**The behaviour of /j/, /v/ and /h/ in Hungarian voice assimilation - an OT analysis**

Sylvia Blaho

The purpose of this paper is to give a unified account of Hungarian voice assimilation phenomena in the framework of Optimality Theory (Prince & Smolensky 1993). The discussion focuses on the sounds /j/, /v/ and /h/, which sometimes behave as sonorants and sometimes as obstruents with respect to voice assimilation. The OT model presented here is capable of accounting for the 'exceptional' as well as the 'regular' cases of voice assimilation. Apart from dealing with the Hungarian data, the paper also examines the question whether faithfulness constraints on [voice] apply to output obstruents with a sonorant input.

## *1. The data*[1]

### *1.1. Voice assimilation in Hungarian*

Obstruent clusters in Hungarian agree in voicing, their voicing properties being determined by the last obstruent in the cluster, while sonorants[2] can cluster with both voiced and voiceless obstruents. All word-initial consonant clusters consist of either voiceless obstruents (1a) or voiceless obstruents and sonorants (1b). The only exception to this is /v/, which is traditionally analysed as a voiced obstruent and can, in spite of this, appear in word-initial clusters (1c).

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (1) | a) | *stop* | 'stop' | b) | *tréfa* | 'joke' | c) | *tviszt* 'twist' |
| | | *pszeudo* | 'pseudo' | | *gnóm* | 'gnome' | | *kvarc* 'quartz' |

Morpheme-internal and morpheme-final obstruent clusters consist of either voiced or voiceless consonants only (2a,c and 2b,d respectively).

[1] All examples are given with Hungarian spelling; transcription is used only where pronunciation differs from what is suggested by the spelling.

[2] I will use the term *sonorant* meaning 'sonorant consonant' in this paper.

| | | | | | | |
|---|---|---|---|---|---|---|
| (2) | a) | *macska* | 'cat' | b) | *barack* | 'apricot' |
| | | *szeptember* | 'September' | | *test* | 'body' |
| | c) | *labda* | 'ball' | d) | *smaragd* | 'emerald' |
| | | *mozdul* | 'move' | | *pünkösd* | 'Whitsun' |

Sonorants neither trigger nor undergo voice assimilation:

| | | | |
|---|---|---|---|
| (3) | a) | *kala*[p] – *kala*[pn]*ak* | 'hat' – 'of the hat' |
| | | *ké*[z] – *ké*[zr]*e* | 'hand' – 'onto the hand' |
| | b) | *sze*[m] – *sze*[mt]*ől* | 'eye' –'from the eye' |
| | | *ő*[r] – *ő*[rt]*ől* | 'guard' – from the guard' |

### *1.2. The phonemes /j/, /v/ and /h/ in voice assimilation*

As mentioned above, the phonemes */j/, /v/ and /h/* do not behave according to the pattern outlined in Section 1.1. Let us now look at their behaviour one by one.

#### *1.2.1. /j/*

In Hungarian, /j/ is realised as a palatal approximant in most cases (4a). Word-finally following a consonant[3] it is realised as a palatal fricative, which is voiced after sonorants and voiced obstruents (4b) and voiceless after voiceless obstruents (4c).

| | | | | | | |
|---|---|---|---|---|---|---|
| (4) | a) | [j] | | b) | [j̬]/$C^{[+voice]}$_## | |
| | | *jár* | 'walk' | | *dobj* | 'throw Imp.' |
| | | *új* | 'new' | | *fogj* | 'hold Imp.' |
| | | *ajtó* | 'door' | | *óvj* | 'protect Imp.' |
| | | *fejbe* | 'into the head' | | *szomj* | 'thirst' |
| | | *fejre* | 'onto the head' | | *férj* | 'husband' |
| | c) | [ç]/$C^{[-voice]}$_## | | | | |
| | | *kapj* | 'get Imp.' | | | |
| | | *döfj* | 'stub Imp.' | | | |
| | | *rakj* | 'put Imp.' | | | |

#### *1.2.2. /v/*

/v/ shows a two-faced behaviour with respect to voice assimilation: it serves as a target of it (5a) but does not trigger it (5b).

[3] Voice assimilation across word boundaries is not examined in this paper, therefore *word-final* always means *pre-pause* as well.

| | | | |
|---|---|---|---|
| (5) | a) | *szí*[v] – *szí*[f]*telen* | 'heart' – 'heartless' |
| | | *é*[v] – *é*[f]*től* | 'year' – 'from the year' |
| | b) | *cson*[t] – *cson*[t]*velő* | 'bone' – 'bone marrow' |
| | | *csa*[k] – *csa*[k]*nem* | 'only' – 'almost' |

Another oddity of the behaviour of /v/ is that this is the only sound traditionally analysed as an obstruent which can occur in word-initial clusters (1c) – a unique distributional property within the group of voiced obstruents in Hungarian.

Therefore, following Siptár (1994), I hypothesize that /v/ surfaces as an obstruent in coda position and as a sonorant – a labiodental approximant, to be precise – in onset position. The obstruent allophone of /v/ will, of course, be subject to voice assimilation, that is, it will be voiced before voiced obstruents and voiceless preceding voiceless ones:

| | | | |
|---|---|---|---|
| (6) a) [ʋ]/_V | b) [v]/_C$^{[+voice]}$ | c) [f]/_C$^{[-voice]}$ |
| *vak* 'blind' | *évből* 'from the year' | *óvtam* 'I protected' |
| *hatvan* 'sixty' | *szívben* 'in the heart' | *szívtől* 'from the heart' |

### *1.2.3. /h/*

Prevocalically, /h/ is realised as a glottal fricative, which is voiced in post-sonorant position (7b), and voiceless after obstruents and word-initially (7a). Preconsonantally and before a strong morpheme boundary (#) it is either deleted (7d) or surfaces as a velar fricative (7c).

| | | | | | |
|---|---|---|---|---|---|
| (7) | a) | [h]/{[-son],#}_V | c) | [x]/_{C,#} | |
| | | *hat* 'six' | | *potroh* | 'abdomen' |
| | | *adhat* 'can give' | | *potrohból* | 'from the abdomen' |
| | b) | [ɦ]/[+son]_V | d) | [ø]/_{C,#} | |
| | | *zuhany* 'shower' | | *cseh* | 'Czech' |
| | | *konyha* 'kitchen' | | *Csehország* | 'Czech Republic' |

There are three important observations to be made in connection with the table above. First, we can describe the distribution of the allophones of /h/ more straightforwardly if we refer to the place they occupy within the syllable: /h/ is realised as a glottal fricative in onset position and it either deletes or turns into a velar fricative in coda position.

Second, we can not distinguish between (7c) and (7d): whether /h/ deletes or is realised as a velar in coda position is unpredictable;[4] moreover, variation among speakers can be detected. Therefore, either the *potroh*-group or the

[4] Certain regularities can be observed; for instance that /h/ never deletes when following an /o/, because this would result in a word-final short [o], which is not allowed by Hungarian phonotactics (see Törkenczy 1994).

*cseh*-group has to be marked as exceptional in the lexicon (this is beyond the scope of this paper, for discussion see Törkenczy 1994: 297-299).

The third fact is that [x] remains voiceless before voiced obstruents:

(8) *potro*[x] – *potro*[x]*ból* **potro*[ɣ]*ból*

These are the data that I wish to account for in this paper. I will present the model serving as the basis of my analysis in the next section.

## *2. An OT typology of voice assimilation*

In this section, I present the model of voice assimilation phenomena developed by Petrova et al. (2000), with two major simplifications. First, the representations I adopt in this paper are based on binary features of the SPE-type (Chomsky & Halle 1968), while Petrova et al. use autosegmental representations.[5] Second, as the present paper deals with Hungarian voice assimilation, I will concentrate on the relevant parts of Petrova et al. (2000) only.

The fact that obstruent clusters must agree in voicing is expressed by the following constraint:

(9) **Agree**[6] Obstruent clusters agree in voicing.

Petrova et al. have this constraint highest ranked, as, they claim, there are no surface forms violating it. However, on the basis of the data in (8), we can see that this is untenable.

Considering the data in section 1.1, it is also clear that the voicing of clusters is determined by the last obstruent in the cluster. In other words, it is the last member of clusters whose output form is faithful to the input in terms of the feature [voice]. The obstruent in question is either followed by a pause or a [+sonorant] segment (a vowel or a sonorant consonant). Therefore Petrova et al. introduce the following faithfulness constraints:

(10) **ID-wf-voi** Word-final obstruents are faithful to their input in terms of the feature [voice].

(11) **ID-preson-voi** Obstruents preceding [+sonorant] segments are faithful to their input with respect to the feature [voice].

Two more constraints relevant for the present discussion are introduced in Petrova et al. (2000):

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[5] I will return to the question of representation in Section 4.

[6] Petrova et al. have the constraint **SHARE**. The distinction has to do with the use of an autosegmental vs. an SPE-type model.

(12) ***[+voice]** Voiced obstruents are prohibited.

(13) **ID-voi** Obstruents are faithful to their input in terms of the feature [voice].

According to Petrova et al. (2000), the ranking of these constraints in Hungarian is as follows:

(14) **Agree, ID-wf-voi, ID-preson-voi >> ID-voi >> *[+voice]**

Let us now see how this model accounts for the Hungarian data.

(15)

| a. ra/kd/ | Agree | ID-wf-voi | ID-preson-voi | ID-voi | *[+voice] |
|---|---|---|---|---|---|
| ra[kd] | *! | | | | * |
| ☞ra[gd] | | | | * | ** |
| ra[kt] | | *! | | * | |
| ra[gt] | *(!) | *(!) | | ** | * |

| b. gé/zt/ | Agree | ID-wf-voi | ID-preson- voi | ID-voi | *[+voice] |
|---|---|---|---|---|---|
| gé[zt] | *! | | | | * |
| gé[zd] | | *! | | * | ** |
| ☞gé[st] | | | | * | |
| gé[sd] | *(!) | *(!) | | ** | * |

| c. ker/tb/e | Agree | ID-wf-voi | ID-preson-voi | ID-voi | *[+voice] |
|---|---|---|---|---|---|
| ker[tb]e | *! | | | | * |
| ☞ker[db]e | | | | * | ** |
| ker[tp]e | | | *! | ** | |
| ker[dp]e | *(!) | | *(!) | * | * |

| d. ra/bt/ól | Agree | ID-wf-voi | ID-preson-voi | ID-voi | *[+voice] |
|---|---|---|---|---|---|
| ra[bt]ól | *! | | | | * |
| ☞ra[pt]ól | | | | * | |
| ra[bd]ól | | | *! | * | ** |
| ra[pd]ól | *(!) | | *(!) | ** | * |

As we can see in (15) above, the model produces the right results when /j/, /v, and /h/ are not involved. The tableaux in (16), (17) and (18) illustrate that it fails to do so when these phonemes are examined.

(16)

| a. fé/rj/ | Agree | ID-wf-voi | ID-preson-voi | ID-voi | *[+voice] |
|---|---|---|---|---|---|
| ? fé[rj] | | | | | |
| fé[rç] | | | | | |
| ? fé[rj̬] | | | | | ∗! |

| b. do/bj/ | Agree | ID-wf-voi | ID-preson-voi | ID-voi | *[+voice] |
|---|---|---|---|---|---|
| ☹do[bj] | | | | | ∗ |
| do[bj̬] | | | | | ∗∗! |
| do[pç] | | | | ∗! | |

| c. ka/pj/ | Agree | ID-wf-voi | ID-preson-voi | ID-voi | *[+voice] |
|---|---|---|---|---|---|
| ? ka[pj] | | | | | |
| ka[bj̬] | | | | ∗! | ∗∗ |
| ? ka[pç] | | | | | |

(17)

| a. ha/tv/an | Agree | ID-wf-voi | ID-preson-voi | ID-voi | *[+voice] |
|---|---|---|---|---|---|
| ha[tv]an | ∗! | | | | ∗ |
| ? ha[tʊ]an | | | | | |
| ha[dv]an | | | | ∗! | ∗∗ |
| ? ha[tf]an | | | | | |
| ha[dʊ]an | | | ∗! | | ∗ |

| b. szí/vt/ől | Agree | ID-wf-voi | ID-preson-voi | ID-voi | *[+voice] |
|---|---|---|---|---|---|
| szí[vt]ől | ∗! | | | | ∗ |
| szí[vd]ől | | | ∗! | ∗ | ∗∗ |
| ? szí[ft]ől | | | | | |
| ? szí[ʊt]ől | | | | | |

(18)

| a. a/dh/at | Agree | ID-wf-voi | ID-preson-voi | ID-voi | *[+voice] |
|---|---|---|---|---|---|
| a[th]at | | | | ∗! | |
| ? a[tx]at | | | | ∗! | |
| ? a[t]at | | | | ∗! | |
| a[dɦ]at | | | ∗! | ∗ | ∗∗ |
| a[dɣ]at | | | ∗! | ∗ | ∗∗ |
| a[dh]at | ∗! | | | | ∗ |

| b. do/hb/ól | Agree | ID-wf-voi | ID-preson-voi | ID-voi | *[+voice] |
|---|---|---|---|---|---|
| do[xb]ól | ∗! | | | | ∗ |
| do[xp]ól | | | ∗! | ∗ | |
| ☞do[b]ól | | | | | ∗ |
| do[ɦb]ól | | | | ∗! | ∗∗ |

| | | | | | |
|---|---|---|---|---|---|
| do[hb]ól | ∗! | | | | ∗ |
| do[ɣb]ól | | | | ∗! | ∗∗ |
| do[hp]ól | | | ∗! | ∗ | |

Examining tableaux (16) and (17), the question arises whether the faithfulness constraints introduced so far apply in the case of obstruents with a sonorant input. In these tableaux, voiceless obstruents with a sonorant input ([ç] and [f]) do not violate the [voice] faithfulness constraints. I will postpone dealing with this issue until the next section.

Thus, the model needs modification in order to be able to account for the behaviour of /j/, /v/ and /h/. I will outline a possible solution by introducing additional constraints and modifying the ranking in the next section.

## *3. Further constraints*

### *3.1. /j/*

To account for the distribution of the allophones of the phoneme /j/, we need to examine a condition on the well-formedness of syllables: **Sonority Sequencing** (SS), which requires that the sonority of segments decrease towards syllable peripheries. The sonority scale of Hungarian consonants (based on Törkenczy 1994) is as follows:

(19) **sonority hierarchy**
stops, affricates < fricatives << nasals << v << l << r << j
where < marks a small sonority difference, << marks a big sonority difference

SS is a universal principle; nevertheless, languages can choose to employ a less restrictive variant of it. Törkenczy, when examining word-final consonant clusters, states that in Hungarian, SS allows for segments of the same sonority to stand next to each other.

We can thus formulate Sonority Sequencing as a constraint:[7]

(20) **Sonority Sequencing** (final version) — Progressing from the nucleus toward syllable peripheries, great sonority increase is not allowed.

As there is great sonority difference between /j/ and all the other consonants, all forms containing postconsonantal, pre-pause [j] violate **SS**. This constraint is thus assumed to be highest ranked in Hungarian.[8]

[7] I owe this idea to Csirmaz (2000) – and thereby to Katalin Balogné Bérces -, who also explains the distribution of the allophones of /j/ by referring to Sonority Sequencing, employing the constraint ***SONRISE**. Nevertheless, my analysis differs significantly from hers.

Let us now return to the question whether the faithfulness constraints introduced above apply to obstruents with a sonorant input or not. Let us examine the former alternative first:

(21)

| a. fér/rj/ | Agree | ID-wf-voi | ID-preson-voi | SS | ID-voi | *[+voice] |
|---|---|---|---|---|---|---|
| fé[rj] | | | | *! | | |
| ☞fé[rj̥] | | | | | | * |
| fé[rç] | | *! | | | * | |

| b. do/bj/ | Agree | ID-wf-voi | ID-preson-voi | SS | ID-voi | *[+voice] |
|---|---|---|---|---|---|---|
| do[bj] | | | | *! | | * |
| ☞do[bj̥] | | | | | | ** |
| do[pç] | | *! | | | * | |

| c. ka/pj/ | Agree | ID-wf-voi | ID-preson-voi | SS | ID-voi | *[+voice] |
|---|---|---|---|---|---|---|
| ka[pj] | | | | *! | | |
| ☹ka[bj̥] | | | | | * | * |
| ka[pj̥] | *! | | | | | * |
| ka[pç] | | *! | | | * | |

(21c) shows that this assumption leads to a dead end, as the model would predict the victory of the grammatical candidate in one of the following cases only:

1. if there were a constraint dominating all others introduced so far, which were only satisfied by ka[pç] among the relevant candidates.
2. if there were a highest ranked constraint, not ranked with respect to the other highest ranked ones, which is satisfied by ka[pç] and violated by ka[bj̥].

Both of these can be shown to be untenable.

Let us therefore examine the possibility that the faithfulness constraints introduced only apply to obstruents with an obstruent input.

(22)

| a. fér/rj/ | Agree | ID-wf-voi | ID-preson-voi | SS | ID-voi | *[+voice] |
|---|---|---|---|---|---|---|
| fé[rj] | | | | *! | | |
| fé[rj̥] | | | | | | *! |
| ☹fé[rç] | | | | | | |

| b. do/bj/ | Agree | ID-wf-voi | ID-preson-voi | SS | ID-voi | *[+voice] |
|---|---|---|---|---|---|---|
| do[bj] | | | | *! | | * |

[8] The constraint does more than account for the distribution of the allophones of /j/: it correctly predicts which word-final sonorant clusters are permitted in Hungarian (see Törkenczy 1994).

| | | | | | | |
|---|---|---|---|---|---|---|
| do[bj̥] | | | | | | *!* |
| ☹do[pç] | | | | | | |

| c. ka/pj/ | Agree | ID-wf-voi | ID-preson-voi | SS | ID-voi | *[+voice] |
|---|---|---|---|---|---|---|
| ka[pj] | | | | *! | | |
| ka[bj̥] | | | | | *! | ** |
| ka[pj̥] | *! | | | | | * |
| ☞ka[pç] | | | | | | |

As (22a) shows, the winner is fé[rç], an ungrammatical candidate. A further oddity of the model is that it is ***[+voice]** that decides between the second and the third candidate, a constraint that is claimed to have no effect in Hungarian. Thus, there has to be a constraint which is fairly low ranked but dominates ***[+voice]** and gives preference to fé[rj̥] over fé[rç]. I hypothesise that it is a faithfulness constraint on the feature [voice] which applies to candidates with their [sonorant] value being different from that of their input:

(23) **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].

Tableau (24) illustrates the effects of **ID[voi][~son]** (the constraints **Agree, ID-wf-voi, ID-preson-voi** and candidates violating them are not included).

(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[bj̥] | | *! | * | ** |
| ☞ka[pç] | | | * | |

The assumption that **ID-voi** dominates **ID[voi][~son]**is supported by two considerations. First, as **ID-voi** is a special subcase of **ID[voi][~son]**, this is the only ranking that shows the effect of **ID-voi** (if the constraints were unranked or **ID[voi][~son]** were ranked above **ID-voi**, there would be no need to formulate **ID-voi** an independent constraint). Second, if these two constraints were ranked in the opposite way, the model would predict the candidate containing the voiced palatal fricative as optimal in (24c); if they were not ranked, the decision would be left to ***[+voice]**, which would be they only case where this constraint had an effect in Hungarian.

To prevent input sonorants from having obstruent outputs anytime, the following constraint needs to be introduced:

(25) **ID-son** Segments are faithful to their input in terms of the feature [sonorant].

This constraint is obviously ranked below **SS** in Hungarian. The tableaux below illustrate its effect.

(26)

| a. fér/rj/ | Agr | ID-wf-voi | ID-ps-voi | SS | ID-son | ID-voi | ID[voi] [~son] | *[+voi] |
|---|---|---|---|---|---|---|---|---|
| fé[rj] | | | | *! | | | | |
| ☞fé[rʲj] | | | | | * | | | * |
| fé[rç] | | | | | * | | *! | |

| b. do/bj/ | Agr | ID-wf-voi | ID-ps-voi | SS | ID-son | ID-voi | ID[voi] [~son] | *[+voi] |
|---|---|---|---|---|---|---|---|---|
| do[bj] | | | | *! | | | | * |
| ☞do[bʲj] | | | | | * | | | ** |
| do[pç] | | | | | * | *! | ** | |

| c. ka/pj/ | Agr | ID-wf-voi | ID-ps-voi | SS | ID-son | ID-voi | ID[voi] [~son] | *[+voi] |
|---|---|---|---|---|---|---|---|---|
| ka[pj] | | | | *! | | | | |
| ka[bʲj] | | | | | * | *! | * | * |
| ka[pʲj] | *! | | | | * | | | * |
| ☞ka[pç] | | | | | * | | * | |

| d. a/j/tó | Agr | ID-wf-voi | ID-ps-voi | SS | ID-son | ID-voi | ID[voi] [~son] | *[+voi] |
|---|---|---|---|---|---|---|---|---|
| ☞a[j]tó | | | | | | | | |
| a[ʲj]tó | *! | | | | * | | | * |
| a[ç]tó | | | | | *! | | * | |

| e. /j/ár | Agr | ID-wf-voi | ID-ps-voi | SS | ID-son | ID-voi | ID[voi] [~son] | *[+voi] |
|---|---|---|---|---|---|---|---|---|
| ☞[j]ár | | | | | | | | |
| [ʲj]ár | | | | | *! | | | * |
| [ç]ár | | | | | *! | | * | |

### *3.2. /v/*

As Siptár (1994) states, /v/ is unlike the other Hungarian obstruents in terms of both its phonetic properties and its phonological behaviour. Phonetically, it is

the least 'noisy' fricative. Its double-faced phonological behaviour is manifest both in its resistance to triggering voice assimilation and in that it is the only segment traditionally analysed as a voiced fricative which can occur as second member of word-initial clusters – an environment occupied by non-nasal sonorants in Hungarian, as we saw in (1). It is thus reasonable to assume that /v/ is sonorant [ʋ] in this environment.

Following Szentgyörgyi (1997), I assume that /v/ is not specified for the feature [sonorant] in the underlying representation. A constraint is then needed to determine the value of this feature in allophones of /v/. Szentgyörgyi employs the following one:

(27) **v-[son]** /v/ is [+sonorant] if and only if it is followed by a [+sonorant] segment.

According to this, /v/ is realised as an obstruent word-finally and when followed by an obstruent and as a sonorant before vowels and sonorant consonants. This, however, is not correct phonetically, as /v/ surfaces as an obstruent before sonorant consonants.

Therefore I reformulate **v-[son]**, in accordance with what has been said in 1.2.2:

(28) **v-[son]** (final) /v/ is realised as a sonorant in onset position and as an obstruent in coda position.

This constraint is also highest ranked. It does not conflict with any of the constraints introduced so far, thus it does not need to be ranked with respect to them. As my analysis employs binary features, none of the forms with an underspecified input violate **ID-son**.

The model now produces the following results:

(29)

| a. szí/v̲t/ől[9] | Agr | ID-wf-voi | ID-ps-voi | v-[son] | ID-son | ID-voi | ID[voi] [~son] | *[+v] |
|---|---|---|---|---|---|---|---|---|
| szí[vd]ől | | | *! | | | * | * | ** |
| ☞szí[ft]ől | | | | | | | * | |
| szí[ʋt]ől | | | | *! | | | | |
| szí[v̲t]ől | | | | *! | | | | * |
| szí[ʋd]ől | | | *(!) | *(!) | | * | * | * |

| b. szí/v̲b/ől | Agr | ID-wf-voi | ID-ps-voi | v-[son] | ID-son | ID-voi | ID[voi] [~son] | *[+v] |
|---|---|---|---|---|---|---|---|---|
| ☞szí[vb]ől | | | | | | | | ** |
| szí[fp]ől | | | *! | | | * | ** | |
| szí[ʋb]ől | | | | *! | | | | * |

[9] v̲ denotes /v/ unspecified for the feature [sonorant].

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| szí[v̲b]ől | | | *! | *! | | | * |
| szí[ʊp]ől | | | | *! | | * | * | |

As we can see in (29), the winner is the candidate with a fricative as the output correspondent of the input v̲. The candidate with an underspecified v̲ violates **v-[son]**, thus the model does not allow for an underspecified v̲ to surface.

*3.3. /h/*

/h/, too, is outside the pale of the Hungarian consonant system. If we adopt the SPE definition of the feature [consonantal], /h/ will receive the value [-cons] indeed. However, this is only true for the glottal allophones of /h/ ([h] and [ɦ̞]), not for the velar one ([x]). As we saw in 1.2.3, the [-consonantal] allophones of /h/ are the ones that can appear in onset position only. Therefore, I propose the following constraint:

(30) ***Co[-cons]** [-consonantal] segments in coda position are prohibited.

This excludes the glottal allophones of /h/ from coda position. As mentioned before, the different behaviour of the *potroh*-type and the *cseh*-type words must be coded in the lexicon, therefore I will not deal with this issue in this paper. Note, however, that both types of words satisfy the constraint in (30), as [x] is not [-cons], and if /h/ deletes, the coda will remain empty.

To prevent segments from changing their [cons] value, we need the following constraint:

(31) **ID-cons** Segments are faithful to their input with respect to the feature [consonantal].

Naturally, ***Co[-cons]** must dominate **ID-cons**, as *potroh*-type words violate **ID-cons** in order to satisfy ***Co[-cons]**. Tableau (32) illustrates how these two constraints regulate the distribution of the allophones of /h/ (disregarding voice assimilation for a moment).[10]

(32)

| a. /h/at | *Co[-cons] | ID-cons |
|---|---|---|
| ☞[H]at | | |
| [x]at | | *! |

| b. zu/h/any | *Co[-cons] | ID-cons |
|---|---|---|
| zu[x]any | | *! |
| ☞zu[H]any | | |

| c. do/h/ | *Co[-cons] | ID-cons |
|---|---|---|

| d. ad/h/at | *Co[-cons] | ID-cons |
|---|---|---|

[10] Whether the glottal fricative is voiced or voiceless is determined by whether it is preceded by a [+sonorant] segment or not (see section 1.2.3). As it is voiced only if following a [+sonorant], it seems as if it assimilated to the preceding segment (András Cser's suggestion). However, I do not wish to deal with this is this paper. Therefore I will use H to indicate both a voiced and a voiceless glottal fricative.

| do[H] | ∗! | |
|---|---|---|
| ☞do[x] | | ∗ |

| ☞ad[H]at | | |
|---|---|---|
| ad[x]at | | ∗! |

We have accounted for the distribution of the allophones of /h/. The next issue at hand is that [x] remains voiceless even if followed by a voiced obstruent. According to the universal markedness hierarchy, [γ] is more marked than all the other voiced fricatives in Hungarian. It is therefore reasonable to introduce the following constraint:

(33) ***γ** The voiced velar fricative and all voiced fricatives above it in the markedness hierarchy are prohibited.

This constraint, too, is highest ranked, as no surface forms violate it.[11] It is also clear that it must dominate **Agree**, as [x]+voiced obstruent clusters do not agree in voicing. This means that **Agree** is not highest ranked in Hungarian.

Let us now see how the model supplemented by these three constraints accounts for the distribution of the allophones of /h/ (**v-[son]**, **SS**, **ID-son** and **ID[voi][~son]** are irrelevant in this respect, therefore they are left out from the following tableaux).

(34)

| a. do/hb/ól | ID-wf-voi | ID-ps-voi | *γ | *Co [-cons] | Agree | ID-cons | ID-voi | *[+v] |
|---|---|---|---|---|---|---|---|---|
| do[hb]ól | | | | ∗! | | | | ∗ |
| ☞do[xb]ól | | | | | ∗ | ∗ | | ∗ |
| do[γb]ól | | | ∗! | | | ∗ | ∗ | ∗∗ |
| do[xp]ól | | ∗! | | | | ∗ | ∗ | |

| b. do/ht/ól | ID-wf-voi | ID-ps-voi | *γ | *Co [-cons] | Agree | ID-cons | ID-voi | *[+v] |
|---|---|---|---|---|---|---|---|---|
| do[ht]]ól | | | | ∗! | | | | |
| ☞do[xt]ól | | | | | | ∗ | | |
| do[γt]ól | | | ∗! | | | ∗ | ∗ | ∗ |
| do[γd]ól | | ∗(!) | ∗(!) | | | ∗ | ∗∗ | ∗∗ |

The only thing left is to explain why /h/ triggers voice assimilation. We can achieve this by specifying the class of segments subject to **Agree**:

(35) **Agree** (specified) Clusters of [-sonorant] segments agree in terms of the feature [voice].

[11] This is not true for fast or careless speech, as [γ] does occur here intervocalically as a positional variant of /g/ (as András Cser was kind to point out). Constraint ranking obviously varies according to speed and register; ***γ** then gets ranked lower.

(36)

| a/dh/at | ID-wf-voi | ID-ps-voi | *γ | *Co [-cons] | Agree | ID-cons | ID-voi | *[+v] |
|---|---|---|---|---|---|---|---|---|
| a[dh]at | | | | | *! | | | * |
| ☞a[th]at | | | | | | | | |
| a[tx]at | | | | | | *! | | |
| a[dγ]at | | *(!) | *(!) | | | * | * | ** |

### *4. Summary and further issues*

My aim in this paper was to account for the behaviour of the phonemes /j/, /v/ and /h/ in Hungarian voice assimilation in the framework of Optimality Theory. By modifying the analysis developed by Petrova et al. (2000), I have succeeded in providing a unified account of these phenomena, which have been regarded exceptional in traditional analyses.

One major weakness of my analysis, however, is the representation adopted. Not only does it employ binary features, it also allows for underspecification, making the model far too strong, enabling the theorist to formulate constraints of questionable universality, even constraints never to be found operative in human languages.

The shortcomings of the SPE-type binary feature model have long been recognised and it has been replaced by several alternatives – the most convincing of these is element theory, advocated primarily by Government Phonology (cf. Kaye et al. 1990). Attempts have been made to develop element-based analyses of voice assimilation phenomena in Hungarian (Szigetvári 1998a, 1998b, for instance), and laryngeal contrasts in general, providing valuable insights but unable to offer a comprehensive solution. I claim that two crucial reasons for this are the neglect GP shows for derivation (or 'non-derivation', as in OT) and the lack of a unified and acceptable theory of consonantal elements.

I strongly believe that a solution can by found by adopting the combined framework of OT and GP developed and applied successfully to vowel interaction phenomena by Krisztina Polgárdi (1998). However, considerable further research work is required in this area.

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