The use of German "braucht" in unscripted speech: morphological reduction or phonetically caused Elision?

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ABSTRACT

The goal of this work is to find out if the loss of the flectional ending of the third person present singular "-t" of modally used "braucht" (needs) is due to a morphological change or a general phonetic issue. This paper documents the background of this investigation, the corpora used, the criteria of speaker selection and the distribution of the realization and non-realization of the flectional ending of the third person present singular "-t". A special issue will be the explanation for this phenomenon.

1. INTRODUCTION

Current observations show that the modally used "braucht" is usually realized as "brauch" where the flectional ending "-t" retains its normal realization in full verbs like "raucht" (smokes), "taucht" (dives) etc. On the other hand, the elision of dental plosives after dorsal fricatives like in "nicht" (not) is a widespread phenomenon in German unscripted speech.

To investigate this process we compared the occurrence of "braucht" with reference data like "raucht" by filtering the automatically segmented ([1]), ([2]), ([3]) and manually corrected German VERBMOBIL data (approx. 14h of spontaneous speech ([4])) using the IPSK speech database ([5]).

The following two sections briefly describe the used corpus, the number of utterances we obtained for our investigation and the criteria of speaker selection as well as number of speakers.

Section 4 gives a detailed documentation of the distribution of the "braucht"-occurrences with and without flectional ending "-t" as well as the distribution of the reference verbs with and without flectional ending.

The fact that the elision of the flectional ending does also occur in the reference verbs leads to the assumption that this phenomenon is particularly frequent after palatal and dorsal fricatives. This tendency for leaving out the morphophoneme "-t" is becoming more and more common. The results given in section 4 will be discussed in section 5 under morphological and phonetic aspects.

In this section we give as well an outline of further investigations, namely the comparison of the use of the flectional ending of "braucht" between unprompted and read speech. This comparison leads to a general explanation of the whole phenomenon of the use of German "braucht". We discuss whether this is a morphological reduction or phonetically caused elision.

Finally, results and future work are discussed in the last section.

2. DATA

To compare the occurrence of "braucht" with reference data like "raucht" in the nonprompted-speech-task we used the first 14h of the German VERBMOBIL data ([4]).

This data includes automatically segmented ([1]), ([2]), ([3]) dialogues.

All automatic segmentations including "-aucht" occurrences were manually corrected for our task.

We obtained 82 utterances. The number of reference verbs found was about the same.

3. SPEAKER SELECTION

The selection of the 52 speakers, whose utterances were investigated with regard to the phenomenon of losing the flectional ending "-t" was done by using the following criteria:

- mother tongue German
- number of speakers balanced in gender
- number of speakers balanced in region
- age between 25 and 30 years.

4. REALIZATION OF THE FLECTIONAL ENDING

Using the VERBMOBIL corpus we extracted the verb form "braucht" and the verb forms of the reference verbs by filtering the data in order to get the relevant segments of speech, namely words orthographically ending in "-aucht". This could easily been done by using the IPSK speech database ([5]) with which words, parts of words, phonetic sequences, etc. can be searched in a web-interface using SQL and Prolog. We obtained the following distribution:

verb form	number of occurrences
Braucht	7
Brauch	75
Auftaucht	22
Auftauch	5
Raucht	15
Rauch	12
Taucht	18
Tauch	18
Faucht	3
Fauch	0

Table 1: Frequency of the flectional ending of the 3rd person singular of "braucht" and its reference verbs

As can be seen in Figure 1 we observed an elision of the dental plosive in 91% of the "braucht"-occurrences. Only in 9% was the flectional ending "-t" realized.

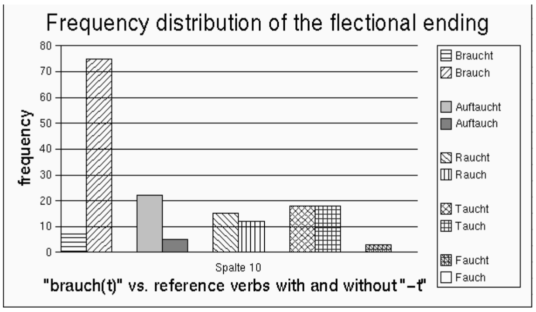

Figure 1: Distribution of the flectional ending of the 3rd person singular of "braucht" and its reference verbs

Looking at the reference verbs about two third of the occurrences were realized with the flectional ending. The following section gives an explanation of how this phenomenon leads to a morphophonological change.

5. INTERPRETATION OF THE RESULTS

Analysing the frequencies of occurrences of the data it can be confirmed that the word final "-t" disappears more often with "braucht" than with the corresponding reference verbs. Based on this observation, we would now like to show that the elision of the flectional ending "-t" leads in fact to a modification of the flectional morpheme of the modal "braucht". The following subsections give an explanation from different points of view.

5.1 Linguistic Explanation

To give an explanation we looked at the environment in which the reference verbs occur. It emerged, that

- they are more accentuated than the modally used "braucht", that
- their frequency of occurence is less and that
- the focus of "braucht" lies "on the action in the dependent verbal phrase [...]" ([6])

The fact that the elision of the flectional ending does also occur in the reference verbs leads to the assumption that this phenomenon is particularly frequent after palatal and dorsal fricatives. This tendency of leaving out the morphophoneme "-t" becomes more and more common. It can be interpreted as an alternation of the zero morpheme still realized in contexts of seldom used or hyperarticulated verb forms.

5.2 Phonetic Explanation

From the phonetic point of view Jessen has already shown that the elision of wordfinal dental plosives in nonprompted German speech can mostly be found after coronal, palatal or dorsal fricatives ([7]). That leads to realizations like "nich" for "nicht"(not) etc.
To give an explanation we have to take a look at articulatory processes:

Palatal and dorsal fricatives are produced more retractedly than dental plosives. When the latter are word final the phone sequence is articulatorily complex.

As was shown in ([10]) weak forms, i.e."in unstressed [function] words the distances the articulators travel are reduced to spaces closer to their neutral positions". Wordfinal consonants especially those which need apical gestures are often eliminated. This would not affect word perception. In other words after using the tongue dorsum as articulator an articulatory gesture produced by the tongue apex - a "more controlled and precisely tuned [...] therefore also more costly" gesture - is replaced by a "long oral closure of the dorsum". Note that articulatory gestures may not be seen in acoustic models we used for segmenting the data. The preceeding fricative is not assimilated because of its "acoustically and auditorily far more" distinctness which leads to a more salient value [p. 87f.].

Eliding the wordfinal "-t" - the flectional morpheme of the verb - does not lead to a homonym. Therefore, especially in unprompted speech which is more relaxed than read speech the plosives are left out, as the elision does not lead to an ambiguity in word semantics. It is obvious that this articulatory "laziness" of leaving the dental plosive after palatal and dorsal fricatives can be observed as well while investigating "braucht" and its reference verbs.

Another reason why modally used "braucht" loses its flectional ending more often than the lexically used one as well as its reference verbs is that it is more frequently used and therefore seldom hyperarticulated.

That means that if the loss of the flectional ending "-t" after palatal and dorsal fricatives is only due to a phonetic process flectional endings would only be realized in read speech.

That is why the next subsection discusses the results of the use of the flectional ending "-t" in read speech after palatal and dorsal fricatives in modally used "braucht" and its corresponding reference verbs.

5.3 Further Investigations

We saw that neither the linguistic explanation nor the phonetic one led to a completely satisfactory conclusion.

Therefore we evaluated the use of "braucht" in read speech([8]), ([9]) under the same assumptions.

If the phonetic explanation was completely adequate we would obtain more realized "brauch" than "braucht" in read speech as well.

If the linguistic explanation fitted best we would find elisions only with the modal form of "braucht". The rest of the verb forms would realize the flectional ending due to hyperarticulation.

As can be seen in Table 2 we still get quite a lot of realizations without flectional ending although there are more realized occurrences.

verb form	number of occurrences
Braucht	32
Brauch	13
Ref. With -t	58
Ref. Without -t	35

Table 2: Frequency of the flectional ending of the 3rd person singular of "braucht" and its reference verbs using read speech.

In fact only about a quarter of the "braucht" occurrences are realized without the flectional ending while more than one third of the reference data loses the wordfinal "-t". This is illustrated in Figure 2.

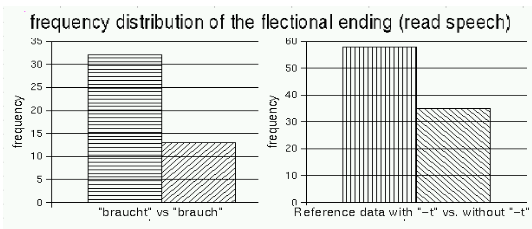

Figure 2: Distribution of the flectional ending of the 3rd person singular of "braucht" and its reference verbs (read speech)

Note that the distribution of the flectional ending of "braucht" is more or less equal to the distribution of the flectional ending of the reference verbs.

As can be seen from Figure 3, there is the same tendency of leaving out the flectional ending of the 3rd person singular although there are still more occurrences of the allomorpheme "-t" than the zero morpheme.

The distribution of the read "braucht" is similar to the reference verbs. That means that the orthographic representation influences the exactness of the realization. The read "braucht" seems to be more accentuated than the unprompted correspondence.

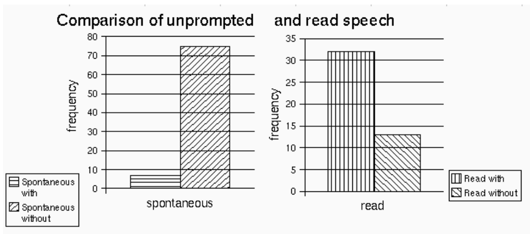

Figure 3: "braucht": comparison of the realization of the flectional ending in unprompted and read speech

Table 3 gives the corresponding data:

verb form	number of occurrences
Spontaneous with	7
Spontaneous without	75
Read with	32
Read without	13

Table 3: Distribution of the realization of the flectional ending in spontaneous and read speech.

Comparing the values of table 3 we come to the following conclusion:

- The elision of the wordfinal ending "-t" is due to a phonetic process. The loss can be observed in other word categories as well.
- This tendency of leaving out the morphophoneme "-t" is becoming more and more common and can therefore be interpreted as an alternation of the zero morpheme.
- Why the elision is more frequent with the modal form of "braucht" compared to the reference forms is a matter of a more frequent use of "braucht" as modal verb.
- The differences in the distributions of unprompted and read "braucht" have their reason in hyperarticulation.

- The differences in the modal use of "braucht" compared to reference verbs is due to accentuation and focus.

6. CONCLUSION AND FUTURE WORK

In the last sections we showed the results of the investigation of the use of German "braucht" in unscripted speech. We saw that we cannot draw a clear line between a morphological reduction or phonetically caused elision under our assumption.

It is clear that the elision of the wordfinal ending "-t" is due to a phonetic process. But whether this leads to a complete loss of the flectional ending "-t" or not has to be observed.

Therefore, we have to analyse all verb forms of the third person singular in unprompted and read speech. We are working on this analysis at the moment.

ACKNOWLEDGEMENTS

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