

CONSONANTS IN CONTACT: ON ASSIMILATION AND CROSS-LANGUAGE CONTRAST¹

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Abstract

The rapid technological development in the field of experimental phonetics makes it possible to examine closely the modification processes in connected speech. Of course, after describing the situation in individual languages (most of them concern English), the cross-language study comes to the fore. The comparative approach is very important and inspiring, because in this way one is forced to reflex on the facts which might seem to the user of the mother-tongue to be self-evident. Also in theoretical phonetics new problems are tackled, or old ones treated anew, side by side with the advances in the experimental research.

In this paper I will pay attention to one case of modification of articulation at the word boundary, i.e. assimilation, which regularly takes place in Dutch, but is avoided in Czech. It is a rather complex phenomenon, and I aim to give here just a few data based on the systematicity of the phoneme inventories of both languages. I also will try to formulate a hypothesis about the reason for this difference. The domain where phonology overlaps with semantics then should not be overlooked.

1 The case of -s#j-

In my everyday communication practice I do not use my Czech mother-tongue, but my second language, which is Dutch. Listening to the Dutch radio I once noticed the pronunciation of the combination of consonants -s#j- at the word boundary, as this was strikingly different from the pronunciation of the same combination in Czech. In Dutch, [s] is palatalized in [ʃ], thus the combination is realized as [-ʃj-], sometimes only as [-ʃ-], e.g. *zes januari* ‘January the sixth’, *prinses Juliana* ‘princess Juliana’.

This modification is a clear case of regressive assimilation of place of articulation, as a consequence of the so-called coarticulation, a process which occurs during the production of connected speech. The notions (and terms) coarticulation and assimilation, in the way I am using them in this discussion, will be specified in the next section. Assimilation in Dutch in such combinations yields a considerable reduction of articulatory effort: the alveolar [s] is shifted backwards along the tongue blade (closer to the palatal [j]) and the result is the postalveolar/prepalatal [ʃ]. The speech organs are thus acting naturally, in accordance with the principle generally valid in speech production: to reach the optimal distinctiveness of the sound material by minimal articulatory effort.

¹ This paper is a revised and with new information provided version of a speech in Czech held at the International Conference *Setkání s češtinou* (Meeting the Czech language), organized by the Czech Academy of Sciences on 6 and 7 September 2001 in Prague, Czech Republic.

Being a speaker of Czech as my mother-tongue, I was puzzled by the question why the users of the Czech language do not likewise assimilate in these combinations and take the trouble to realize a clear [-s#j-]. When we adhere the standpoint that in connected speech the overlap of articulatory gestures is spontaneous, and that the coarticulation thus necessarily occurs in both languages, is it not the manner of articulation itself which is different, but its articulatory-acoustic result. This fact then sheds another light on the automatism of the speech organs and on the ‘naturalness’ of assimilation in Dutch. Consequently, two questions arise: what is the reason why in Dutch this assimilation takes place and why does not it happen in Czech. Both questions are equally legitimate.²

Already some attention was paid by linguists to differences in the context-dependent influencing of consonants across languages, as we can find out in the literature on this question. Until now the situation in the Czech language concerning this type of modifications was not studied in the contrastive way, and therefore it is interesting to get acquainted with the themes and results of investigations carried out in other languages.³ One such project is that of Evers, Reetz and Lahiri (1998), concerning English, Dutch and Bengali. The authors aimed at comparing the realization of phonetic contrast between the prealveolar [s] and the postalveolar [ʃ], without paying respect to the different phonological status they have in these languages. For in English the sounds are independent phonemes, while in Dutch [ʃ] is an allophone of [s] whereas in Bengali [s] is an allophone of [ʃ]. The authors came to the remarkable conclusion that the feature [anterior], by which the two sounds are distinguished from each other, is realized almost identically in the languages concerned, despite the different phonological ordering.

In examining these phoneme combinations at the word boundary in Czech and in Dutch we, too, are confronted with a different phonological status of the consonants taking part in it. I will give more information on this point in the description of the Czech and the Dutch phoneme inventory, in the following section.

The question of presence or absence of assimilation at the word boundary demands an examination in two directions: 1. In the theoretical direction where in general data are analyzed about modification phenomena and their application in the framework of language-specific rules of a given phonological system; 2. In the experimental direction, where measurements of the segments under examination would be carried out and the conditions would be to make the presence of assimilation (coarticulation) possible or prevent it. Also, listening tests would be needed to find out whether there are differences in the way in which Dutch and Czech listeners distribute their attention throughout the words produced.

I would like to accomplish my own investigations of the assimilation contrast along these two lines. Concerning the experimental part, I am for the time being collecting the material, i.e. sentences and segments, produced by native speakers, in which the combination -s#j- occurs at the word boundary in all possible contexts in the language. I hope to be able to complete this investigation in the near future. In the present paper, thus, I will concentrate on the theoretical aspects of the cross-linguistic contrast in the occurrence of assimilation between Dutch and Czech.

² For the purpose of completeness we have to remark that a similar difference exists also with the realization of the phonemes /d/, /t/, /n/ that are in Dutch palatalized before /j/, but in Czech they are not.

³ “Quite often context-dependent changes involving the same articulatory structures have different acoustic and perceptual manifestations in different languages so that it is possible to distinguish what can be considered universal phonetic behavior from language particular rules.” Farnetani 1997:377.

1 The phoneme inventory and its oppositions

A fundamental difference between the phonological interpretation of the speech sounds concerned can be learned from the data in the phoneme inventory of both languages. In Czech, all three, i.e. /s/, /š/ and /j/⁴, are phonemes; however, in Dutch the status of these sounds is not unequivocally stated and this already indicates the problematic approach to the description of their function.

1.1 The phoneme inventory of Dutch

In the handbooks of the Dutch language (e.g. de Groot 1968, Cohen, Ebeling, Fokkema & Van Holk 1972, Booij 1995) only /s/ and /j/ are listed as phonemes.⁵ Besides, with Booij the independent status of /j/ is weakened, as he leaves /j/ out of the table of distinctive features operating in the Dutch consonant inventory. He accounts for it by stating that /j/ possesses the same specification as /i/, but the realization of the former is shorter (Booij 1995:211); this fact in the handbook of Booij is referred to also by Rietveld & Van Heuven (1997:98).

In the description of the phoneme inventory de Groot characterizes [ʃ] as an allophone in the position before palatal [j], as it regularly occurs at the derivation of diminutives from stems ending in -s, cf. *bos* > *bosje* [-ʃj-] ‘wood, small wood’, *tas* > *tasje* [-ʃj-] ‘bag, small bag’, *glas* > *glaasje* [-ʃj-] ‘glass, small glass’, *poes* > *poesje* [-ʃj-] ‘cat, little cat, kitten’.

In the treatment of the word phonology in Dutch, Booij mentions two rules of allophonic modifications. The first one concerns the lengthening of vowels in front of /r/, the second one the palatalization of consonants /s, z, t, n/ in front of /j/. He describes the latter modification as the shift from the primary place of articulation and he extends this process above the diminutive formation (see above) also to the contact of two consonants at the word boundary. At the same time, however, he limited the occurrence of it to a specific morphological context, where in a question phrase the form of the 2nd person of a verb is followed by the enclitic form of the personal pronoun, cf. *had je?* [-tj-] ‘had you?’, *was je?* [-ʃj-] ‘were you?’, *kan je?* [-nj-] ‘can you?’ etc.⁶

Remarkably enough, Booij noted in the combinations /s/ + /j/ voiced pronunciation, i.e. [-ʒj-, -ʒ-]. This would then concern not only assimilation of the place of articulation, but also assimilation of voice (Booij 1995:151). By this statement the author distinguishes these instances at the one hand from assimilation at the morpheme-boundary (diminutive formation), where the realization always is voiceless (as in *tasje*, *poesje*, *glaasje*, see above), and on the other hand from similar cases with a voiceless final consonant. In his example given in the foregoing paragraph, i.e. *had je?* [-t-] even a devoicing has taken place. Following the opinion of some native speakers the voiced pronunciation as [vaʒjə] instead of [vaʃjə] in *was je?* ‘were you’ would be felt as marked (non-standard). Here it is evident that still more

⁴ In the present discussion I am going to note the Czech phonemes by their ordinary signs (i.e. as they are noted in the alphabet): /s, š, j/ whereas for the Dutch assimilated sound I will use the symbol [ʃ], despite the fact that the Czech phoneme /š/ also sounds like [ʃ]. It is for the sake of clarity for the reader and to stress the fact that the Czech /š/ does not result from the palatalization of /s/.

⁵ De Groot points out that the question whether the palatalized alveolars should be classified among Dutch phonemes or not, is a controversial one, cf.: “Het is een bekende strijdvraag of men deze (i.e. palatalized alveolars, A.R.) moet aannemen in woorden als *tjalk*,...*pasja*, *meisje*,...*oranje*, *franje*, e.d. dan wel een foneem t, d, s, z, of n plus een volgende j.” (De Groot 1968:163).

⁶ The [e] in *je* is realized as a schwa.

material from spontaneous speech is needed to describe the contact rules at the word boundary to their full extent.

The consonant [ʃ] is briefly mentioned also in the handbook on phonetic transcription by Vieregge (1985:88) as a sound which appears in Dutch in a few words, e.g. *meisje* [-ʃj-] 'girl', *sjouwen* [ʃj-] 'carry, drudge', *was je?* [-ʃj-] 'were you?'. Vieregge does not explicitly report the regular occurrence of [ʃ] at the derivation of diminutives.

On the contrary, in the phonetically based description of the Dutch consonants by Nootboom & Cohen (1984), all three sounds, [s], [ʃ] and [j] (and also [dʰ], [ŋ], [tʰ]) are listed as independent phonemes. This lack of unanimity in the functional evaluation of the Dutch sounds we are concerned with, indicates the necessity of systematic study of the phonetic and phonological data from the standpoint of the contextual modifications. Here, too, the contrastive approach (as that applied in the examination of Evers, Reetz and Lahiri (1998) could be useful, because it doubts the self-evidence with which one looks at the language facts at studying a language in isolation.

1.2 The phoneme inventory of Czech

Contrary to the situation in Dutch, the consonants /s/, /š/ and /j/ have their steady place in the phonological inventory of the Czech language: they are all three classified as independent phonemes, cf. Kučera (1961), Hála (1962), Krámová (1984), Romportl (1985), Mluvnice češtiny 1 (1986), Palková (1994). According to the place of articulation /s/ is characterized as prealveolar, while /š/ is characterized as postalveolar or palatoalveolar. Both phonemes are fully exploited for distinguishing the lexical or grammatical meaning, and in this function can be found in all positions in a word, e.g. *sít* - *šít* 'sow / sew', *sedí* - *šedí* 'he sits / grey m.pl.anim.', *vysel* - *vyšel* 'he sowed/ he went out', *blesky* - *blešky* 'lightnings / little fleas', *dusí* - *duší* 'stifle / of souls', *mys* - *myš* 'cape / mouse', *kos* - *koš* 'blackbird / basket', *ples* - *pleš* 'ball / bald patch', *ves* - *veš* 'village / louse', *nás* - *náš* 'us, dat. / our' etc. As regards the manner of articulation, it is important that [š] is not realized by the secondary articulation (palatalization); this modification does not operate in the present-day Czech, but for a few exceptions (Palková 1994:39,145,208).

2 Processes in connected speech

Connected speech is characterized by a high degree of variability, since the sound segments are influenced by the articulatory features of their neighbors. The processes which account for this variation, i.e. coarticulation, assimilation, sandhi and reduction, have been intensively studied for some decades already. Nowadays their character and effect are examined anew, because of the possibilities of electronic means which are at the disposition of the linguists. The exact measurable results, obtained in this way, are the basis for further manipulation and comparison. In our discussion two major processes, i.e. coarticulation and assimilation and their mutual relationship play a central role.

2.1 Coarticulation

The term coarticulation was introduced already in Menzerath & de Lacerda (1933), who showed that segments of speech are not just connected to each other, but that

they can be 'slipped' into each other. It means that their articulation can overlap. In the numerous studies that followed (see for an overview Hardcastle & Hewitt, 1999), most authors agree at the point that the phenomenon of coarticulation concerns a spontaneous, mutual and temporary process of influencing of one phoneme by the neighboring phoneme (or phonemes).⁷ This overlap of the articulatory gestures follows from the physiological limitations of the speech organs: in connected speech the tempo is so high that the articulators cannot or will not realize the required movements segment-by-segment. The production then might be marked by certain modifications, such as the change of the place of articulation (Vieregge 1985:154).

2.2 Assimilation

Closely related to coarticulation is assimilation. However, in the treatments of these processes there is not always an agreement on their specification and the terminology is not uniform, too. So we can find with Ohala (1993:155) that he uses the term coarticulation as synonymous to the term assimilation. Yet most authors distinguish between the both processes, but their criteria are different. Nootboom & Cohen defined on the one hand coarticulation as an inevitable result of the physiologically limited abilities of the speech organs, and on the other hand assimilation as a modification caused by coarticulation, which successively became a permanent feature of the language system (the so-called phonologized coarticulation) (Nootboom & Cohen 1984:120-127). Similarly Farnetani distinguishes between coarticulation as a continuous influencing of the speech channel by more than one segment, and assimilation, when one or more features of a segment have changed in such way that they are more alike the features of the neighboring sounds (Farnetani 1997:376, cf. also Lindblom 1983). The latter definition is in my opinion sufficient in that it describes both the processes clearly and let the difference between them come to the fore. As it is not the aim of the present paper to examine the definitions of the two processes as such, I am not going further in the summing up of their various characteristics, nor shall I try to formulate a definition of my own.

Intensive studies of the phenomena in the connected speech yielded also a piece of information which is important with respect to the question with which I am concerned. So, for instance, Recasens (1984a,b), Farnetani (1990,1997) and Fowler & Saltzman (1993) came to the conclusion that coarticulation is not obligatory and that at least its measure can vary depending on the actual conditions. They stated that in a language system two concurring tendencies are at work: one which forces the coarticulation to be carried out (coarticulatory aggression) and the second one which prevents the coarticulation from happening (coarticulatory resistance).⁸

Some of the factors which assist the coarticulatory resistance are already known; one of them is word stress. Lindblom (1990) and De Jong, Beckman & Edwards (1993) have proved that in stressed syllables the overlap of articulatory gestures underlies a restriction by the so-called hyperarticulation (i.e. by careful articulation

⁷ In spite of this, some authors claim that the heart of the matter of coarticulation is not yet clearly established, cf. "This central and very important fact of speech production (i.e. coarticulation, A.R.) has received considerable attention in the literature...However, there is no consensus on what coarticulation is..." (Fowler & Saltzman 1993:173).

⁸ They defined the former as an intensity of intention of the phonetic, phonological and communicative factors to realize the articulatory adjustment, and the latter as an ability of an articulatory gesture to resist the potentially disturbing influence of the neighboring gestures (Farnetani 1990, Fowler & Saltzman 1993).

accompanied by slowing down of the speaking rate).⁹ I expect this factor to be one of those that account for the absence of assimilation at the word boundary in Czech.

3 The differences

In the discussion so far I have given an introduction into the systemic relationships in the phoneme inventories of Dutch and Czech and some opinions and claims concerning the processes in connected speech. Now I will try to draw a schematic comparison of the discussed facts, at the phonetic, phonological and functional levels.

Czech	<u>[s] ~ [ʃ]</u>	Dutch
phonetic level		
<u>articulation</u>		
primary		[s]: primary, [ʃ]: secondary (palatalization)
[s] - prealveolar		[s] - prealveolar
[š] - postalveolar		[ʃ] - postalveolar
<u>modification</u>		
does not assimilate		[s] > [ʃ]
phonological level		
<u>classification</u>		
/s/ - phoneme		/s/ - phoneme
/š/ - phoneme		[ʃ] - allophone
<u>morphological alternations</u>		
/s/ and /š/ take part in it		/s/ and [ʃ] take part in it (see below)
functional level		
<u>distinguishing of meaning</u>		
distinctive opposition /s/ : /š/		no distinctive opposition /s/ : [ʃ]

⁹ Cf. "...stressed segments have timing patterns which yield less coarticulatory overlap with their neighbors. ...A stressed syllable has a more extreme range for all phonetic features, so that all segmental specifications are realized more fully, not just sonority specifications." De Jong, Beckman & Edwards (1993:197,206).

3.1 The variation of [s] ~ [ʃ] in Dutch

From the foregoing discussion follows that the systemic opposition between [s] and [ʃ] in Dutch is not determined as unequivocally as in Czech, and this makes a considerable extent of variation possible. Its conditions (contextual, situational, sociolinguistic) and effects (pragmatic-communicational) are up to now not fully explored. In my opinion, as far as can be said now the three relevant positions can be distinguished at which the variation takes place. These are the positions:

- a. at the morpheme boundary,
- b. at the word boundary, and
- c. at the end of words with the final *-s*.

We will look at the modifications in these positions in more detail in the following sections.

3.1.1 The variation at the morpheme boundary

The variation at the morpheme boundary concerns first of all the forming of diminutives, as we have explained above. With the derivation in Dutch five different morphemes are used, i.e.: *-je*, *-tje*, *-etje*, *-kje*, *-pje*, e.g. *glaasje* < *glas* ‘small glass, glass’, *treintje* < *trein* ‘small train, train’, *ringetje* < *ring* ‘small ring, ring’, *kettinkje* < *ketting* ‘small chain, chain’, *boompje* < *boom* ‘small tree, tree’. On the point of the palatalization [s] > [ʃ] in front of [j], that in this case regularly occurs, there is unanimity about its definition as an automatic result of the coarticulation process, i.e. assimilation to the following [j].

However, we could put here the question whether the given modification really is a purely phonetic one or whether also phonological aspects are involved. In my opinion the question should be answered affirmatively. In contrast to assimilation in the other two positions mentioned above, in this position assimilation is obligatory, the pronunciation of the diminutives without palatalization is not possible. The rule for palatalization to be carried out comes probably not only from the phonetic needs (then it could be avoided, like in Czech), but it is dictated by other systemic demands. The unusual form of the suffixes yields a vigorous emotional effect on the part of the listener, cf. *poesje* ‘little cat, kitten’, *liefje* ‘sweetheart’, *kusje* ‘little kiss’, *hondje* ‘little dog, puppy’, *oortje* ‘little ear’, *schatje* ‘darling’, etc. vs. *poes* ‘cat’, *hond* ‘dog’, *oor* ‘ear’. I suppose that palatalization in these cases is used as a signal of the morphosemantic process of derivation of diminutives (similar as e.g. ablaut in German and other languages). Because of this phonological function, which is as a matter of fact a distinctive opposition, the articulatory and acoustic difference between [s] and [ʃ] is realized - so far as is possible in Dutch - in optima forma.

Moreover, there is another group of instances where assimilation regularly can be observed and these are the compound words. I have noted several instances of compounds, e.g. *kampioensjaar* ‘champion’s year’, *bedrijfsjubileum* ‘company’s anniversary’, *dorpsjuffrouw* ‘village miss’, *uitgaansjurk* ‘evening-gown’, *bruidsjapon* ‘wedding-dress’, *jagersjargon* ‘hunter’s yarn’, *stadsjuwelier* ‘town-jeweler’, and in all of them assimilation was carried out. I suppose that in these clusters assimilation is obligatory, as these compounds are produced and perceived as wholes, bound together by the word stress on the first segment (first or second syllable of it), like the diminutives. Unlike the forming of diminutives, there are probably no other reasons for the application of assimilation but phonetic ones.

3.1.2 The variation at the word boundary

About the variation at the word boundary there is up to now still little information. Some authors consider the realization of [s] as [ʃ] to be the same as assimilation at the morpheme-boundary (cf. Booij 1995); Rietveld & Van Heuven (1997) even present this case as an example of palatalization in Dutch, without mentioning assimilation in front of the suffix *-je*. On the contrary, Nootboom & Cohen pay attention to the difference between the phenomena inside a word and at the word boundary, and they claim that the former is obligatory, while the latter is not, even though it occurs there, too, as consequence of the inertia of the speech organs (1984:148-149).

My material collected so far has shown that assimilation in this position is facultative and conditioned by several factors. Tentatively, I consider the distribution of word- or sentence stress important; perhaps also the communicative attitude of the speaker, i.e. if he articulates carefully or relaxed, and, moreover, the phonetic context, may play a role. It seems that some consonant clusters, e.g. [n+s] + [j] can prevent assimilation or diminish it, cf. *Frans jaagt* ‘Frans hunts’, *Ans jubelt* ‘Ann jubilates’ vs. *Guus jubelt* ‘Gus jubilates’, *poes jaagt* ‘cat hunts’.

There is one exception to this type, where assimilation always occurs, and that is with the use of the 2nd person singular of the personal pronoun *je* in wh-questions (we have mentioned it in section 1.1 at the quotation from Booij). These combinations (see examples below) obviously cannot be perceptually distinguished without context from the homonymous diminutives, because the *je* here is enclitic (and as well *-je* in the diminutives is always unstressed), cf. the pairs: *Hoe schat je het in?* [-tj-] ‘what is your estimation of it’ vs. *Je bent mijn schatje* [-tj-] ‘you are my darling’; *Pas je goed op jezelf?* [-ʃj-] ‘do you take care of yourself’ vs. *Daar ligt hun pasje* [-ʃj-] ‘there is their passport’. Whether in this position the mechanism of imitating the situation at the morpheme-boundary is at work or whether here, too, assimilation underlies another systemic functions, e.g. signaling of a wh-question (the wh-question is marked by an inverse word-order), cannot as yet be stated.

Thus, it can be expected that the factor most supportive for realization of assimilation at the word boundary will be the combination of one stressed syllable with an unstressed one. In Dutch word stress is placed on various syllables, so that if the first syllable of a word which follows after the final *-s* is unstressed, the word boundary need not to be marked by an interval and the consonant cluster is realized as a whole. A rather extreme example of this fact is the much frequented sequence: *als je* (*komt, denkt, bent, neemt, slaapt* etc.) ‘when, if you come, think, are, take, sleep’, where the pronunciation is reduced in some idiolects maximally, into [#ajə#].

Hypothetically, then, the combination least supporting to the assimilation would be that of two stressed syllables. However, in the language practice of Dutch, in connected speech, we can observe that in two successive stressed words the second stress is weakened and no interval is realized. So there are combinations like *zes jaar* [-ʃj-] ‘six years’, where assimilation occurs as if it would concern the position at the morpheme-boundary. On the other hand, while listening to the radio, I noted an interesting case where on both segments an emphatic stress was laid. The theme was a report about a period of punishment because of the committed crime, accompanied by an amazement or indignation on the part of the speaker: *zes! jaar!* [-s#j-] ‘six years’ (meaning: Imagine, they sentenced him to such a long imprisonment!). Here no assimilation was audible and the interval, too, was realized distinctly.

Therefore, the general impression is that in Dutch the word boundary is not as important as an organizing principle for perception and recognition as e.g. in Czech. The conditions under which assimilation in this position takes place are undoubtedly

very complex, as they include phonetic/phonological as well as communicative aspects. Of course, detailed experimental investigations are needed to put them in proper perspective.

3.1.3 The variation at the end of words

This type of variation, at the end of words, where the final *-s* is followed by an interval, has not yet received enough attention and is not described in the handbooks. With many native speakers of Dutch we can observe (if we are speakers of a language in which /s/ and /š/ are distinct phonemes), that they pronounce [s] like [ʃ], without being influenced by any phonetic context whatsoever. E.g. *bos* [-ʃ#] ‘wood’, *huis* [-ʃ#] ‘house’, *vos* [-ʃ#] ‘fox’, *tas* [-ʃ#] ‘bag’ etc. Our experimental investigations in a later stage must prove whether the phonetic context, i.e. if before the final *-s* a consonant or a vowel is placed, can influence assimilation. Similarly as this can be assumed for the occurrence of assimilation at the word boundary (see above, e.g. *Ans jubelt*), we suppose that here, too, the phonetic context may be effective. Also, the factors have to be stated which support this pronunciation.

The speakers with such relaxed pronunciation, then, notice as the signal of diminutive forming the shift [ʃ] > [ʃj] with diminished perceptual contrast, and not the shift [s] > [ʃj], as in carefully articulated standard Dutch (*vos* > *vosje* ‘fox, little fox’).

The above modification is a consequence of the intention to reduce the articulatory effort in a relaxed idiolect which, of course, can grow out into the supraindividually valid norm. Such development is surely not just imaginary, after all the perceptual difference between [s] and [ʃ] at the word-end is not distinctive. Another systematic relaxation, in the pronunciation of Dutch vowels, has already been signaled, e.g. by Stroop (1999), in an article with the meaningful title “Young Women’s Farewell to standard Dutch”.

3.2. Invariance of /s/ and /š/ in Czech

To be able to analyze the situation in Czech phonetics properly, with respect to the lack of assimilation in the cluster *-s#j-*, we should take into thorough account the theoretical knowledge about the modification phenomena in general. However, as has already been mentioned in the foregoing discussion, the statements are sometimes conflicting. From the claims that – on the one hand – assimilation is inevitable and – on the other hand – that it can be prevented by coarticulatory resistance, we as yet cannot draw an unequivocal conclusion about what really happens in such combinations in the Czech language. Therefore I will try to present here just the facts, accompanied by my suggestion about how they possibly could be explained.

To coarticulation in Czech up to now only limited attention has been paid, e.g. in *Mluvnice češtiny* 1, (1986:55-68,97-100), where it is stated that “... speech sounds influence each other and create in this way sound combinations both inside a syllable, as well as over the syllable-boundary.”¹⁰ The treatment of assimilation of place and manner concerns only the case of alveolars and nasals in front of velars /k, g/, cf. *banka* [-ŋ-] ‘bank’, *tramvaj* [-ŋ-] ‘tram’. Besides, occasionally an occlusive may assimilate in front of a fricative, such as *lidský* [-c-] ‘human’. About the situation at the word boundary there is no explicit information given, only in some examples the changes are mentioned between a prefix and the following word, and between a word

¹⁰ “...hlásky na sebe působí a vytvářejí tak hlásková spojení jak v rámci slabiky, tak i přes hranici slabiky ...” (Mluvnice češtiny 1086, 1:55).

and the following reflexive *se*. These instances, however, are about segments put together under one stress, so that they are not really different from the combinations occurring at the morpheme boundary.

Yet, we suppose the existence of coarticulation also in combinations, which up to now have not been described, and among them is possibly – at least to a certain extent – also the sequence of consonants at the word boundary (after all, coarticulation is a gradual phenomenon). The conclusion that coarticulation takes place overall in Czech follows from the general knowledge based on the spectral analyses of connected speech: every segment carries the tracks of the neighboring segments. See in this respect also the claim of Keating: “Coarticulation refers to articulatory overlap between neighboring segments, which results in segments generally (underscore is mine, A.R.) appearing assimilated to their contexts” (1999b:4). However, if we adopt the standpoint that coarticulation occurs, the question arises why the phoneme /s/ does not assimilate, with other words, why coarticulation does not get phonologized.

This fact can perhaps be accounted for by the statement of Farnetani that “Coarticulation may or may not be audible in terms of modifications of the phonetic quality of a segment” (1997:371). I think that this happens in Czech: the temporary influencing of neighboring segments is measurable, but not audible as a modification, because by this the distinctiveness – and, consequently, the identification – of individual segments would be jeopardized. After the inevitable coarticulatory influencing of the segments at production, a strong resistance starts preventing it to go over into modification. Thus, in the case of Czech, the resistance would concern not coarticulation itself, but its potential result, i.e. assimilation. Therefore, in my opinion, it would be justified to make the theoretical distinction between **coarticulatory resistance** and **assimilatory resistance**, so that a parallel pair would be created to the notions and terms **coarticulation** – **assimilation**. The description of the differences between coarticulatory resistance and assimilatory resistance would throw more light on their nature and functioning.

With respect to the factors which are responsible for assimilatory resistance in Czech, there certainly is a complex constraint, in the first place at the phonetic and phonological level. To begin with, the /s/ and /š/ are phonemes with a distinctive function. Their phonetic shape should always be preserved, in order to ensure the right semantic interpretation. This principle seems to be self-evident, but it is not, as we can see by the example of the English language. In English, /s/ and /š/ are independent phonemes like they are in Czech, but nonetheless the assimilation of [s] > [ʃ] at the word boundary takes place, like in Dutch, cf. *bless you* [-ʃ#j-], *as you said* [-z#j-]. So from the phonological status itself of the sounds involved we cannot deduce the satisfactory answer to our question.

Another important factor, which works against assimilation, is the word stress. Except for enclitics, stress is always placed at the first syllable in a word. It generally applies that at the word boundary the interval is realized, in front of the stressed first syllable of the following word. This regularly slowing-down of the speaking rate of production makes the articulation without assimilation easy (cf. the remark on hyperarticulation in 2.2.), it compensates for the (not realized) assimilation. The effect of the interval is to mark the end of a word, to which effect testifies that if the final sound is a voiced consonant, it becomes unvoiced, like at the very end of an utterance, cf. *hned jedou* [-t#j-] ‘they depart at once’. Whereas, at the morpheme-boundary the consonant stays voiced in front of [j], cf. *odjel* [-dj-] ‘he departed’.¹¹ Thus the interval

¹¹ The example is from Palková 1994:267.

between the words, together with the stress, belongs to the Czech language-specific segmentation pattern, which yields the perceptual entities for recognition.¹²

In the next section, however, I will try to look for the decisive factor for the assimilation resistance in Czech - and at the same time for the explanation of the difference between Czech and Dutch at a higher level - namely at the level of language typology.

4 Dutch and Czech compared

I suppose that the difference between the Dutch and the Czech language, manifested in our discussion by the presence (or absence) of assimilation, can best be approached at the level of language typology. The former language belongs to the non-inflective languages, the latter to the inflective languages. I think that this typological characteristic is of primary importance for the production and perception in these languages.

In the literature on language modifications we can find the information, that while the syllabic onsets stay preserved, most changes are found in the coda of the given syllable/word, which can be transformed into a segment homorganic with the following onset (Greenberg 1999).¹³ This is probably what happens at the word boundary in Dutch.

In my opinion, however, it could be that this claim holds true only for the non-inflective languages: when the lexical meaning is indicated by the phonetic shape of the onset, the remainder of the unit is less important, because there practically little or no information would be added before the following onset. On the contrary, in an inflective language it is the coda in which the meaning of the whole utterance will be revealed. Therefore the listener, having identified the lexical meaning supplied in the onset, always has to hold his attention to the very end, i.e. to the coda, to be able to understand the message. If it concerns e.g. the lexical meaning *otec* 'father', the coda will inform whether it is about 'father does, without father, to father, to see father, to address father, about father or with father' etc., all the meanings of the seven cases of declination, cf.: 1. *otec*, 2. *otce*, 3. *otci*, 4. *otce*, 5. *ot•e!*, 6. *otci*, 7. *otcem*.

If we now look at a word ending in *-s*, e.g. *pes* 'dog', we see the following row of codas: *pes*, *psa*, *psovi*, *psa*, *pse*, *psovi*, *psem* (these are only singular forms!). It seems to me evident that the listeners have enough work to grasp the whole meaning of the word because of this huge formal variation and to anticipate the meaning of the whole utterance, than that the perception could be made still more difficult by phonetic modifications.

The numbers of transformations of a coda, or even the complete deletion of a coda as found by Greenberg (1999:169), probably only apply to languages without inflection variation. Besides, conjugation variation in the inflective languages is considerable, too, and takes place mostly in the coda of a word-form. The reduction of final *-e* into schwa like in Dutch, cf. *bellen* [bɛlɐ#], does not occur in Czech, just because the *-e* has a distinctive function cf. *vidím* 'I see' vs. *vidíme* 'we see'.

It can be assumed that already at the acquisition of an inflective language the child learns to listen to the sound material in a language-specific way, holding the attention to the very end of a word, and not releasing it after the onset has been heard. By this, step by step, actual expectation patterns are created in a child: every coda brings with

¹² As we have mentioned in the foregoing discussion, in Dutch (and English), in contradistinction, the merger of words might even result in voicing of [s] into [ʒ].

¹³ "The phonetic realization of syllabic onsets tends to approximate the canonical...for most lexical instances...The coda element is often deleted or transformed into a segment that is phonetically homorganic with that of the following syllable's onset (i.e., it is assimilated)." Greenberg 1999:168-169.

it new selection of appropriate candidate lexemes and forms which can be used in the next onset. Listeners tests by children and by adults are needed to verify this hypothesis. If it comes true that the Czech language user has a different way of listening than e.g. the English language user, we could speak about a typologically based priority of the semantic principle over the phonetic one as a reason for another application of modification processes.

5 Conclusions

I have tried to give a brief insight into an inter-language phenomenon, concerning the different treatment of assimilation at the word boundary in Dutch and Czech. I have introduced some relevant contrasts between the two languages at the phonetic and phonological levels which possibly contribute to the maintaining of the given difference. We have seen that, in Dutch, the permitted contextual variation of the phoneme /s/ is considerable, while in Czech it is not. At the same time assimilation in Dutch makes the anticipation of the listener easier, because after the realization of [•] only /j/ can follow, while in Czech the realization of [s] or [š] at the word boundary does not imply any phonetic expectation of this kind. In other words, Dutch is phonetically implicit, while Czech is phonetically explicit.

Whether or not these facts are important, we still need a more general explanation for the problem discussed and it seems rewarding to look for it in the typological domain. The languages examined belong to different types, Dutch being a non-inflective and Czech being an inflective language. It is without doubt that the supply of information in these languages proceeds along different lines, and this could be the major factor in different application of phonetic changes.

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