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ALAPSZAKOS SZAKDOLGOZAT

Zöngésségi hasonulás az angolban és zöngenyelvekben: Az angol és a magyar összehasonlítása

Voicing assimilation in English and in voicing languages: A comparison of English and Hungarian

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Abstract

This study investigates whether the devoicing of English /z, d/ and Hungarian /j/ word-finally before a voiceless (or fortis) obstruent can be analysed as progressive voicing assimilation. First, it examines the behaviour of the two languages with respect to regressive voicing assimilation, which is the usual direction of the phenomenon. Then it discusses the articulation of these three consonants and their typical properties in word-final position. Third, it compares two formal descriptions of each language: for the English phenomenon, Lombardi's Optimality Theory model (1999) and the analysis by Iverson and Salmons (1999); and for the Hungarian phenomenon, the description by Siptár and Törkenczy (2000) and Blaho's OT model (2002). Finally, the study ends with the conclusion that the primary cause of the two phenomena is probably not assimilation but the word-final environment and the articulatory difficulties the production of /z, d/ and /j/ demand.

Table of Contents

1. Introduction

Hungarian and English show important differences with respect to voicing assimilation phenomena, which are rooted in the different articulatory properties of their obstruent sets. However, both languages have examples when the laryngeal specifications of an obstruent seemingly depend on those of the preceding sound. This occurs in the position C_#. In the English words *picks* and *kicked*, the final sounds are fully voiceless, and they are often transcribed as fortis: [pɪks, kɪkt] (e.g. Cruttenden, 2014). This transcription, then, supposes a complete change in their laryngeal specifications, which can be considered progressive assimilation. In Hungarian, word-final postconsonantal /j/ turns into a voiced fricative [j] in e.g. *kérj* [ke:rj] (Siptár & Törkenczy, 2000). If the preceding obstruent is voiceless, it completely devoices into [ç] in e.g. *kapj* [kɔpç]. This phenomenon is also categorized sometimes as progressive voicing assimilation.

Nevertheless, this denomination raises some language specific and cross-linguistic problems. On the one hand, English exhibits no perceptible voicing assimilation elsewhere, and its word-final lenis obstruents are generally voiceless regardless of the preceding sound, because they have no active voicing. On the other hand, voicing assimilation is generally regressive and is not restricted to so specific environments as this progressive devoicing. Based on these problematic issues, this thesis has the following two aims: firstly, it wants to find out whether the analyses of the English phenomenon show similarities to those of the Hungarian phenomenon; and secondly, whether progressive voicing assimilation is the best term for the phenomenon in each of the two languages.

2. Phonetic background

2.1. Laryngeal contrast in obstruents

Laryngeal contrast in obstruents is cued by different phonetic components across languages. However, there is a limited set of features that languages choose from, which typically comprises the following cues: vocal fold vibration, Voice Onset Time (VOT), preceding vowel (or vowel plus sonorant sequence) length, glottalization and force and length of articulation. According to Cruttenden (2014: 163–166), in English the contrast is between lenis and fortis obstruents. Fortis (i.e. *strong*) obstruents are always voiceless[1], are preceded by shorter vowels (a phenomenon known as Pre-Fortis Clipping), are articulated with greater force than their lenis (i.e. *weak*) counterparts, and the stops are aspirated word-initially or before stressed syllables. Since in this position, aspiration (or positive VOT) is the most salient cue, English is termed an aspirating language. Lenis stops, on the other hand, are not aspirated in any environment, and can be passively voiced between vowels and sonorants. In all other environments, they are either fully or partially voiceless (Jones, 1922: 35; Cruttenden, 2014: 164). Hence the [b̥] and [d̥] in *bad* [b̥ad̥] are both voiceless unaspirated, and the vowel [a] is comparatively longer than, for example, in *bat*. Hungarian also uses preceding vowel (plus sonorant) length and force and length of articulation (Jansen, 2004), but as opposed to English, the most salient cue of its obstruents is active voicing (which makes it a voicing language), and therefore the members of each pair are better classified as voiced and voiceless.

2.2. Active and passive voicing

The articulation of obstruents makes the initiation and maintenance of vocal fold vibration difficult because it involves either the full or the partial closure of the mouth, which

[1] At least in General British English. In General American, for instance, fortis /t/ is flapped [ɾ] before unstressed syllables as in *better* [beɾər] or *writer* [rɑjɾər].

increases the intraoral pressure. However, this pressure must be lower than the subglottal pressure for the vocal folds to vibrate. Therefore, Stevens (1998: 466) points out that, if no articulatory adjustments are made to enlarge the oral cavity (e.g. lowering of the larynx, expansion of the pharyngeal volume, raising of the soft palate), vocal fold vibration will become impossible. Hungarian voiced stops and fricatives are articulated with the help of these mechanisms, as opposed to English lenis stops, the articulation of which resembles that of Hungarian voiceless stops (which are always unaspirated). As for fricatives, Jansen (2004) showed that voicing is part of the relevant cues of contrast in both English and Hungarian, even if to a lesser extent in the former. Therefore, he classified English word-initial [z] as a phonetically actively voiced fricative.

2.3. Coarticulatory voicing assimilation

The difference between actively and passively voiced obstruents is intrinsically connected to their (dis)ability to trigger voicing assimilation. Jansen (2004) argues for a coarticulation-based analysis of regressive voicing assimilation (RVA). He claims that the phenomenon is caused by the spreading of the articulatory adjustments mentioned in the previous subsection to the preceding obstruent, thus making it voiced. It follows from this definition that the process does not affect all the cues of laryngeal contrast. Hungarian obstruents are actively voiced, and, as Siptár and Törkenczy (2000) state, they voice the preceding voiceless obstruent(s) independently of speech-rate as in *rakd* [gd], *kútban* [db] and *széfben* [vb].[2] The authors add that the phenomenon also applies across a compound or a word boundary (p. 78). In contrast, Cruttenden (2014) points out that passively voiced English lenis stops do not trigger RVA: *nice boy* [sb], *black dress* [kʤ] and *birthday* [θd] all involve fortis–

[2] Importantly, Hungarian /v/ is unable to trigger RVA in the standard dialect (cf. *tviszt* [tv], *akvárium* [kv], *lopva* [pv]). Kiss and Bárkányi (2006) demonstrated that this is due to /v/'s sonorant-like realization in these environments, because sonorants never trigger RVA in this dialect. The other exception is the fricatival allophone of /h/, [x], which resists to get voiced (e.g. as in *méhben* [xb] and not *[ɣb]).

lenis obstruent clusters (p. 311). On the other hand, Jansen showed in an experiment that word-initial /z/ did increase the voicing of the preceding /k/ and /g/ across word sandhi. This nonetheless resulted to be no more than coarticulatory RVA because the rest of the cues were unaffected by the process. Hungarian RVA was shown to be different in that it neutralized vowel length distinctions, but Jansen's results indicate that it does not lead to complete neutralization either (p. 163).

Apart from voice spreading, the (coarticulatory) devoicing of a preceding obstruent can also be attested in both languages, although the exact environments and mechanisms are not completely identical. Siptár and Törkenczy state that in Hungarian, a voiceless obstruent devoices a preceding voiced obstruent as in *rabtól* [pt], *melegtől* [kt] and *háztól* [st]. This is again obligatory, postlexical (cf. *rabszolga* [ps] or *nagy kalap* [ck]) and independent of speech rate (p. 78). As opposed to Hungarian, Jones (1922) and Cruttenden (2014) claim that General British English does not show a similar tendency[3]. Jones mentions that optionally there can be assimilation in *width* [tθ] and *fivepence* [fp], and Cruttenden points to the equally optional assimilation in "close knit groups" such as *with thanks* [θ:] or *these socks* [s:] (p. 310). In Jansen's experiment, word-initial /t/ and /k/ articulated with active devoicing measures resulted to "cause deviations in the phonetic voicing of the preceding obstruent" (p. 141) across a word-boundary. Myers (2010) presented similar results after analysing obstruent clusters: he found that the voicing duration of a lenis fricative was significantly lower when this sound was followed by a fortis stop. The results of these two experiments indicate coarticulatory RVA.

[3] Yorshire English is different. Wells (1982) coined the term "Yorkshire Assimilation", which refers to the "complete neutralization of the voicing opposition" (p. 367) in e.g. *bedtime* [t:] or *big piece* [kp]. (p. 367)

3. Progressive voicing assimilation

3.1. English data

Besides the cases of (coarticulatory) RVA discussed above, English presents an example for what is often considered perceptible progressive assimilation. This affects the regular past tense suffix /d/ and the plural/3rd person singular/possessive suffix /z/. Cruttenden (2014: 265–266) lists the following pronunciation rules for the past tense morpheme (the /-id/-rule is not included):

(a) if the stem ends in any voiced sound (apart from /d/), add /-d/, e.g. *buzz* /bʌz, bʌzd/

(b) if the stem ends in any voiceless consonant (apart from /t/), add /-t/, e.g. *kick* /kɪk, kɪkt/

He then continues with the rules for the *-s* morpheme (the /-iz/-rule is not included):

(a) If the stem ends in any non-sibilant voiced sound, add /-z/, e.g. *regard* /rɪgɑ:d, rɪgɑ:dz/

(b) If the stem ends in any non-sibilant voiceless sounds, add /-s/, e.g. *pick* /pɪk, pɪks/

Jones (1922) mentions an additional "assimilation from voice to breath" (p. 101): when the contracted form of *has* /haz/ and *is* /ɪz/ follows a fortis (or, in his terms, "breathed") consonant as in *Jack has been here* or *that is all right*, he transcribes the sound as a fortis /s/: /ʤæksbinhiə/; /ðætsɔ:lrait/, and he terms this process "assimilation" (pp. 101–102). Importantly, this progressive "assimilation" only affects the C_{fortis}+/z/ or C_{fortis}+/d/ sequences when they are in these two suffixes and clitic. Jansen showed that word-initial /z/ is articulated with active vocal fold vibration, and it increases the voicing of the preceding /k/. Thus, when a word-boundary is involved, the fortis /k/ does not have the same effect on the cluster, and instead of devoicing the /z/, it undergoes coarticulatory RVA (because its phonetic voicing increases).

3.2. Hungarian data

The Hungarian example for progressive devoicing or voicing assimilation is that of the imperative suffix /j/. Siptár (1994) lists three surface forms for Hungarian /j/: in the position $C_{voiceless}\_\#(C_{voiceless})$, it is realized as a voiceless fricative [ç] (e.g. *kapj* [pç], *rakj* [kç], *döfj* [fç], or *lépj ki* [pç]); word finally, after other consonants, as a voiced fricative [ʝ] (e.g. *kérj* [rʝ] or, monomorphemically, in *férj*); and in all other environments it is realized as an approximant sonorant [j] (e.g. *jár* and *ajtó*). As it can be seen, the voicing of its fricatival realization depends on the voicing of the preceding obstruent. Moreover, Siptár and Törkenczy (2000) add that it is the target of RVA, too, which applies iteratively in a sequence such as *lépj be* [bʝb]. In contrast, Siptár (1994) pointed out that approximant [j] is unaffected by RVA as it can be seen in *ajtó* [ɔjto:] *[ɔçto:], thus when the /pj/ sequence is followed by a vowel as in *kapjon*, the /p/ does not have the devoicing effect. The same allophone appears in a sequence such as *kap jegyet*, which shows that the process does not apply across word sandhi either: [kɔpjeʝet] vs. *[kɔpçeʝet].

3.3. Difficulties

The term progressive voicing assimilation presents difficulties that are in part cross-linguistic and in part specific to English or Hungarian. One of the difficulties affecting both languages is the direction of assimilation. Lombardi (1999) established a cross-linguistic typology of voicing assimilation, in which she found that the phenomenon is regressive in most cases (p. 288). It certainly is in all other environments in Hungarian, and the coarticulatory RVA across word sandhi reported by Jansen also applies regressively. Another difficulty is that the phenomenon is limited to the segments and morphemes mentioned above and to word-final environments, while RVA does not exhibit the same limitations. Jansen (2004) points to two further peculiarities of the English devoicing phenomenon: (1) as opposed to coarticulatory RVA, this progressive assimilation is probably fully neutralizing (because he supposes it to

affect all cues to laryngeal contrast); (2) it "is not phonetically conditioned to the extent that it occurs in both voicing varieties […] and aspirating varieties […] of Germanic." (e.g. in both Current British English and Scottish English[4]) (p. 112). Consequently, he considers it essentially different from coarticulatory RVA. Lastly, in Hungarian, there is the additional problem of accounting for /j/'s switch from sonorant to obstruent, which precedes its devoicing.

4. Analyses of the English phenomenon

4.1. Jones's phonetic analysis

As it was stated in section 2, English lenis obstruents have no active voicing, and word-finally they are fully or partially voiceless. Word-initial [z] was found by Jansen (2004) to be articulated with active vocal fold vibration, although he adds that it involves less vocal fold vibration than the other lenis fricatives. Jones (1967), on the other hand, claims that a great number of English speakers do not use voiced [z] word-initially either. However, both authors agree that word-finally in e.g. *begs* [beg̥z̥], instead of a fully voiced [z], frequently a (partially) voiceless [z̥] is pronounced. A word such as *puts*, however, is most often transcribed with a fortis /s/: /pʊts/. Jones (1967: 47) highlights that the phonetic difference between the [s] and [z̥] sounds is that [s] is pronounced with stronger breath force, but he adds that word finally even this sound has a somewhat weaker pronunciation. Thus, the two sounds are very similar to each other in this environment, which makes it more difficult for hearers to accurately say which of the two they hear. If they identify the sound as /s/, it is probably because of the rest of the cues, especially preceding vowel length, which is shorter before fortis clusters.

Jones (1967), nevertheless, observed that "the use of [z̥] (which = a weak [s]) is not by any means uncommon: [putz̥, driŋkz̥, bokz̥]" (p. 47). Based on this and on the phonetic

[4] Scottish English is a voicing variety of English with actively voiced obstruents that trigger RVA as in *most valuable* [zv] (after the elision of /t/) (Wells, 1982: 412).

similarity of the two sounds, he raises the possibility that the word-final fricative in e.g. *puts*, *drinks*, and *box* may better be transcribed not as a fortis /s/, but as a lenis /z/, just as after lenis or sonorant stems. He provides two main arguments for this claim. Firstly, that the same sound cannot belong to two phonemes in the same language, and this word-final fricative is transcribed as a fortis sound only after fortis stems. Secondly, he mentions that many of his native English students often transcribed this suffix as /z/ because they felt it to belong to that category based on their own pronunciation. This observation has important consequences for the analysis of the devoicing phenomenon. If the sound is pronounced and perceived by many native speakers as a lenis [z̥], then it can be assumed that the rest of the cues do not change in this process. Therefore, in this framework, the phenomenon cannot be attributed to progressive assimilation from the fortis stem. Instead, it is better described as a word-final lenition process. Jones does not discuss if the *-(e)d* morpheme can also be transcribed in the same way, i.e. as a lenis /d/, which devoices into [d̥] but does not change fully into a fortis [t]. However, the descriptions referred to in this paper (Lombardi 1999, Iverson & Salmons, 1999, Jansen 2004) all assume that the same process affects both suffixes. Therefore, it is plausible to suppose that if the *-s* does not fully change, nor does the *-(e)d* suffix. However, based solely on this last point, the possibility that it is different from *-s* and its assimilation is more complete (and that it should be transcribed as /t/) cannot be ruled out.

Despite Jones's suggestion, many (more recent) grammars of English (e.g. Cruttenden, 2014) categorize the plural and past tense morphemes as fortis when they follow a fortis stem, and they transcribe them as /s/ and /t/ respectively. Jansen, too, argues that this process is not phonetically conditioned but governed by the morphology of the language primarily for three reasons. Firstly, the same alternation takes place in Scottish English and Dutch (there only with the past tense morpheme), both of which are voicing languages that have phonetically voiced obstruents word-finally. Therefore, the process does not depend on the

phonetic manifestation of the laryngeal contrast in obstruents as it does with regressive voicing assimilation. Secondly, it is not gradient and is independent of speech rate and style. Thirdly, Jansen assumes it to affect all cues of laryngeal contrast. He argues that word-final lenis clusters (e.g. *nagged* [nagd̥]) also tend to be phonetically voiceless, but they are still distinguishable from the cluster in *racked* [rakt]). However, phonetic data e.g. about the rest of the cues would be necessary to make definite statements in this respect, but Jansen mentions that these do not seem to be available. The existence of pairs such as *logged* and *locked*, nonetheless constitutes a further argument in this vein.

Jones (1967) also mentions that e.g. *puts* is often pronounced with an [s]. He even says that in the speech of those who regularly use this sound, it should be transcribed as /s/. It is noteworthy, however, that this recommendation goes against his claim that the same sound cannot be assigned to two different phonemes within the same language. Still, Jansen's arguments presented above, and the fact that the fortis transcription is widespread, make it necessary to discuss analyses of the phenomenon that describe it as resulting from some specific assimilation rule or constraint.

4. 2. Phonological analyses

The phonological models reviewed in this thesis unanimously consider the lenis /z/ and /d/ to be the underlying forms of the *-s* and the *-(e)d* morphemes, which, however, change completely into a fortis [s] and [t] when they follow a fortis stem. One argument (besides those mentioned by Jones, 1967) for assuming the underlying sounds to be lenis is that these forms appear after sonorants (e.g. *films* [fɪlmz̥], *skimmed* [skɪmd̥]) and lenis obstruents, which (in English) do not affect the voicing of their neighbours. Therefore, analyses based on this assumption focus (1) on why these obstruents change into their fortis counterparts in e.g. [kɪkt] and [pɵts], and (2) on why they do not in other environments. Thus, the restricted nature of the phenomenon and its progressivity are two of the main difficulties for analyses. Moreover,

opinions differ on whether in English the relevant feature for obstruents is [voice] (e.g. Cho, 1990, Lombardi, 1999) or [spread glottis] (e.g. Iverson and Salmons, 1999).

An additional issue in connection with the former view is that it treats [voice] to be privative, so it claims that only the presence of [voice] is visible to the phonology. This, however, causes theoretical difficulties for describing the assimilations to voicelessness. Jansen (2004) points out problematic aspects in both the [voice]-based model and the [spread-glottis]-based model, which suggest that none of them can be considered ideal. Nevertheless, in what follows, I will compare these two types of analysis thereby highlighting those aspects in them that are helpful for explaining the devoicing phenomenon.

4.2.1. Lombardi's (1999) model

Crucially, in Lombardi's analysis voiced and lenis obstruents both have an L-node, and only these consonants have one. She considers fortis or voiceless obstruents to be laryngeally unmarked, so they are represented as lacking an L-node just like sonorants. Her model is developed in the framework of Optimality Theory (OT) (Prince & Smolensky, 1993), which uses positional faithfulness and markedness constraints that are cross-linguistically universal to account for changes in segments. These constraints are ranked differently in languages. The constraints relevant to voicing assimilation are the following:

> Laryngeal Constraint: Laryngeal features within the same syllable are only allowed before a [+son] segment (vowel or sonorant).
>
> IDOnsLAR: Consonants in the position stated in the Laryngeal Constraint should be faithful to underlying laryngeal specification.
>
> IDLAR: Consonants should be faithful to underlying laryngeal specification.
>
> *LAR: Do not have laryngeal features.
>
> AGREE: Obstruent clusters should agree in voicing (pp. 270-273).
>
> Harms' Generalization: Voiced obstruents must be closer than voiceless to the syllable nucleus (p. 288).

According to Lombardi, these constraints are ranked in English as follows: Harms' generalization » IDOnsLAR, IDLar » *LAR » AGREE (p. 289).

The primary benefit of this analysis is that it accounts for both the suffixal devoicing and the lack of assimilation in other environments. Lombardi, similarly to Cho (1990), attributes the devoicing of /z/ and /d/ primarily to a syllable well-formedness constraint, which is based on Harms (1973). Harms claims that progressive devoicing in English cannot be the result of a language-specific spreading rule. He formulated the generalization that "[o]nce voicing ceases following the nucleus (vowel) of any syllable voicing can no longer resume in that same syllable" (as cited in Cho 1990, p. 38). The tableau below shows the effect of *LAR and of the constraint based on Harms' Generalization:

/kæt+z/	Harms' genl.	IdentLar	*Lar
a. kætz	*!		*
b. kædz		*	*!*
☞ c. kæts		*	

Figure 1. Effect of Harms' Generalization and *LAR (Lombardi 1999: 289)

As it can be seen, this constraint inhibits the form *[katz] but still leaves *[kadz] as a possible realization of the word *cats*. This is ruled out by *LAR, which selects the fortis cluster so only [kats] remains. As for the lack of voicing assimilation in the other environments, Lombardi explains it with the lowest ranking of AGREE, which means that obstruent clusters do not have to be homogeneous in voicing in this language.

Despite the benefits of this model, Jansen highlighted at least three of its drawbacks. Firstly, it is phonetically inaccurate because it assigns the privative feature [voice] (an L-node) to the lenis obstruents of aspirating languages and to the voiced obstruents of voicing languages.

While in the latter this is supported by the fact that voiced obstruents are articulated with vocal fold vibration (which can then spread to the neighbouring sounds), in the latter type, lenis obstruents (especially the stops) do not involve the same. The model can thus only resort to different constraint ordering to account for the inability of lenis obstruents to trigger voicing assimilation. Secondly, in this model, neither the fortis nor the voiceless obstruents have laryngeal specifications that could spread forwards so devoicing can only be achieved with the delinking of [voice]. Nevertheless, Jansen observed that the delinking seems to be motivated by the presence of a laryngeally unmarked segment, which should otherwise be invisible to phonological processes. This makes the privativity of [voice] uncertain (more on this in section 5.2).

As a last disadvantage, it can be mentioned that Jansen (2004) and Iverson and Salmons (1999) both question if it is really the constraint based on Harms' Generalization that causes the delinking. On the one hand, Jansen supposes that Dutch past tense morphology shows the same allophonic alternation as English. Nevertheless, in the former the stem and the suffix belong to different syllables, so in Dutch the phenomenon cannot be due to this syllable well-formedness condition. Iverson and Salmons, on the other hand, consider this Generalization unsatisfactory on the ground that it leaves many other strategies open (e.g. nasalization, RVA, deletion, or epenthesis), and it does not explain why it is solved by progressive assimilation and not by one of these other strategies.

4.2.2. Analysis by Iverson and Salmons (1999)

It was partly the second problematic issue mentioned above (i.e. that [voice]-based models consider fortis obstruents to be laryngeally unmarked) that motivated Iverson and Salmons to propose a different type of model. They observed that in English only voicelessness spreads (albeit, in General British, it only spreads in limited environments). Therefore, they suggest that in this language (and in most other Germanic languages) it is the fortis obstruents

that are laryngeally marked, and the relevant feature is [spread glottis] (or [sp gl]). In their analysis, this is the feature that spreads rightwards to the /d/ and /z/ suffixes and turns these lenis sounds into fortis. This is clearly an advantage of this model over that of Lombardi since it manages to show that fortis obstruents are phonologically active.

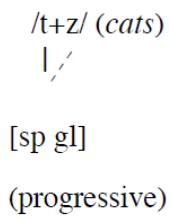

Figure 2. Progressive spreading of [sp gl] (Iverson & Salmons 1999: 15)

This model also accounts for an exceptionality that has not been mentioned so far: the limited number of nouns whose plurals are formed with the lenis allophone, e.g. *wife* [wɑjf]–*wives* [wɑjvz] or *leaf* [lɪjf]–*leaves* [lɪjvz]. Iverson and Salmons assume that, under a [voice]-based analysis, this would probably be analysed as regressive voicing assimilation to the lenis suffix. They add, however, that it contravenes the constraint ranking that account for the lack of RVA in other environments, and that the irregularity is not present with the possessive in *wife's* [wɑjfs]. This word final RVA would, of course, be contrary to the phonetic properties of [z̥] in this environment as well (i.e. that it lacks vocal fold vibration). Therefore, according to this model, a form such as [wɑjvz] does not result from RVA but from the lack of the progressive spreading of [sp gl]. The authors claim that this is "a lexically arbitrary reflex of a historical segmental weakening […]" (p. 15).

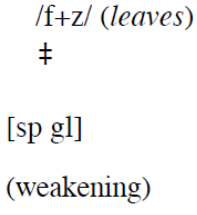

Figure 3. Segmental weakening in *leaves*$_N$ (Iverson & Salmons, 1999: 16)

Apart from its advantages mentioned above, this model, too, has disadvantages. Jansen again refers to Scottish English and Dutch, in which the devoicing of the suffix cannot be due to the spreading of [spread glottis], because the relevant feature for their voiced obstruents is presumably [voice] and not [spread glottis]. Thus, in this framework it would have to be traced back to a totally different mechanism (than in General British), for which "there seems little empirical support." (p. 226) Furthermore, Jansen highlights that this model assigns the same phonological feature to all fortis fricatives and stops in English. However, this is clearly not confirmed by his phonetic analysis, which indicated that, especially, word initial lenis [z] is produced with vocal fold vibration, which spreads backwards. [spread glottis], then, is not necessarily the relevant feature for both manners of articulation.

Two further disadvantages could be added to those mentioned by Jansen. Firstly, the model does not discuss why [spread glottis] does not spread in other environments e.g. across a word boundary. This is an important issue because the regressive assimilations to voiced and voiceless obstruents (e.g. in Hungarian) are not limited to word final clusters or to certain specific suffixes, while the progressive spreading of [sp gl] seems to be. The second is again a phonetic consideration. As it was mentioned in section 2, Myers (2010) showed that a fortis obstruent decreases the voicing duration of a preceding lenis fricative. He explained that this is because the spread glottis required to produce a fortis obstruent regressively affects the articulation (especially the voicing) of the preceding lenis fricative. This is clearly an example of the coarticulatory RVA discussed in detail by Jansen, and it shows that in other environments the spreading of the articulatory properties (especially the spread glottis) of fortis obstruents is regressive. Nonetheless, Iverson and Salmons argue that [sp gl] spreads progressively here, but they do not discuss the reasons for this otherwise unusual direction.

4.3. Summary

To sum up the analyses of the English phenomenon, it can be stated that two of the three approaches do not analyse it as assimilation, i.e. as a process that results from the spreading of the articulatory properties of a neighbouring sound. Jones does not assume that the suffix should be transcribed as [s], so the process cannot be treated as complete assimilation there. Lombardi's model considers the process to be the effect of constraints and not of the spreading of a feature. Only Iverson and Salmons work with a model that is based on feature-spreading, which is closer to traditional assimilation rules. These two models justify the widespread fortis transcriptions ([s, t]), but both have points that are problematic for phonological theory. Jones's (1967) suggestion that the devoicing of the word-final *-s* does not result in an assimilated [s] but in a voiceless lenis [z̥] has two practical benefits. First, it assumes only two allophones instead of three: /z, iz/ and /d, id/. Second, it does not require the formulation of a phonological rule or constraint to describe the assimilation process.

5. Analyses of the Hungarian phenomenon

5.1. Phonetic analysis

Similarly to the English devoicing phenomenon, Hungarian word final /j/ devoicing, too, can be explained (at least in part) with the articulatory difficulties that the production of this sound presents word-finally. /j/ in most environments is realized as an approximant, and it becomes fricated only in C_# position. If the preceding consonant is voiced, /j/'s fricatival allophone is considered to be a voiced [ʝ]. However, Kiss and Bárkányi (2006) explain that the articulation of voiced fricatives requires an "uneasy balance" (p. 200). On the one hand, fast transglottal airflow is needed for the production of friction noise, which is achieved with a widely abducted glottis and a constriction in the mouth. Vocal fold vibration, nevertheless, requires just the opposite: adducted glottis and free airflow through the mouth (or nose).

Consequently, the authors argue that voicing in fricatives is not sustainable in unfavourable environments, and the C_# position resulted to be one of the worst contexts in this respect. Their analysis focused on the phonetics of Hungarian [v], which becomes strongly fricated and devoiced in this position (p. 210). Presumably, however, the results of their analysis can (to some extent) be extended to [j̥].

According to Siptár (1994) and Kiss and Bárkányi (2006), /v/ is realized as an approximant in most environments, but in e.g. *jókedv* and *könyv* it becomes a noisy fricative. Kiss and Bárkányi point out also that its fricativization is in parallel with its devoicing (p. 209): they reported that all of the participants in their study pronounced the /v/'s in *könyv* and *jókedv* as voiceless, which shows that /v/ devoices in spite of the preceding voiced consonant. /j/, nonetheless, is said to be a voiced fricative word-finally when it follows a voiced consonant ([ke:rj̬]). However, in the light of the observations about /v/, it becomes questionable to what extent it is voiced after voiced consonants. Given the difficulty of voicing in word-final fricatives, it can be assumed that [j̥] (just as /v/) is either devoiced in this position too, or its phonetic voicing is rather weak (compared to actively voiced fricatives in other positions). This feeble voicing may explain its failure to trigger RVA (c.f. *[le:bj̬] as opposed to /d/, which always voices the preceding sound as in *rakd* [rɔgd], *lásd* [la:ʒd]), and it may also account for its dependence on the voicing of its neighbours. However, if the devoicing of [j̥] can take place after voiced consonants too, it can be asked whether the devoicing in *kapj* is indeed primarily motivated by assimilation from the /p/.

Apparently, phonetic data on the voicing (and the rest of the laryngeal cues) of these allophones is scarce, and therefore it is hard to make definite statements. It is reasonable to argue that the preceding voiceless obstruent further contributes to the devoicing process, but this is quite different from the regular RVA to voiceless obstruents. In the latter, the articulatory properties are sufficient to devoice the preceding sound (e.g. *háztól* [hɑ:sto:l]); in the former,

however, the word-final environment is also necessary for the devoicing process to take place. After these phonetic details, I now turn to two formal descriptions of this phenomenon.

5.2. Analysis by Siptár and Törkenczy (2000)

Siptár and Törkenczy considered [voice] to be a privative feature (p. 199), and thus in their framework (as in Lombardi's) only voiced obstruents have an L-node as opposed to voiceless obstruents and sonorants, which are both laryngeally unmarked. The authors use the following three rules to describe the distribution of the allophones of /j/ in the position C_#:

(a) [+son] → [ ], [voice] / _#

(b) Coda Obstruentization: [ ] → [−son] / in syllable coda[5]

(c) Final Fricative Devoicing (FFD):

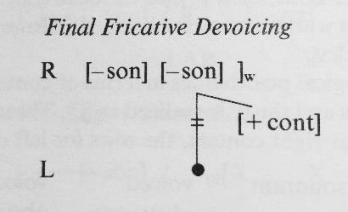

Figure 4. Final Fricative Devoicing (Siptár & Törkenczy, 2000: 206)

Rule (a) turns word-final /j/ into a voiced obstruent, i.e. it deletes [+son] and adds an L-node, which would otherwise be missing because sonorants are unspecified for [voice]. The sound derived in this way is not specified for the feature [son], and rule (b) turns all such sounds into obstruents if they are in syllable coda. These two rules are sufficient to predict that the voiced allophone ([ɟ]) will surface in *kérj* or *férj*. Rule (c) predicts that the [ɟ] in *lépj* will be realized as a voiceless [ç]. The authors explain that adding [+cont] for the input is necessary because /d/, which is [−cont], does not lose its L-node but spreads it leftward in *rakd* [gd] and thus it is exempt from the rule. Importantly, FFD applies before regressive voicing assimilation, because

[5] The authors originally use this rule to account for /v/'s behaviour (which patterns with obstruents in this position), but they add that it applies in the processes affecting /j/, too.

the stem final /p/ only becomes voiced in e.g. *lépj be* [le:bjbe] and not in *lépj* [le:pç] (*[le:bj]). Voice spreads leftwards only from /b/, and not from the allophone of /j/, which gets devoiced.

As it was mentioned in connection with Lombardi's analysis, models that are based on privative [voice] accurately describe the spreading of voice, but their accounts of the assimilations to voicelessness raise problems. In a privative [voice] framework, the voiceless segments are laryngeally unmarked because they are supposedly invisible to the phonological processes affecting laryngeal specifications. However, as Szigetvári (1998) and Jansen (2004) observed, they do not always seem to be completely invisible. In the regular cases of RVA in Hungarian, it appears that it is their presence that triggers the delinking of [voice] in the neighbouring segment. Similarly, if the suffixal devoicing of English /d, z/ and Hungarian /j/ are analysed as progressive voicing assimilation, this process is triggered by the absence of [voice]. This problematic aspect of privative [voice] frameworks becomes even more visible when the behaviour of voiceless obstruents is compared to that of sonorants (in English or in Standard Hungarian): sonorants never trigger the (de)voicing of a neighbouring sound (e.g. *futni* [tn] or *háznál* [zn]), which indicates that they are indeed laryngeally unmarked and that their voicing specifications are irrelevant to voicing assimilation processes.

5.3. Blaho's (2002) OT analysis

Although the rules by Siptár and Törkenczy constitute an accurate formal description of /j/-devoicing, they leave some questions unanswered. Blaho (2002) developed an OT model, which provides an alternative and, in some ways, a more detailed explanation of the phenomenon. To account for the behaviour of obstruents with an obstruent input with respect to RVA, she uses roughly the same constraints as Lombardi (see Section 4.2.1). The ranking is as follows: AGREE, ID-wf-voi, ID-preson-voi » ID-voi » *[+voice] (p. 21). She uses binary [±voice] and not an autosegmental representation. The key idea of her model, however, is that these faithfulness constraints only predict the right forms with those obstruents whose input is

also an obstruent. She claims that the behaviour of surface fricatives that are underlyingly sonorants (such as [j]) can only be predicted with further constraints that only apply to these sounds. First, to account for word-final /j/'s switch from sonorant to obstruent, she draws on the Sonority Sequencing Principle. This "requires that the sonority of segments decrease towards syllable peripheries" (p. 23). Following Törkenczy (1994), she presents the following sonority scale for Hungarian:

> stops, affricates < fricatives << nasals << v << l << r << j (ibid.)

Based on this, the constraint she formulates is SS:

> SS: Progressing from the nucleus toward syllable peripheries, great sonority increase is not allowed." (ibid.)

This constraint is ranked together with the highest ranked constraints mentioned above. Since /j/ is much more sonorous than obstruents and /r/, SS provides a possible explanation for why /j/ turns into an obstruent in the position C_#. However, it proves unsatisfactory when the surface form is the voiceless allophone: [ç]. For this reason, she proposes two more faithfulness constraints:

> ID[voi][~son]: Obstruents are faithful to their input in terms of the feature [voice] even if this is not true for the feature [sonorant] (p. 25).
>
> ID-son: Segments are faithful to their input in terms of the feature [sonorant] (p. 26).

The final ranking and derivations are shown in the tableau below:

(24)

a.fér/rj/	SS	ID-voi	ID[voi][~son]	*[+v]
fé[rj]	*!			
☞fé[rj̥]				*
fé[rç]			*!	

b. do/bj/	SS	ID-voi	ID[voi][~son]	*[+v]
do[bj]	*!			*
☞do[bj̥]				*
do[pç]		*!	*	

c. ka/pj/	SS	ID-voi	ID[voi][~son]	*[+v]
ka[pj]	*!			
ka[bj]		*!	*	**
☞ka[pç]			*	

Figure 5. The effects of SS, ID-voi and ID[voi][~son] (Blaho, 2002: 25)

5.4. Summary

From the phonetic details and the formal descriptions presented above, it can be seen that progressive /j/-devoicing differs from RVA in aspects other than its direction as well. The phonetic description reveals that [j̥] devoicing is closely connected to its articulatory targets in a word-final environment. It also highlights that the devoicing of /j/'s fricatival allophone is (presumably) very similar to the devoicing of word-final /v/ in *könyv* or *jókedv*. This, however, cannot be caused by progressive assimilation since the preceding sound is either a sonorant or a voiced stop. As for the formal descriptions of the devoicing of [j̥], they also show that very specific rules or constraints are required to give a formal account of the phenomenon. This conforms well to the observation that the general direction of voicing assimilation (across languages) is regressive, and when it is progressive, usually various further mechanisms are at work. Considering all these aspects, the term progressive voicing assimilation is not the most accurate analysis of the phenomenon.

6. Final comparison and conclusion

This thesis had two main aims: first, to find out if the devoicing of English /z, d/ and Hungarian /j/ in C_# position is due to similar mechanisms; second, to see if progressive voicing assimilation is the appropriate analysis of any of these two phenomena. The bases of the uncertainties about this denomination were that English, due to the properties of its obstruents, does not show (neutralizing) voicing assimilation elsewhere, and in Hungarian (as in other voicing languages) the phenomenon is regressive and not progressive. The closer inspection of the articulatory properties of English lenis obstruents and of voiced fricatives in general reveals that the word-final devoicing of these sounds is typical, even without a preceding voiceless/fortis obstruent. It follows from this observation that these word-final devoicing processes are unlike voicing assimilation because the latter is triggered solely by spreading the articulatory properties to the neighbouring (generally to the preceding) sound(s).

Despite this, the English process is often analysed as being a neutralizing phonologized process that results in a fortis /s/ and /t/. The arguments in favour of this view may be taken as justifications for this analysis, but the models that assume this have questionable parts, cf. Harms' Generalization or the progressive spreading of a [spread glottis] in this limited environment. Thus, to accept Jones' suggestion that the phenomenon is not assimilation but only word-final devoicing (at least with the plural suffix) reduces the number of allophones to two and helps to avoid the formulation of a progressive assimilation rule.

In conclusion, both the English and the Hungarian phenomena affect obstruents with little or no active voicing, which (partially) devoice after consonants word finally. If the preceding consonant is voiceless/fortis, the devoicing is enhanced and complete, however, it can be assumed that this devoicing is not exclusively triggered by this voiceless/fortis consonant. The word-final environment, especially with the Hungarian [j̥], is also necessary for it to take place. Therefore, the word-final devoicing of neither English /z d/ nor Hungarian /j/ seem to be examples of real progressive voicing assimilation.

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