The influence of syntactic boundaries on place assimilation in German

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1. Introduction and Overview

The present study investigates the influence of sentence internal syntactic boundaries on place assimilation in German. In a related study on English, Holst and Nolan looked at the role syntax plays in [sʃ] assimilation [1,2]. They report that, while [sʃ] assimilation generally yields a continuum of possible patterns of fricative energy, a clause boundary at the assimilation site triggers certain assimilation patterns but inhibits others. However, their study was restricted to clause boundaries – syntactic boundaries that are embedded deeper were not analysed. In a combined production and perception study, the paper presented here focuses on place assimilation in German at syntactic boundaries below the clause level, namely the boundary between sentence initial NP and VP. The results confirm the main conclusions drawn by Holst and Nolan for German and suggest that the level of syntactic embedding at the assimilation site may also affect the assimilation type involved.

2. Background

Holst and Nolan conducted a production study with two conditions. In the first condition a clause boundary was present at the [sʃ] assimilation site (+CB), whereas in the second condition no clause boundary was included (-CB). Holst and Nolan observe four different patterns of energy distribution and classify them in the following terms: In type A, [s] and [ʃ] show clearly discrete regions of fricative energy in the spectrogram. Types B and C show a gradual change from an [s]-like to a [ʃ]-like energy distribution. In type D, there is "a single spectrally stable period of friction"[1] that resembles an [ʃ] (cf. Figure 1).

Holst and Nolan report that in condition +CB, there is "a strong preference for type A" assimilation and a strong bias against all other types, while in condition –CB, assimilation type A is ruled out and "there is a steady increase to type D"[1].
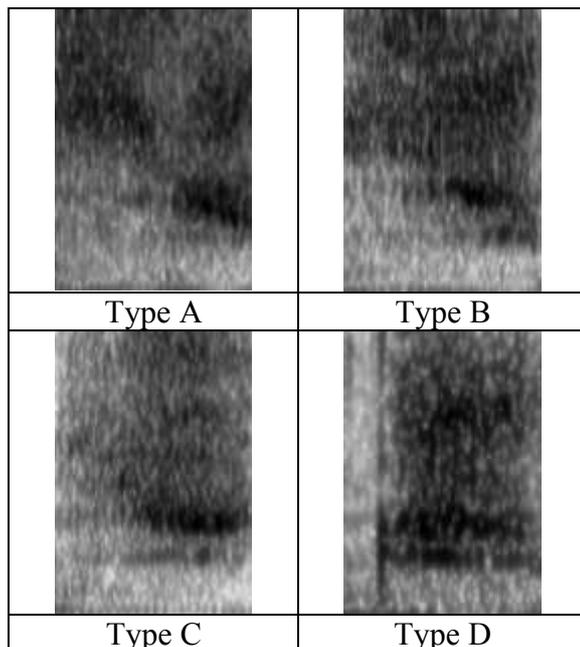

Figure 1: assimilations types

3. Experiments

In order to test whether the reported phenomena hold for German and deeper syntactic embedding, a production study was carried out. Productions were recorded in two conditions: A and B. Condition A, which is comparable to Holst and Nolan's –CB condition, comprised of ten sentences that contained a compound consisting of a noun ending in [s] and another noun beginning with [ʃ]. Thus, only a word boundary was present at the assimilation site. Condition B was made up of another ten sentences, which were designed so as to contain an NP-VP boundary at the assimilation site. Condition A for example comprises the sentence "Hanna hat Hal[sʃ]merzen". The equivalent in condition B would be "Hannas Hal[s] [ʃ]merzt". Further distractor sentences were

included. Three male and three female speakers of the Eastern Westphalian variety of German took part in the experiment. They were presented the sentences one at a time in randomised order and were recorded while reading them aloud. No time pressure was put on the subjects. Based on analyses of energy distributions at the assimilation sites, all tokens were assigned to one of the four assimilation types independently by three annotators. Classifications where the annotators disagreed were discussed until a consensus was reached.

To test the perceptual relevance of the different assimilation strategies, a perception study was conducted using the speech material from the first experiment. Three type A and three type D assimilation sites were cut out of their carrier sentences and presented to 13 subjects, none of whom had taken part in the first study. All tokens were presented three times in a randomised order. Another seven tokens served as distractors. Subjects were asked to listen to the tokens and write down what they heard. It was hypothesized that subjects would classify the type A tokens as an [s] followed by an [ʃ] and reflect this in their orthographic descriptions, whereas the type D tokens would be classified as [ʃ] alone.

5. Results

As can be seen in Figure 1, when there is no NP-VP boundary type D assimilation occurs most often, whereas type A assimilation is ruled out. However, at NP-VP boundaries, type-A assimilation is licensed, and type-D assimilation tends to occur less frequently than in condition A.
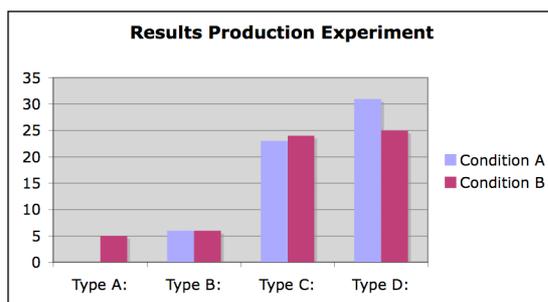

Figure 2: Results production study

The difference between type-A assimilation occurring in condition A and condition B is significant (t-test; $p = 0.0253$). This finding confirms Holst and Nolan's results for German and for deeper syntactic embedding. However, unlike Holst and Nolan's findings, the distribution of type D assimilation in both conditions does not differ significantly. Still the tendency points in the same direction. The weaker effect can be explained by the weaker syntactic boundary. Yet it has to be noted that there are large differences between the individual speakers. For example subject 5 produced ten type D tokens whereas subject two produced only two. This indicates that place assimilation in this context is not triggered by an obligatory phonological rule.

Results from the perception study (cf. Table 1) point in the same direction. There is a tendency for subjects to classify the tokens as expected, but they tend not to be very consistent in their evaluation.

Token	Classified as expected?		% correct
	Yes	No	
A1	34	5	87
A2	25	14	64
A3	29	10	74
D1	26	13	67
D2	28	11	71
D3	37	2	95

Table 1: Results perception study

6. Conclusion

NP-VP boundaries in German do influence [sʃ] assimilation despite them being less prominent than clause boundaries. NP-VP boundaries trigger type-A assimilation, which is blocked if there is no boundary present. They also reduce the probability of type-D assimilation.

Due to speaker specific variation, more data is necessary in order to corroborate this preliminary phonological interpretation.

5.References:

[1] Holst, T. and F. Nolan (1995): The influence of syntactic structure on [s] and [ʃ] assimilation. In *Phonology and phonetic evidence: papers in laboratory phonology* IV (B. Connell & Arvaniti, editors), pp. 315-333. Cambridge: Cambridge University Press.

[2] Holst, T., Nolan, F. & Kühnert, B.(1996) Modelling [s] to [ʃ] accommodation in English, *Journal of Phonetics*, **24**, 113-137.

[3] Browman, C.P. (1995) Assimilation as gestural overlap: comments on Holst and Nolan. In *Phonology and phonetic evidence: papers in laboratory phonology* IV (B. Connell & Arvaniti, editors), pp. 334-342. Cambridge: Cambridge University Press.