed a realization of a phoneme, but a realization of a ‘juncture’ (Bičan, 2008: 6), or in other words a phoneme that indicates either a cessation or a continuation of speech (Demirezen, 2019: 197).

In the Czech language, a glottal stop translates as “ráz”. There is, however a slight difference between the two terms. The term ‘glottal stop’ usually refers only to a certain type of glottalization (full closure of vocal folds to restrict the air from flowing through the vocal tract, and then its sudden release) (Cruttenden, 2014: 10). The Czech term “ráz”, on the other hand, serves as a much broader term to describe all the different glottalization variants, which produce the sound, that stands at the beginning of the word to signalise a boundary (Bortlík, 2009: 2.1.1.1)

(1) *další olympiáda* [dalʃi: ʔolimpja:da]

If a word has a vowel in its initial position, a glottal stop usually precedes it to indicate that a new word is starting. As can be seen in the phonetic transcription in example (1), when saying *další olympiáda* (“another Olympics”), Czech speakers would usually insert a ‘ráz’ between those two words.

(2) *neobratný* [neʔobratni:]

That is, however, not the only position that a glottal stop can stand at in the Czech language. When a prefix or a root word begins with a vowel, a glottal stop also precedes it, as can be seen in example (2) – the word *neobratný* (“clumsy”) contains the prefix *ne* and the root word *obrat* (Obstová et al., 2022: 162).

In most cases, a glottal stop is an optional element of speech. The only circumstance under which a glottal stop becomes obligatory is when a non-syllabic preposition (such as *v*, *s*, *k*) stands before a word that has a vowel in its initial position (Hála, 1955: 9). Používá, ale neorto...

(3) *v Olomouci* [f ʔolomoutsɪ]

(4) *s Annou* [s ʔanou]

(5) *k autu* [k ʔautu]

As can be seen in the phonetic transcriptions in examples (3), (4) and (5), a glottal stop is present in front of each of the words that follow the non-syllabic preposition – *v Olomouci* (“in Olomouc”), *s Annou* (“with Anne”), *k autu* (“towards the car”). The reason why a glottal stop is necessary, and why the phrase cannot be said with the [s] and [a] linked together, as in *s Annou* [s anou], is because it is not regarded as orthoepic (Skartnizl et al., 2022: 162). The phrase *s Annou* can also be transcribed as [z anou] which is more probable to appear in Moravia, as the glottal stop is less frequent in Moravian dialects of the Czech language. (Hála, 1967: 36).

(6) *poetické* [po.e.tɪts.kɛ:]

(7) *tento experiment* [ten.to ʔeks.pɛ.rɪ.ment]

As was already mentioned above, a glottal stop can appear at the beginning of a root word that has a vowel in its initial position. A problem then arises with words such as *museum*, *dialect*, or *poetické* (“poetical”), as can be seen in example (7), where there is the [o.e] boundary; here, a glottal stop does not appear. The same [o.e] boundary is also in the phrase *tento experiment*, as can be seen in example (8). In example (7), the [o] and [e] are linked using hiatus (linking two different vowels together), while in example (8), there is a glottal stop between these two vowels (Rubach, 2000: 298). One may argue that since the word *poetical* does not have ‘etical’ as its root base, the use of a glottal stop is unjustified, and linking the two vowels together is better. Another reason may be the fact that if *poetické* were said as [po.ʔe.tɪc.kɛ:] the meaning of the word could be shifted to something like “after ethical”.

(8) *idiot* [ʔɪ.dɪ.ot]

(9) *hinduista* [hm.du.jɪs.ta]

Similar problem also appears with words beginning with an [i] sound – for example with the word *idiot* (Rubach, 2000: 298). As can be seen in example (10), a linking ‘j’ is used to connect the vowels [u] and [i] in the word *hinduista* (“a Hinduist”). When [i] stand in an initial position, however, a glottal stop is again required to precede it, as can be seen in example (9). The explanation for this, though, is not as complicated, as the Czech language has word such as *jiný* (“different”) or *jít* (“to go”), which begin with [j]. The reason for a glottal stop in front of [i] in initial position is then lexical (Rubach, 2000: 298). Besides the function of separating words and making the boundaries between them more clear, a glottal stop can also be used to sound more cultivated and formal (Skarnitzl, 2022: 162).

In 2012, Jan Volín studied to what extent do Czech people use the glottal stop instead of linking. He took five men and five women, all of them professional broadcasters and compared to what extent they used glottalization, and to what extent they used linking instead (Volín, 2012: 52). Glottalization and linking patterns in Czech speakers are definitely not consistent. The use of glottalization by Czech speakers is different with each speech style – in read speech the subjects tended to glottalize much more than in an unprepared dialogue (Volín, 2012: 53). Volín also found out that gender also affects the way people glottalize and link to a certain extent. According to him, Czech women tend to use glottalization to a greater extent than Czech men (Volín, 2012: 52). While women tended to glottalize before 64,84 % of initial vowels in unprepared dialogue, men used glottalization only in 41,06 % of initial vowels in unprepared dialogue (Volín, 2012: 53).

2.3 Linking and Glottalization in the Slovak language

Despite the fact, that Slovak and Czech languages are both Slavic languages, one thing that they differ in is the use of glottalization and linking. Slovak language is often described as a language that ‘flows’. Slovak speakers often use voicing assimilation, which means that they connect words together instead of inserting glottal stops before vowel-initial words. Because of that, Slovak speakers may often be perceived as if they pronounce vowel-initial words softly (Král, 2016: 44). The fact that glottalization is not a common factor in Slovak speech may further be proved by the fact, that often it is not even given as an alternative in

pronunciation (Uhrinová, 2012: 21). In Pauliny (1979), the phrase *chlap ani nejedol* (in English “the man did not even eat”) is transcribed simply as [xlab aňi ňejedol], which highlights the fact, that glottalization may not be researched to great extent (Uhrinová, 2012: 21).

(1) naša Eva [naša_ Eva]

(2) správa o úspechu [správa_ o_ úspechu]

As can be seen in example (1), the vowels in the phrase *naša Eva* (*our Eva* in English) are linked together, hence why the speech is described as more fluent or smooth. The vowels are not divided by glottalization even when there are more of vowel-initial words in a row, which can be seen in the phrase *správa o úspechu* (*success report* in English) in example (2). Furthermore, in Slovak language, no other consonants are inserted in between the two vowels (Kráľ, 2016: 45). Yet, there are some instances, in which linking is not the only option.

There are a few instances, in which there are two different options of pronunciation – softly, or sharply. Both, at the beginning of a word preceded by a pause, and a word preceded by another vowel, the speaker can choose whether they will use linking or glottalization. The same applies to words, which have two consecutive vowels in the middle (Kráľ, 2016).

In Slovak language, the beginning of a vowel (or as they are also called in Slovak language, ‘hlasové začiatky’) can be performed in five different ways – soft (mäkký), breathy (šumový), sharp (ostrý), creaky voice (chrapľavý), and as a glottal stop (ráz) (Rendár, 2015: 619). The last term is, however, not discussed much in Slovak phonetics. Creaky voice is, in other words, a ‘laryngealized voice’ or ‘vocal fry’. What happens is that a turbulence is produced in the air stream is produced by vibrating loosened vocal cords. In other words, creaky voice can be defined as something between full voice and whispering (Jain, 2011). The three other possible types of glottalizations are defined more thoroughly.

Breathy voice onset describes a type of onset, that utilizes a breathy voice at the beginning of a word. It is the most uncommon type of voice onset (Rendár, 2015: 47). As using the breathy voice onset can be, for example, describe a word, that starts with a rustle (*šum* in the Slovak language), which is quite similar to the pronunciation of the consonant /h/. It can be articulated at the beginning of a word, but also in the middle (Rendár, 2015).

By soft (mäkký) voice onset, we understand the soft beginning of a certain sentence segment. As opposed to a very rare breathy soft onset, soft voice onset is the most common type of voice onset and is as such used the most frequently. During soft voice onset, the air stream is not restricted in any way, the vocal cords vibrate only slightly – according to K. N. Stevens, the vocal folds are only about 0,3 cm² away from each other (1998, 59), which differentiates this type of voice onset from the vocal fry, or the breathy voice onset. (Rendár, 2015: 619).

Soft voice onset does not necessarily have to be used only in between words, as examples (1) and (2) display. In Slovak language, two vowels can be positioned next to each other. Between those, a vowel boundary is placed to differentiate them from each other – each vowel then belongs to a different syllable (Kráľ, 2016: 47). However, in Slovak language, the stems of words contain vowel clusters very rarely (Kráľ, 2016: 46). That is why those vowel clusters can only be found in certain words – prefixed words, composed words and words borrowed from other languages. The transition between the vowels in these words is very smooth. A soft voice onset is used.

(3) koalícia [ko_alíci_a]

(4) Ásia [ási_a]

As can be seen in example (3) in the word *koalícia* (*coalition* in English), there is no sign of glottalization in between the vowel clusters. The borrowed word is pronounced in a smooth manner. This is also true for final vowel clusters of borrowed or foreign words, which can be seen in example (4). Here, the end of the word *Ásia* (*Asia* in English), again, comprises a vowel cluster, which is pronounced with a soft voice onset (Kráľ, 2016: 47).

The soft voice onset is not the only voice onset which is comparable to another possible beginning of a vowel. The glottal stop is often deemed as very similar to the sharp voice onset in Slovak language, the sharp voice onset is defined as a little softer than a glottal stop. During its production in the air passage, no release burst occurs. Another feature of the sharp voice onset is the fact that even though in Slovak language, the vocal cords are usually oscillated gradually during the voice onset, when sharp voice onset is used, the vocal cords are oscillated in a much swifter manner (Kráľ, 2016: 45). The first vibration is much stronger than the other ones, and as a result, the vowel is separated from the vowel or the consonant that precedes that specific vowel. Rendár describes the sharp voice onset as a hard pitched voice that occurs at the beginning of a production of the vowel after a pause. (2015: 622) This beginning of a vowel can be labelled as a voiceless consonant. Glottal stop, on the other

hand, is defined by Král' as a 'vocalic explosive consonant' (Král', 2016: 45). The glottal stop and sharp voice onset are, however, used only scarcely throughout the Slovak language – most often at the beginning of interjections, or inside onomatopoeic words (Král', 2016: 46). Because the glottal stop and sharp voice onset can sometimes act as this vocalic explosive consonant, sometimes mistakes in voicing assimilation can occur.

(5) pod oknom dub a smrek [pot_ʔoknom, dup_ʔa_smrek]

(6) on i ona [on ʔi_ʔona]

As can be seen in example (3), the vowels in the phrase *pod oknom dub a smrek* (*an oak and a spruce under the window* in English) are still connected to the preceding, however, a sharp voice onset is used to create a vocalic explosive consonant. In example (4), the first word-initial vowel in the phrase *on i ona* (*him and her* in English) is separated from the preceding vowel with a glottal stop, while the second word-initial vowel is divided from the preceding word with a sharp voice onset. Both of these examples are deemed a mistake, as Slovak language should be linked together, and hence flowy (Král', 2016: 46).

There are, however, a few instances in which the sharp voice onset and glottal stop are acceptable and often occur.

(7) ozval sa hlučný krik [ʔozval_sa_hlučnǐ_krik]

In example 5, we can see that all the words in the phrase *ozval se hlučný krik* (*there was a loud cry* in English) are connected by a soft voice onset, except the first one. If a vowel-initial word follows any type of pause, some type of glottalization is inevitable, hence why Slovak people articulate a glottal stop as a part of the initial vowel of the first word (Rendár, 2015: 49).

(8) on si začal [ʔon_si_začal]

Similarly, to a word after a pause, all words at the beginning of a new sentence are also pronounced with a sharp voice onset or a glottal stop. As can be seen in example (6), the phrase *on si začal* (*he started it* in English) is pronounced with either a glottal stop, or a sharp voice onset at the beginning of the vowel of the first word (Král', 2016: 46).

(9) meé [mʔeʔé]

(10) ach, utri si nos [ʔax, ʔutri_si_nos]

Sharp voice inset can also be used in emotionally coloured statements, interjections, and exclamations. In example (7), glottalization is used inside of the word to differentiate each

vowel from the preceding vowel or consonant, making the interjection *meé* (which stands for the sound goats make in Slovak language) less flowy (Rendár, 2015: 49).

(11) *nie* [nieʔ]

(12) *áno* [ánoʔ]

A glottal stop, however, does not necessarily stand at the beginning or in the middle of a word in Slovak language. Sometimes, when a Slovak speaker wants to put a greater emphasis on either the disagreement or the agreement, they can use a glottal stop to do so. As can be seen in example (9), a glottal stop is put at the end of the word *nie* (*no* in English) to show the forcibleness of the disagreement. In example (10), the same is applied for the word *áno* (*yes* in English) to achieve similar effect, but with agreement (Kráľ, 2016: 46).

An important part of the Slovak language is voicing assimilation. Voicing assimilation describes the process of when one consonant is modified based on a different neighbouring vowel. The most important type of voicing assimilation in the Slovak language is called ‘regressive assimilation’ and is much more common than assimilation progressive (Kráľ, 2016: 53). Regressive assimilation describes the modification of a consonant based on the following phoneme. The modified consonant can either be voiced (in that case it becomes an unvoiced consonant if it undergoes regressive voicing assimilation), or unvoiced (then it becomes a voiced consonant) (Kráľ, 2016). Regressive assimilation can only modify consonants, that create voiced and voiceless pairs – p/b, f/w, t/d, s/z, c/3, š/ž, č/ž, ť/dʔ, k/g, x/ɣ (Kráľ, 2016: 54).

Voicing assimilation can only occur at specific places in speech – at morphemic boundaries. That means that voicing assimilation happens at the boundaries of words, at the boundary of a word base in compound words, at boundaries between the stem of the word and the preposition, and finally very rarely at the boundaries between the base of the word and the derivational suffix (Kráľ, 2016: 54).

(13) *dážď padá* [dášʔ_padá]

(14) *prosba* [prozba]

(15) *tak asi* [tag_asi]

As can be seen in example 13, the final consonant in the phrase *dážď padá* (*rain is falling* in English) would normally be pronounced as voiced. However, because of the fact that it precedes an unvoiced consonant, regressive assimilation is applied, and the /dʔ/ is pronounced as [ʔ]. Similarly in example 14, the consonant /s/ in the word *prosba* (*a plead* in English),

which would normally be pronounced as devoiced, is followed by a voiced consonant, hence why it becomes its voiced counterpart, and is pronounced as [z]. Furthermore, whenever a consonant precedes an initially placed vowel, regressive assimilation also happens. As can be seen in the example 15, the usually voiceless /k/ is pronounced as voiced [g], because it is followed by the vowel /a/ (Kráľ, 2016: 55-56).

2.4 Linking and Glottalization in the English language

There are four different types of linking in the English language (see 2.1.1). Nevertheless, a vowel or a diphthong must be present word-initially for linking to happen, as consonants cannot be linked to each other in the English language.

(1) *small antelope* [smɔ:l_æntɪləʊp] → [smɔ: .læn.tɪ.ləʊp]

As can be seen in example (1), the last consonant of the first word becomes part of the second word when they are linked together. This process is called ‘resyllabification’, or syllabic restructuring in other words. When the phrase *small antelope* is linked together, the consonant [l] is separated from its original syllable [smɔ:l] and becomes part of the first syllable of the second word [æn] instead (Heike, 1984: 345).

Vowels in an initial position can also be linked to vowels in the final position of the preceding word. Such process is called the ‘vowel hiatus’ and is very similar to the vowel-to-consonant linking. The difference is that the space between the words does not get absorbed, instead a linking [j] or a linking [w] takes its place. The final two types of glottalization are the linking ‘r’ and the intrusive ‘r’ – an [r] substitutes for the space between the words in both instances (see 2.1.1).

In the English language, various phenomena can be understood under the term ‘glottalization’. It is also important to note that in the English language, the differentiation between the terms ‘glottaling’ and ‘glottalization’ must be made. Glottalization refers to actions which happen in the glottis, such as a glottal stop or a creak (see 2.1.2). Glottaling then describes the act of inserting a glottal stop inside of a word, while replacing a certain consonant with it. To summarize, glottalization is used for glottal gestures that accompany a certain vowel or consonant, while glottaling means using a glottal stop to substitute for a certain consonant (Bortlík, 2009: 3).

(2) *act* [ʔækt]

(3) *clock* [klɒʔk]

(4) *rotten* [rɒʔn]

Cruttenden describes three circumstances under which the glottal stop can appear in a word. Most often, the glottal stop is realized in words that have a vowel in their initial position, as can be seen in the phonemic transcription in example (2). Glottal stop can also be used to strengthen the voiceless plosives /p,t,k/ in certain words, such as in example (3). In certain accents, it even replaces these voiceless plosives completely, an instance of which can be seen in example (4). (Cruttenden, 2014: 10). The voiceless plosives are most often replaced by a glottal stop when they are followed by a consonant that is articulated in the same place of articulation. However, a glottal stop can also be substituted for /t/ in other instances, such as before non-syllabic consonants (as in *not mine* [nɒʔ maɪn]) or when it stands before syllabic [l] and [n] (Cruttenden, 2014: 184).

Linking and glottalization can be used interchangeably in most cases, as neither carries a semantic function, hence the meaning does not change based on which one is used. There are certain reasons, however, why linking sometimes may sound better, especially if a person wants to sound like a native speaker – when linking, the speech does not sound as choppy. Using glottal stops after every single word may also serve as a distraction from the information a person is trying to convey. Glottalization may be used to make an utterance more clear, more emphasized. It is also obligatory after silence, as there is no preceding syllable that the vowel can be linked to (Heike, 1984: 346).

Bortlík states that the distribution of glottalization in a vowel-to-consonant linking may vary based on the prosodic context. The main three factors are the position of the vowel in the intonational phrase, presence of pitch accent on the target syllable or word, and the realized lexical stress. He writes that word-initial vowels are more prone to glottalization, if they stand at the beginning of a new intonational phrase. The probability of an initial vowel being glottalized is also higher if a pitch accent is put onto the syllable (Bortlík, 2009: 25).

(1) *adult* [ˈædʌlt]

(2) *adult* [əˈdʌlt]

Finally, the lexical stress is also important and people glottalize based on whether the stress is put on the first syllable, or the second syllable. People tend to glottalize before the full vowel more, rather than before the reduced one. As can be seen in example (1), the stress is put on the first syllable, hence the vowel is full and is more prone for glottalization. In example (2), the stress is on the second syllable, and the vowel is reduced so glottalization is not as frequent (Bortlík, 2009: 26).

2.5 Prosodic Differences in Czech and Slovak

As Macaulay and Salmons state, in some languages, the behaviour, of what is phonetically a glottal stop, is linked to prosodic phenomena. In other languages, glottalization ‘serves primarily prosodic functions’ (Macaulay and Salmons, 1995: 38). Nevertheless, it can be said that linking and glottalization are closely related to prosodic differences, as they both significantly affect the rhythmic and melodic qualities of speech (Bortlík, 2009: 17).

Glottalization, intonation, assimilation of voicing, rhythm, stress patterns and speech patterns – these all refer to variations in the suprasegmental aspects of speech. They are influenced based on historical, sociolinguistics and even geographical factors (Gross, 1998). Because of that, prosody is a little different for every language. Prosodic structure can then be understood as involving the variation between stressed and unstressed syllables, as well as between accented and unaccented words. It is also the inclination of speakers to form a layered arrangement of prosodic units of varying sizes through rhythm and intonation (Uhrinová, 2012: 22).

2.5.1. Stress

Czech and Slovak are both very closely related languages, which share different morphological, syntactic and most importantly phonological traits. Both of these languages have a fixed stress pattern – it is predominantly fixed on the first syllable of words (Uhrinová,

2012: 14). However, in some cases, for example in the phrase *na okně* (*on the window* in English), the stress can shift to the preposition. There are also some one-syllable words that don't carry stress at all (Sabol, 1979: 193).

In English, stress is relatively free, as Gimson describes “in the sense that the main accent is not tied to any particular point in the chain of syllables constituting a word” (Gimson, 2001: 221), but it is also fixed in the sense that it “always falls on a particular syllable of any given word” (Gimson, 2001: 221).

One of the most often suprasegmental mistakes in both Czech and Slovak speakers of English, as Uhrinová describes, is the fact that they always transfer the stress to the first syllable of the word. This is due to the influence of Czech and Slovak stress patterns, that are incorporated into the second language (Uhrinová, 2012: 15). As Sabol describes, Slovaks also put stress on a one-syllable preposition, as that is what is deemed a standard form of the pronunciation for Slovak speakers (Sabol, 1979: 193). This could then alter the way Slovak and Czech speakers of English use glottalization, as prosodically, if a word-initial vowel is stressed, it promotes glottalization even with native English speakers (Garellek, 2012: 2).

Further on, Czech differentiates from English by the fact, that it is not able to indicate difference between words using stress.

(1) noun – record [ˈrek.ɔ:d]

(2) verb – record [rɪˈkɔ:d]

In example 1, we see the English noun *record*. Since it is a noun, it puts stress on the first syllable. On the other hand, the verb *record* in example 2 carries stress on the second syllable, which is also the reason for a change of consonant in the first syllable.

2.5.2 Glottalization

According to Volín et al., Slovak speakers do not use glottalization as much as Czech speakers do in their native language (Volín et al., 2012: 175).

(1) tak asi nie [tag_asi nie]

(2) tak asi ne [tak ʔasi ne]

As can be seen in example (1), Slovak speakers would normally initiate an assimilation of voicing between a word that ends with a consonant and a word that starts with a vowel. That may be due to the fact that Slovak speakers tend to connect the initial vowel of a word closely with the preceding consonant (Volín et al., 2012: 175). As can be seen in (1), they also pronounce the consonant [k] as a voiced consonant [g], due to the tight connection to the initial vowel [a] of the following word. In the example (2), however, the Czech speakers will most likely use glottalization, hence why the word-final consonant [k] stays unvoiced.

2.5.3 Voicing Assimilation

Despite the many different syntactic, morphological, and phonological features that Czech and Slovak share, rules of voicing assimilation are something, in which those two similar languages differ. Both Czech and Slovak language, as well as English, use a two-way voicing contrast, in which they distinguish consonants voiced and unvoiced (Skarnitzl and Šturm, 2016). The sounds that are transcribed as / p t k f s/ are usually realized as voiceless consonants, while the sounds /b b d g v z/ are usually realized as fully voiced.

(1) David ['davit]

(2) David ['davit]

(3) David ['d̥eivɪd̥]

In the examples above, three different transcriptions of the same name can be seen. In example (1), the Czech pronunciation is transcribed. In example (2), a Slovak pronunciation is transcribed, and as can be seen, it is quite similar to the Czech one. In example (3), there is the English pronunciation transcribed, and as can be seen, rather than a voiceless [t], the final consonant is a devoiced [d̥].

Further on, both Slovak and Czech language use regressive assimilation of voicing across word boundaries (Skarnitzl and Šturm, 2016). That means that the voicing characteristics of a sound in one word assimilate to the sound in the following word. This phenomenon is also called 'right-to-left assimilation' as it only happens with words in a sentence that are going from right to left.

(4) let[t] stačil – led[t] stačil (the flight was enough – the ice was enough)

(5) let[d] začal – led[d] začal (the flight started – the ice started)

As can be seen in example (4), no matter whether the final consonant in the first word is orthographically *t* or *d*, if the following word starts with an unvoiced consonant [s], the last consonant in the first word will be read as an unvoiced consonant (in this case [t]), too. In example (5), the following word starts with a voiced consonant [z], hence why the final *d/t* is also read as a voiced consonant [d]. In English, regressive assimilation is a very rare phenomenon and can only be seen in a few rare examples, such as *off[f] course*, or *was[s] sent* (Skarnitzl and Šturm, 2014: 200). However, it is possible that due to the Slovaks and Czechs being used to the rules from their native language, they still will assimilate the final consonants of the first word to the initial consonant of the second word in their English.

The difference in voicing assimilation between Czech and Slovak language occurs when the initial consonant of the second word is a sonorant. While Bohemian Czech does, in fact, not assimilate the final consonant to the sonorant, Slovak language and Moravian Czech both do assimilate the final consonants in those contexts. So while a Czech would pronounce both *let mohl* and *led mohl* with a [t], as if before a pause, Slovak and Moravian Czech would pronounce the final *t* and *d* as a voiced [d] (Skarnitzl and Šturm, 2016).

Overall, in the Czech language there is a stronger correspondence between the phonological and phonetic voicing, than in the Slovak language. That means that phonologically voiced consonants are usually pronounced as voiced, while voiceless consonants are usually pronounced as voiceless (Skarnitzl and Šturm, 2014: 200). Czechs and Slovaks also neutralize final consonants that should be voiced, which is why words such as *les* (forest in English) and *lez* (crawl in English) are both pronounced as /les/ (Skarnitzl and Šturm, 2014: 200).

That may be the reason why in English, Czech speakers will have a harder time to differentiate between the devoiced [z̥] and voiceless [s], as well as between partially voiced [z̥] and fully voiced [z] (Skarnitzl and Šturm, 2014: 200).

Furthermore, as was already mentioned in the section 2.5.2, Slovak people often assimilate the final consonant of a word, that precedes the initial vowel of another word. While in the Czech language, a consonant will remain unchanged most of the time, even during less careful pronunciation, in the Slovak language, the final consonant is usually assimilated based on the following vowel (Volín et al., 2012: 175). This can sometimes happen in the

Czech language as well, however it is deemed as non orthoepic. On the other hand, in the Slovak language, the absence of voicing assimilation is also deemed as an orthoepic mistake (Kráľ, 2016: 53).

2.5.4 Rhythm

Rhythm is defined as a regularly repeated pattern of stress on syllables. That means, that if the flow of an utterance – phrase, sentence or word – is not broken by any disruptive element (such as pause, stuttering, etc.), stress should occur at a regular frequency (Nováková, 2007: 27). As was already mentioned in the segment 2.5.1, both Slovak and English are languages, that use a stress-timed rhythm, which utilizes a repeated frequency of the accent that is put on different words (Kráľ and Sabol, 1989: 156). Czech, on the other hand, similarly to Vietnamese or Finnish, is a language that uses rhythm that is syllable-timed (Nováková, 2007: 27). In syllable-timed rhythm, it does not matter, whether the syllable is stressed or not and All syllables have similar duration.

Furthermore, English utilizes the repetition of stress for rhythm to a much greater extent than Czech or Slovak (Uhrinová, 2012: 14). In both Czech and Slovak language, a stress group functions as a sense unit, however in English, it is often used to state rhythm in sentences (Uhrinová, 2012: 15).

2.6 Speech Production in the English as L2

Speech production in the L2 is based on many different factors. Due to the fact, that all languages differ at least slightly in most, if not all of those features, different speakers produce speech in second language in different manners. To determine how fluent a person is in their production, CEFR has came up with different levels of fluency – A1, A2, B1, B2, C1, C2 (Llupi, 2016).

Speech production can be divided into four different processes, which goes as follows – conceptualization, formulation, articulation, and self-monitoring (Kormos, 2015). Conceptualization consists of imagining comprehensible and concise concepts, which in speech production in the L2 means mapping out exactly what one wants to say. Formulation

is the second step, during which the speaker must think of the grammatical, lexical and phonological features of the desired language, and incorporate them onto the conceptualized concept. Articulation then consists of producing speech – in this part, phonological transfer and phonemic acquisition are important factors. Finally, the last part is self-monitoring, which happens after the certain utterance or word has been spoken out loud. During this part, the person must go back to what they say and check, whether it was correct grammatically, phonologically, and lexically (Levelt, 1999). While in speech production of L1, the first three processes are quite consecutive and fast, in L2 it takes a little longer, because the production of a foreign language includes a greater amount of attention control (Kormos, 2015).

When a person starts learning a second language, it is very typical that his accent is nowhere near the accent of a native speaker. This has to do with phoneme acquisition and phonological transfer. As phonemes differ across all languages, it is sometimes quite difficult to produce them correctly. To pronounce the foreign phonemes correctly, both perception and production are required (Havlíková, 2020: 6). For example, vowels in English language are different from those in Czech, and those are different from vowels in Slovak – despite the fact, that they are both Slavic languages. While Czech has only three diphthongs and Slovak has only four, English disposes of eight different diphthongs – /eɪ, aɪ, əʊ, aʊ, ɔɪ, ɪə, eə, and ʊə/ (Havlíková, 2020: 7). Because of that, Czechs and Slovaks often have troubles with producing them. Similarly, the consonants /v/ and /w/ are sometimes pronounced interchangeably (Choi, 2021). The same can be said about consonants /t/ and /θ/ and /d/ and /ð/.

Another notable difference between native speakers and L2 speakers is the use of stress. While in Czech language, the stress is usually put on the first syllable (Nováková, 2007: 11), in English, stress is relatively free. Both Slovaks and Czechs tend to put stress on the first syllable, when producing English as a second language (Uhrinová, 2012: 15).

(1) [ˈpɹɒfɛsə:rs]

(2) [prəˈfesəʳz]

As can be seen in example 1, the phrase *professors* was pronounced incorrectly, as the stress is on the first syllable, which also subsequently causes the quality of the vowel in that syllable. In example 2, the correct pronunciation is transcribed – in other words, how it would have been most possibly pronounced by a native English speaker (Uhrinová, 2012: 15).

Intonation is another thing, with which Czech and Slovak learners of English as L2 struggle often. English has different types of intonation patterns, from which the most frequent ones are fall intonation and fall-rise intonation (Son, 2020:196). Czech is on the other hand very monotonous, while native Slovak speakers use a gradational effect, rather than the gliding effect that English uses. In consequence, English often uses a higher pitch to indicate the functionality of the sentence, which both Czechs and Slovaks do way less (Uhrinová, 2012: 15).

Another mistake which Czech and Slovak speakers of English often make, is the incorrect use of glottalization, when linking should be used instead. That is possibly because, as has been explained in Segment 2.2, Czech uses glottalization, mainly a glottal stop, to a much greater extent than native English speakers. The reason for heightened glottalization in Slovak speech in English may be such factors as incorrect phrasal intonation, monotonous intonation, or incorrect speech rate (Uhrinová, 2012: 15). Yet, glottalization is still used in a much lesser amount in the Slovak language, than in the Czech language. That is the reason, why linking in English as a second language should be more common among Slovaks, than among Czechs.

3 Method and Material

3.1 Audio Material

14 female students of the first year of English and American studies at Charles University in Prague (six Czech women and eight Slovak women aged between 18 and 21) were asked to read a longer text in English (Figure 1). From the Czech female participants, five were from Bohemia and one was from Moravia. Three of the Slovak female participants were from Trenčianský region, four were from Východoslovenský region, and one female participant did not state her region at all. Their level of English was taken into consideration (two female participants stated that they are at a B2 level, 10 claimed they were at a C1 level, and two female participants wrote down a C2 level). Other studied languages were also taken into account – most participants studied either German or French, but Spanish, Swedish and Czech were also among those languages. Other than that, the female participants were also asked whether they are trying to imitate a certain accent, whether they had resided in an

English speaking country for a longer period of time, or if they are in a reoccurring contact with people from English-speaking countries. Finally, the female participants were also asked whether they know what a *glottal stop*, *linking* and *glottalization* is – only four of them answered no, the rest claimed that they know what these terms mean in relation to phonetics.

All fourteen female participants were presented with and read the same text (see Appendix 1). The composed text took various news segments from the BBC radio station as its model. Comprised from eight paragraphs in total, the text began with an introductory paragraph. After that, five distinct paragraphs followed. Those dealt with various contemporary topics of that time followed in subsequent sections. These five paragraphs were divided by one short informational paragraph, and the whole text concluded with one short closing paragraph. **přiložím do přílohy i s odstavcema + tučně slova s vowel initial words**). Recordings were made in the recording studio of the Phonetic Institute, Faculty of Arts, Charles University (at a 32 kHz sampling frequency) in 2015.

L1	Sex	Age	Region	AAA	LOL	Eng_Level	Languages	Accent	Residence	Contact	Awareness
Czech	f		21 Moravia_Silesia	yes	NA	B2	German, B2	No model	No	No	Yes
Czech	f	19	Bohemia	yes	10 years	C1	German, B2	American	No	US	Yes
Czech	f	19	Bohemia	yes	10 years	C1	French, B2/C1	British	Yes (US/UK)	US/UK	Yes
Czech	f	20	Bohemia	yes	14 years	C1	German B1, Swedish A1	American	No	No	No
Czech	f	19	Bohemia	yes	11 years	C1	Spanish B1	No model	No	No	Yes
Czech	f	21	Bohemia	yes	10 years	C1	French B1	No model	No	No	Yes
Slovak	f	19	Trenčianský	yes	6 years	C1	French B2	No model	No	US	Yes
Slovak	f	18	Trenčianský	yes	8 years	C1	German B2	US	Yes (UK)	US/UK	Yes
Slovak	f	19	Východoslovenský	yes	15 years	C1	French A2	US	No	No	No
Slovak	f	19	Trenčianský	yes	16 years	C2	French B2, German A1, Czech C1	UK	No	UK/US	Yes
Slovak	f	21	Východoslovenský	yes	15 years	C1	German B1	No model	US	UK/US	Yes
Slovak	f	18	Východoslovenský	yes	11 years	B2	French B2	No model	No	No	No
Slovak	f	19	N/A	yes	9 years	C2	French B1	US	No	No	Yes
Slovak	f	21	Prešovský	yes	17 years	C1	German B2	UK	No	No	No

Figure 1 Answers of the female participants, who provided the recordings

3.2 Determining the Segment Boundaries

When segmenting the boundaries between different vowels and consonants, the time course of the wave, formants, and spectral changes were all taken into consideration, as well as the actual auditory perception. In Figure 2, a part of the word “animals” can be seen. This particular sequence shows a glottal stop, vowel, nasal, vowel, nasal and a vowel again. All of those can be easily distinguished from each other, as nasals have a smoother waveform, compared to vowels. They also contain less energy in higher frequencies (Šturm, 2011: 28).

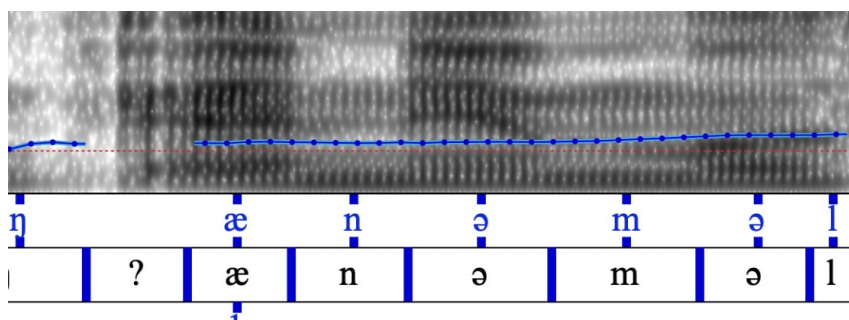


Figure 2 A spectrogram of a part of the word 'animals'

In Figure 2, a glottal stop stands at the beginning of the word. It is observable, that in the speech waveform, the energy drops during the glottal stop. Another noticeable feature is the loss of periodicity, or the momentary disappearance of the voicing contour (F_0). This can be seen at the beginning of the word *animals*, which is preceded by a glottal stop.

In Figure 3, a somewhat different situation is shown. First of all, the sequence is now a glottal stop, vowel, plosive, vowel, and a plosive. Secondly, the spectrogram shows one whole word (*at*) and a second partial word *about*. Those words were linked by the speaker, which can be noticed because the glottal stop is missing, but also because the voicing contour (F_0) was not disrupted.

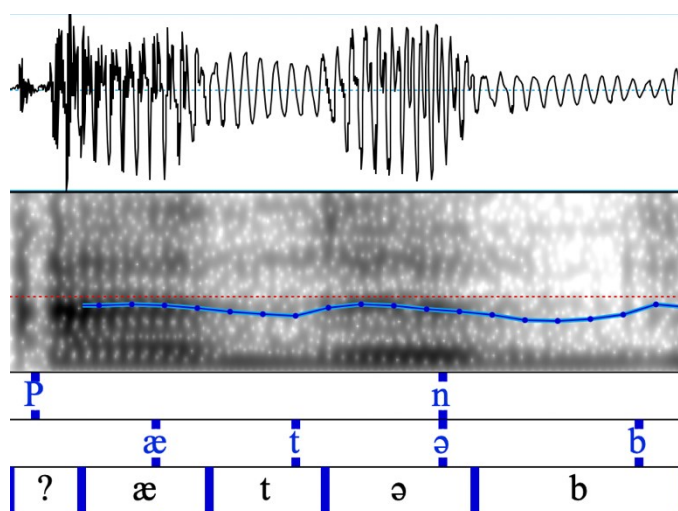


Figure 3 A spectrogram of a part of the words 'at about'

3.3 Labelling

A methodical procedure was employed during the labelling of the various elements within the text and audio files. Using the TextGrid tool, different tiers were created – one for phonemes, one for phones, one for stress and one for full words. Besides that, a tier for prosodic boundaries was created, as well. Every time the word started with a vowel, it was determined according to the procedure mentioned in section 3.2 whether linking or glottalization was present. If linking was present, no changes were made. However, when the speaker used glottalization, a new interval was created, and the glottalization of the vowel was marked with the symbol ‘?’ (see Figure 1 and 2).

In addition to that, prosodic boundaries were also analysed in the tier called ‘glot’. This analysis was structured around three possible outcomes – that there was a prosodic boundary (labelled as ‘y’ for ‘yes’), that there was no prosodic boundary (labelled as ‘n’ for ‘no’), and that there was an audible pause (labelled as ‘P’ for ‘pause’). This is important to distinguish as it is impossible to link words separated with a pause, which needs to be taken into account (discarded from analyses).

According to Beckmand and Ayers’s definition, there are different types of break indices (1994). When working with Praat, break indices 1, 2, 3 and 4, along with a Pause, were taken into consideration. While break indices 1 and 2 signify no or minimal prosodic boundary, break indices 3 and 4, on the other hand, signify a prominent prosodic boundary. What differentiates 3 from 4 is the fact, that 4 has both melodic features (a nuclear tone) and rhythmic and temporal features (lengthening of the final syllable, mini pauses, etc.). When break index 3 is performed, the speaker does not execute any melodic features, only the rhythmic and temporal ones (or vice versa). Both types of boundaries (BI 3 and BI 4) were labelled as ‘y’ in the ‘glot’ tier. When there were no melodic features, nor temporal and rhythmical features, the boundary was labelled as ‘n’ to signal the break indices 1 and 2. Whenever there was a longer disruption in the text, such as breathing, stuttering, or any other dysfluency including a pause or a short pause, it was labelled as ‘P’ and subsequently discarded.

Taking all of this into consideration, the total number of total possible contexts, in which either glottalization or linking could be used, comes up to 162 (see Figure 4). Out of all of those possible contexts, only 43 words begin with a stressed syllable, while 121 words begin

with an unstressed syllable. In the whole text, there were 91 vowel initial words that were lexical, and 71 that were grammatical. The number of words preceded by a pause differed across speakers.

	In one text
Stressed syllables	43
Unstressed syllables	121
Grammatical words	71
Lexical words	91
Pauses	(see text)
Total possible outcomes	162

Figure 4 The number of analysed contexts in the text

3.4 Data extraction

In collaboration with my bachelor's thesis advisor, a comprehensive script was put together from the data gathered. Then it was processed through the Praat Script. The focus was put on determining whether the speaker used linking or glottalization. If it was the latter one, the duration of the glottal stop was quantified. Then the target word was determined. In order to know what segment preceded the analysed vowel, the preceding word was determined as well. It was also ascertained, whether there was a prosodic break, a pause, or no prosodic break – labelled as 'y' for yes, 'P' for pause, and 'n' for no – this was by having the Praat Script look at the first layer of each recording, and for each point in that layer, it wrote down each the appropriate label. Other than that, the tempo of the speaker was measured. Furthermore, it was determined whether the speaker put stress on the initial vowel or not. The data was then extracted into an Excel table. In Excel, the status of the words was determined – whether they were grammatical or lexical. From Excel, the data was transferred to the RStudio programme. A code was then written, which helped create the final chart bars.

In total, there were 2248 contexts ready for analysis. However, from those, 411 words were preceded by a pause. Because linking is not possible after a pause, these words were subducted from the final number of analysable contexts – which then came up to 1837. Of those, 792 were extracted from audio recordings of Czech speakers, and 1045 were extracted from audio recording of Slovak speakers. Because of that, the final results were counted as percentual.

4 Results

In this chapter, the data that were acquired from Praat and subsequently Rstudio are analysed further. The main goal was to find out, whether the use of linking and glottalization differs in English as a second language for Czechs and Slovaks. However, the stress, prosodic breaks and the status of words also played a part in the question.

4.1 Percentage of Linking Based on Different Factors

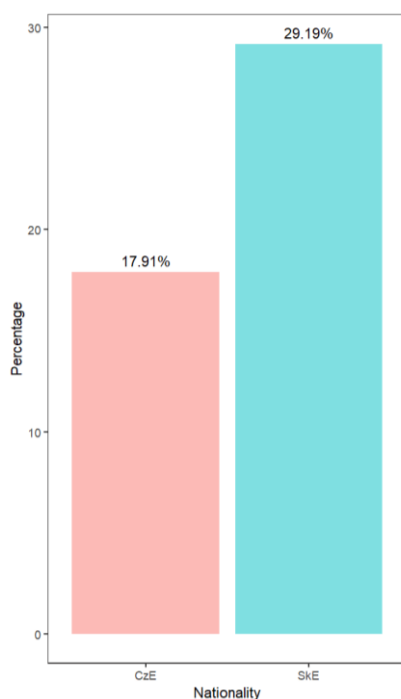


Figure 5 Percentage of linking based on nationality

Figure 5 shows that based purely on nationality, Slovak speakers chose to link more often, than Czech speakers. While Czech speakers used linking only in 17,91 % out of all the possible outcomes, Slovak speakers chose to use linking in almost 30 % of the vowel-initial words. Glottalization was, however, still more often – Czech speakers glottalized in 82,09 % and Slovak speakers did so in 70,81 % which is very clearly more than half of all of the possible cases.

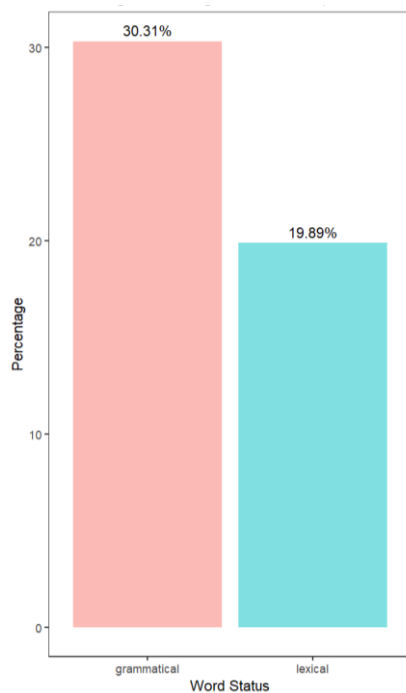


Figure 6 Percentage of linking based on word status

Figure 6 shows how many times had linking been used based on whether the word was grammatical or lexical. Grammatical words are usually without stress, which means that they should be linked to preceding words more often. While lexical words were linked to the words preceding them only in 19,89 % of all the analysed contexts, grammatical words were attached to the preceding words by linking in 30,31 % of times.

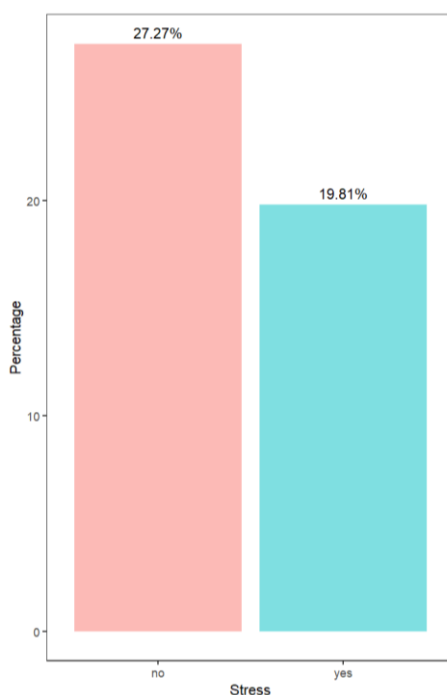


Figure 7 Percentage of linking based on stress

As can be seen in Figure 7, initial vowels which were unstressed were more prone to linking than those that were stressed. While vowels that were stressed, were cojoined to the preceding word by linking only in 19,81 % of times, words that were unstressed were connected to the word that preceded them in 27,27 % of times.

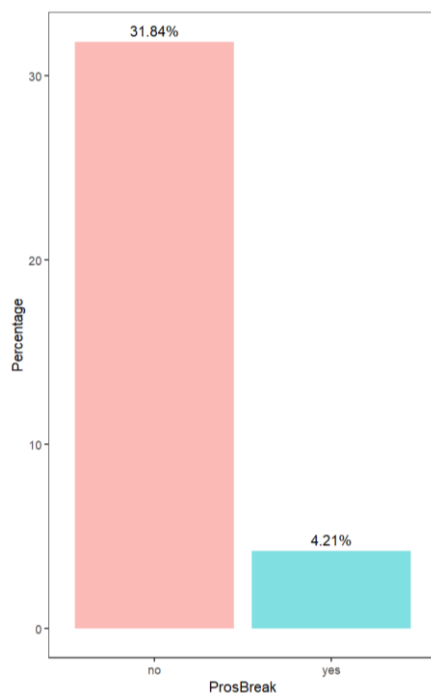


Figure 8 Percentage of linking based on prosodic break

Prosodic Differences were also taken into account, as can be seen in Figure X. While words, that were preceded by a prosodic break were linked to the precursory word only in 4,21 % of times, words that were not separated by a prosodic break were linked much more – 31, 84 % of times.

4.2 Percentage of Linking for Each of the Speakers

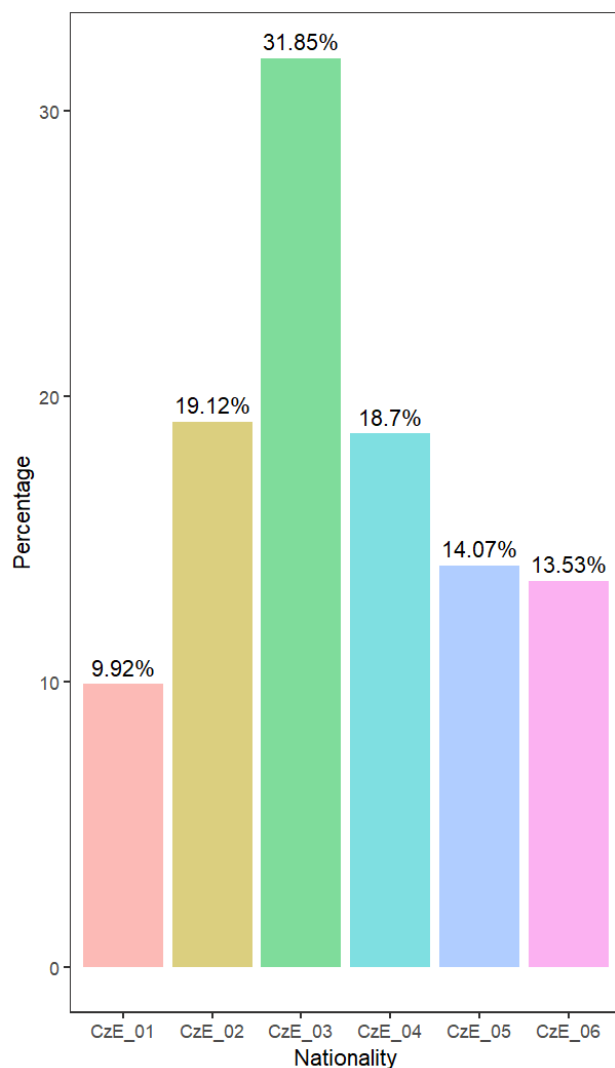


Figure 9 Percentage of linking of each of the Czech speakers

As can be seen in Figure 9, no participant linked the same number of words together. The lowest linking percentage stands at 9,92 % for participant CzE_01, and the highest stands at 31,85 %, which was participant CzE_03. Participants CzE_02 both linked similarly, same applies for participants CzE_05 and CzE_06.

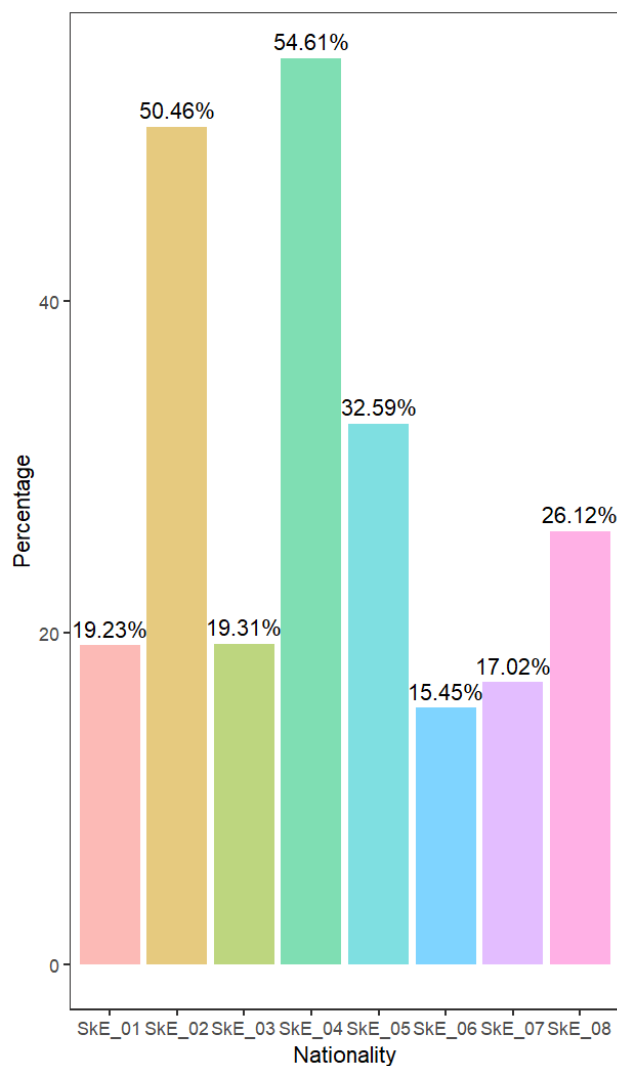


Figure 10 Percentage of linking of each of the Slovak speakers

As Figure 10 shows, the Slovak participants linked on average more often than the Czech participants. Two of the Slovak participants – SkE_02 and SkE_04 – linked in more than 50 % of the cases, SkE_04 being the one who used linking the most (in 54,61 % of times). The least amount of linking showed participant SkE_06, who only linked 15,45 % times.

4.3 Discussion

The main goal of this study was to understand the possible differences between Czech and Slovak speakers, when using linking in English as a second language. As was proven in Chapter 3, Slovak speakers do, in fact, utilize linking more often than the Czech speakers. Hence, the original hypothesis has been confirmed. However, quite surprisingly, only two of

the Slovak speakers linked in more than half of the possible cases. It is debatable, what caused it – there are, however, some possible factors, that could explain this unexpected outcome.

First of all, as is mentioned at the end of chapter 2.2, more times than not, people tend to glottalize more, when reading a text, even more so, when it is a text, they have never seen before. All of the female participants have seen the text before reading it, but only for a short time, so there was little preparation. It is possible that if the participants were asked to perform an unprepared speech, which would have then been recorded and analysed, the results would differ even more significantly than they do now. It must also be taken into account, that the recordings were taken, most probably, in unfamiliar surroundings, which could have contributed to the levels of stress of the participants, and that could have in due course caused a greater frequency in glottalization. Moreover, the text was in English, which is, after all, a foreign language for all of the participants, and they were all still learning it, at that time – that may have contributed not only to the stress, but to the ratio of glottalization versus linking, as well.

On the other hand, all participants were recorded under the same conditions. They were also given the same text, so the comparison is presumably more prone to a better detailed comparison, than if sixteen different unprepared discourses were compared together.

Still, the fact that the female participants were given a text, which was prepared in advance by somebody else, can be deemed as a limitation. It would be interesting to see, how would the results differ if an unprepared speech was analysed. Another limitation is the fact, that all participants were women. Though no other factors are at play – such as sex, social circumstances etc. – still, it would be great for further experiments to include male participants, as well. If more people were analysed, it would most probably alter the results in some extent, and if not, the hypothesis would at least be confirmed further. Hence, why expanding the sample of people that were surveyed is a desired possibility.

It is also quite interesting, that the Czech speaker from Moravia-Silesia used glottalization in a significantly greater amount than all of the other speakers – no matter, whether Czech or Slovak. That may be due to the fact in Moravia, the dialect differs from both Bohemian dialect and Slovak language. Further analysis of the differences between Czech speakers

from Bohemian district and from Moravian-Silesian district would also be an interesting matter for further studies.

Another factor that should be analysed, is the language level of each participant. All Czech participants, except one (CzE_01), claimed, that their language level was C1. CzE_01 stated, that her language level is B2. That can be another reason, why she used glottalization to the greatest extent out of all the participants. On the other hand, participant CzE_03, who used linking to the greatest extent, was the only one who had resided in an English speaking country (the participant said that she resided both in England and in the United States of America). What is also quite interesting is the fact, that the longevity of learning the language did not seem to have any effect on the results. The participant, who claimed to have studied English language for the longest time, which was fourteen years, had very similar results to the participant CzE_02. However, the participant CzE_02 stated that she has been learning English language for only ten years at that time. Another factor, that the participants were asked, was whether they know what glottalization and linking is – all of them said yes, except participant CzE_04. Once again, this factor seemed to have no effect on the speech production of English as second language, as CzE_04 had almost the same results as participant CzE_02, who stated that they knew what glottalization and linking was. Finally, the participants were also asked about what other languages they knew. Everyone, except participants CzE_03, CzE_05, and CzE_06 answered that they knew German at least at level B1. While German and English language both belong to the German branch of the Indo-European language family, participant CzE_03, who stated that she studies French, which is part of the Romance languages, showed the most amount of linking (and linking is very frequent in French or Romance languages more generally, see Skarnitzl et al., 2022). Furthermore, it is definitely worth discussing whether the participants model their accent according to any particular accent – CzE_03 was the only one, who modelled her accent after a British one. Participant CzE_02 and participant CzE_04 said that they try to model their accent after a British one, and the other participants stated that they have no model. However, CzE_03's model accent may be British due to the fact, that she spent some time in the United Kingdom.

Among the Slovak speakers, the two participants, who had resided either in England or the United States of America, were participants SkE_02 and participant SkE_04. These were again the two, who achieved the highest score, and also the only two who used linking in

more than half of the analysed cases. This then provides an opportunity for further studies, as it would be quite interesting to compare, whether a longer (more than one month) residence has any effect on the way people use glottalization and linking in their speech. Participant SkE_04 was also one of the two people, who stated that their level of English is C2. The other participant was SkE_07, yet, she was one of the Slovak speakers, who glottalized more. SkE_06 stated that her English level is B2, which may be the reason why she showed the lowest percentage of linking. Other participants stated that their English level was C1, and they all linked more or less in the same amount. What is interesting is the fact that the Slovak speakers tend to model their accent more than Czech speakers – while only two Czechs modelled their accent, three of the Slovaks modelled their accent after American pronunciation, and two after the British pronunciation. This, however, seemed to have no effect on their level of linking. The same applies for the other learned languages, as there was no real correlation between those and the level of linking.

What must also be taken into account are such factors as stress, prosodic boundaries preceding the words, or the word status. As grammatical words are not stressed, unless a special emphasis is desired, it would be logical for them to be linked more than words, that are lexical – that turned out to be true. Grammatical words were stressed about 30 % of times. Lexical words, on the other hand, were stressed less often, as only 19,89 % of all the analysed contexts were linked to the preceding words. Similarly, to grammatical words, some of the lexical words do not hold a stress on the initial vowel – specifically words, that are more than one syllables long, and their stem is preceded by a prefix. As the results showed, words that carried stress on the initial vowel were linked to the preceding word in 19,89 % cases. However, words that carried stress on the second syllable, or did not carry stress at all, were linked 30,31 % of times. From these results, a conclusion can be drawn with the most probability – stressed vowels tend to be glottalized much more than unstressed vowels, at least by Czech and Slovak speakers in English as a second language. Finally, the presence or absence of prosodic boundaries showed the greatest difference between the amount of linking. While words that followed a prosodic boundary were linked only in 4,21 % of times, words that were not separated by a prosodic break were linked in a much greater extent – a whole 31,84 %. This may be due to the fact, that prosodic boundaries require certain melodic, rhythmic, and temporal features, that force the speaker to use glottalization much more often than linking. Glottalization also reinforces breaks between words and thus makes the prosodic boundaries more prominent.

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6 Appendix

BBC news with Kyle Andrews.

The **Italian** Senate has passed a tough **austerity** budget, **including** cuts **of** forty billion euros **over** the period **of** three years. The lower house must **also adopt** the measures **in a vote on** Friday. **Italy** has **one of** the largest debts **in** the Eurozone, **and** the latest **efforts aim to avoid any** need for a bail **out**. Both the government **and** the **opposition are well aware of** the fact that **Italy is under** close scrutiny due to **its** large debts. **At the end of** last week, the **I eM eF urged Italy to ensure** decisive **implementation of** spending cuts.

Kenya has **agreed to open** a new refugee camp near **its** border with Somalia, **as** thousands **of** people **are** fleeing the region's worst drought **in** sixty years. The Prime Minister **of** Kenya **announced** that a camp which can fit **up to eighty** thousand people would **open** within ten days. Some ministers had feared **opening** the camp would **encourage** more Somalis to cross the border, but the Prime Minister said that turning **away** the refugees was not **an option**. **In his opinion**, that would **amount to ethnic** cleansing.

Buranda **Airways is expected** to hold **an emergency** meeting **of its** board **of** directors. The **airlines** have been **experiencing** problems **over** fulfilling **admission** criteria **of** the Star **Alliance**, a global **airline** network. The directors were **angered** by the latest **offer and accused** the **Alliance of** pursuing their **own interests in** the negotiations. The board, **acting on the instructions of** the shareholders, were **ordered to arrive at a** decision by Friday.

You're listening to the news from the BBC **in** London.

A colourful, spindly legged toad that was believed to be **extinct** has been rediscovered **in** the forests **of** Borneo. Scientists from the university **in** Sarawak found three **of** the missing

animals up a tree during **a** night-time search. The team had spent **eight** months searching for the toad. **According** to Doctor Robin Moore **of** Conservation **International**, **it is** good to know that nature can surprise **us** when we **are** close to giving **up** hope, **especially amidst** **our** planet's **escalating extinction** crisis.

A rare Jane **Austen** manuscript has sold for **almost a** million pounds **in** London, three times more than **its estimated** price. **Auction** house Sotheby's had **originally** valued the **unfinished** novel, **entitled** The Watsons, **at about a** quarter **of a** million pounds. The manuscript, **originally owned** privately, was purchased by **an independent institution**. **It is assumed** that **Austen** wrote the tale **about a** young woman who returns to her father's household **after** being brought **up** by her **aunt**, **in eighteen oh** four. **Austen** published six complete novels **and** died **in eighteen** seventeen **at the age of** forty one.

BBC news.