

# DIFFERENCES IN THE PRODUCTION OF FORTIS-LENIS OPPOSITIONS IN PLOSIVES FOUND IN THE FRENCH-GERMAN BORDER AREA

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## ABSTRACT

**Objectives:** The phonetic basis of the fortis-lenis distinction between [p, t, k] and [b, d, g] in the Moselle-Franconian (MF), the Rhenish-Franconian (RhF), and in the Transitional region dialects (TR) was examined. These dialects are spoken on both sides of the French-German border, i.e. in Lorraine, the Saarland, and N.W. Palatinate. **Methods:** Production data from 4 German and 6 germanophone Lorraine dialect communities were analysed. **Results:** Cross-border production convergence is shown for the fortis-lenis plosives concerning their VOT durations. Further, the differentiation on the basis of stop closure duration made by the German speakers of RhF is absent in the speakers of the same dialect in Lorraine, whereas closure voicing and short stop closure durations, characteristics of Lorraine MF-speakers were not found for German speakers. **Conclusion:** The results indicate systematic production differences which justify the use of different cross-border transcription systems on the above mentioned dialects in the literature. **Keywords:** Fortis-lenis opposition, Cross-border production differences, Transcription systems

## 1. INTRODUCTION

The subject of the present study is the phonetic basis of the fortis-lenis distinction between the fortis plosive series [p, t, k] and the lenis plosive series [b, d, g] in the MF, the RhF as well as the TR region dialects spoken on the French and the German sides of the French-German border, i.e. in Lorraine, Département de la Moselle, the Saarland and N.W. Palatinate, respectively. The present study was motivated by the discovery that different transcription systems have traditionally been used in the literature on the aforementioned dialects in Germany [1-5]. RhF word initial plosives are transcribed with lenis symbols and MF plosives with fortis symbols. With respect to the dialect areas of Lorraine (France), the relevant dialectological literature is primarily found in the *Atlas linguistique et ethnographique de la Lorraine germanophone* [6]. In this atlas - contrary to the transcription systems for dialects on the German side of the border - MF word initial plosives in etymologically related lexemes are usually transcribed with lenis symbols, in the RhF

area with fortis symbols, while in the TR region the same segments are rendered with either fortis or lenis symbols (see Table 1) [6]:

**Table 1:** Transcription conventions

<i>MF region</i>	<i>TR region</i>	<i>RhF region</i>
[blu:t]	[blu:t] or [plu:t]	[plu:t]
(-blood)	(-blood)	(-blood)

However, in all three areas, the pre-vocalic fortis-lenis opposition still exists as the following examples illustrate (see Table 2):

**Table 2:** Minimal pairs

<i>MF</i>	/pu:r/ (-pair) - /bu:r/ (-well)
<i>TR</i>	/pɛ:r/ (-horses) - /bɛ:r/ (-bears)
<i>RhF</i>	/pɛ:r/ (-horses) - /bɛ:r/ (-bears)

These transcription differences are also found in dialect descriptions on the German side of the border. However, there is an as yet unexplained reversal of the MF and the RhF fortis-lenis relations compared to Lorraine. Namely, the fortis plosives ([p, t, k]) are found to predominate in the MF regions, while their lenis counterparts ([b, d, g]) are used predominantly in transcriptions of RhF and TR region lexemes (see Table 3) [2, 5]:

**Table 3:** Transcription conventions

<i>MF region</i>	<i>RhF region</i>
[tan] (-fir)	[dan] (-fir)

Again, the pre-vocalic fortis-lenis opposition still exists in both areas (see Table 4).

**Table 4:** Minimal pairs

<i>MF</i>	/paus/ (-pause) - /baus/ (-swelling)
<i>RhF</i>	/pɛ:r/ (-horses) - /bɛ:r/ (-bears)

This divergent representation of the plosives not involved in the fortis-lenis distinction implies a different phonetic basis. The aim of this study is to identify differences in this phonetic basis.

The phonetic structure of the fortis-lenis opposition is known to be complex in languages with Germanic roots [7-9]. 'Plosive-intrinsic' properties of interest are closure duration, closure voicing, stop release, and degree of aspiration. Differences in vowel duration preceding fortis and lenis, and in the vocalic transitions into and out of the stop closure we call 'plosive-extrinsic' properties.

## 2. MATERIAL AND METHODS

### 2.1. Speakers and language material

Ten speakers, one each from 10 small towns or villages were recorded. They spoke ten tokens of bilabial, alveolar and velar fortis-lenis initial plosive minimal pairs appropriate to the particular dialect.

The speakers from the communities in Lorraine were part of a project investigating cross-border comparisons of MF and RhF dialect features. These communities were those in which a wider range of speakers had been investigated in the course of a cross-border comparison of MF and RhF dialect features. Two of these communities (Apach and Schwerdorff) are located in the Northwest MF region, two others (Rahling and Rohrbach) in the Southeast RhF region, and finally, two (Vahl-Ebersing and Vahl-lès-Faulquemont) in the TR region between them, which is known to exhibit a mixture of MF and RhF dialect features. The four German communities were Beuren and Besseringen in the MF regions of North Saarland and the Northwest Palatinate, and Saarbrücken and Großrosseln in the RhF region of the Southern Saarland, respectively. The ten tokens of the minimal pairs were recorded in two separate randomised series of five, the words being spoken in carrier sentences equivalent to the High German "Ich habe immer \_\_ gesagt" (I have always said \_\_)

E.g. RhF: /ix xɔn 'imər pɛ:r gə'za:d/

/ix xɔn 'imər bɛ:r gə'za:d/

### 2.2. Recording procedure

The recordings were digitized at a 16kHz sampling rate and the stop closure duration (*closure duration*), the closure voicing during closure (*periodicity*), and the duration between stop release and voicing onset for the following vowel (*voice onset time, VOT*) were measured using the Kay CSL (Model 4300B) waveform and spectrographic display facilities.

### 2.3. Statistical procedures

Data analysis was performed using SPSS version 22 for all tests. The three dependent variables, closure duration, periodicity, and voice onset time were

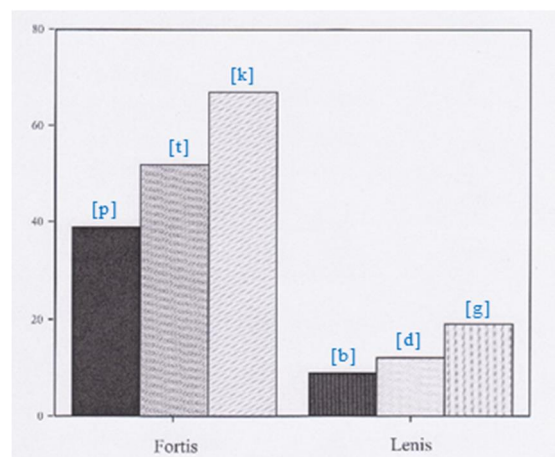
tested for the effects of the independent variables Fortis/Lenis, Regional Group, and Individual Speaker in three three-way Repeated-Measures ANOVAs for the German and the French speakers.

## 3. RESULTS

### 3.1. German dialect areas

For these areas, the greatest acoustical difference between fortis and lenis was found to lie in the duration of the *VOT*. (average duration, ms: [p]=39, [t]=48, [k]=66; [b]=9, [d]=14, [g]=17;  $F 622.9, p < 0.001$ ). In Figure 1 these differences are shown.

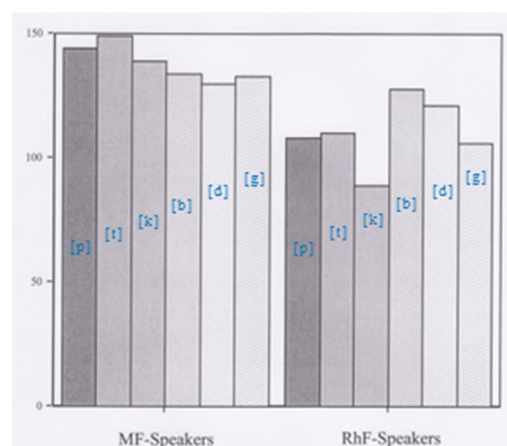
**Figure 1:** Production results for the dialects regions in Germany: Overall average VOT (ms).



Small overall differences in *closure voicing* were also detected, but systematic differences here were found to exist only in one (female) speaker.

With regard to the stop closure duration, which does not differ significantly as a function of the fortis-lenis category, the following tendencies were found (see Figure 2):

**Figure 2:** Production results for the dialects regions in Germany: Fortis [p, t, k] and lenis [b, d, g] overall average closure duration (ms).

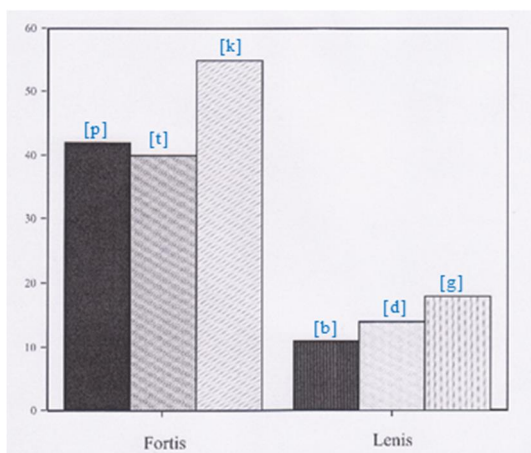


First, Moselle-Franconian speakers displayed only very few of the differences between the fortis and lenis known to be present in standard German: fortis stop closure duration > lenis stop closure duration (by about 10%). However the productions of RhF speakers point to an inversion of this relationship: lenis stop closure duration > fortis stop closure duration (by about 14%). Second, closure durations are systematically different across the two dialect regions (average duration, ms: MF: [p]=147, [t]=149, [k]=142; [b]=138, [d]=134, [g]=136; RhF: [p]=115, [t]=116, [k]=79; [b]=131, [d]=127, [g]=112;  $F(71.20)$ ,  $p < 0.01$ ) All these findings are illustrated in Figure 2 above.

### 3.2. French dialect areas

The duration of VOT was also found to be a common acoustical difference between fortis and lenis plosives (average duration, ms: [p]=42, [t]=39, [k]=56; [b]=12, [d]=14, [g]=17;  $F(651.9)$ ,  $p < 0.001$ ; see Figure 3).

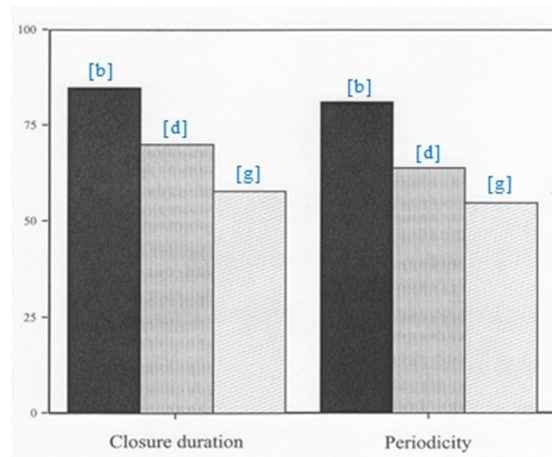
**Figure 3:** Production results for the dialects regions in France: Overall average VOT (ms).



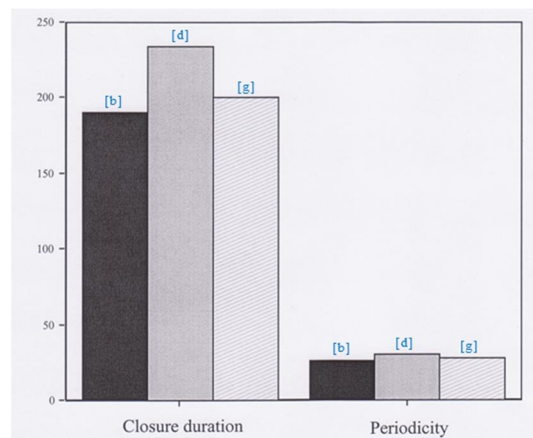
However, with respect to the closure voicing (periodicity), speakers also show considerable differences: Periodicity is most frequent in the lenis production from speakers from the MF region (average duration, ms: [b]=81, [d]=63, [g]=58, see Figure 4). However, RhF plosives do not show continued periodicity (average duration, ms: [b]=25, [d]=27, [g]=26, see Figure 5).

Speakers from the Transitional region (TR) take an intermediate position in so far as their plosives are differentiated by MF closure-voicing characteristics (average duration, ms: [b]=82, [d]=54, [g]=52). Furthermore, speakers take an intermediate position regarding stop closure duration characteristics typical of RhF informants (see Figures 6, 5).

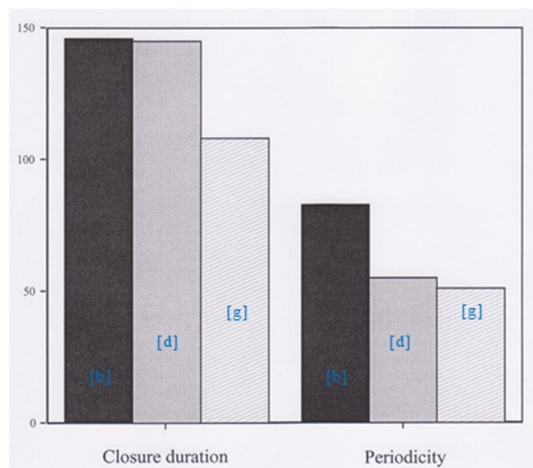
**Figure 4:** Lenis production results for the dialects regions in France MF-Speakers: Overall average closure duration / periodicity in the closure (ms) of lenis productions.



**Figure 5:** Lenis production results for the dialects regions in France RhF-Speakers: Overall average closure duration / periodicity in the closure (ms) of lenis productions.



**Figure 6:** Lenis production results for the dialects regions in France TR-Speakers: Overall average closure duration / periodicity in the closure (ms) of lenis productions.



With respect to the stop closure durations of the MF speakers, results show that overall, their values are relatively short compared to those other two dialects (see Figures 4, 5 and 6 for lenis productions).

### 3.3. Converging and diverging factors in the cross-border dialect areas

#### 3.3.1. Production convergence

The results of the production tests in the Moselle-Franconian, the Rhenish-Franconian, and in the Transitional region dialects clearly show that fortis and lenis plosives are acoustically differentiated on the basis of their *VOT durations*. VOT is the most salient cue differentiating the language-specific realizations of fortis ([p, t, k]) and lenis ([b, d, g]) plosives. These findings are well known to be present in standard German. German belongs to the group of aspirating languages and contrasts zero to short lag VOT plosives ([b, d, g]) with their long lag VOT counterparts ([p, t, k]).

#### 3.3.2. Production divergence

The differentiation on the basis of the *stop closure duration* made by the German speakers of Rhenish-Franconian (lenis closure duration > fortis closure duration) is absent in the speakers of the same dialect on the French side of the border, in Lorraine. But, in contrast to the German speakers, closure duration does differentiate the fortis-lenis categories for the Lorraine speakers significantly (see Figures 4, 5 and 6;  $p < 0.05$ ). However, the very strong regional and speaker effects are the product of extremely long values for the RhF and (particularly) the TR speakers, who regularly paused to give the test word the emphasis they must have thought it deserved (see Figures 4, 5, and 6).

On the other hand, *closure voicing* (periodicity) and short *stop closure durations*, characteristics of Lorraine Moselle-Franconian speakers were found to be missing in the German speakers of this dialect. Closure voicing makes a very strong contribution to fortis-lenis differentiation in Lorraine, and there is also a systematic regional effect, with the RhF speakers not exploiting the voicing (see Figure 5).

## 4. DISCUSSION

In this study, a production analysis of the fortis-lenis opposition in initial plosives from 4 German and 6 germanophone Lorraine dialect communities is presented to describe the phonetic basis of the plosives. The motivation of the study lies in the fact that different transcription systems have traditionally been in use in the literature on Moselle-Franconian,

Rhenish-Franconian as well as on Transitional region dialects. These dialects are spoken on the French and the German side of the French-German border.

For the German dialect areas as well as for the French dialect areas, the common acoustical difference between the two plosive series for all speakers was found to lie in the duration of the VOT (see Figures 1 and 3). Against this production convergence other results for the Saarland/Palatinate speakers are not corresponding to the Lorraine speakers. Thus, a considerable difference can be found for the German RhF speakers. Their *ölenisö* closures are systematically longer than their *öfortisö* closures. (see Figure 2). This production behaviour is in contradiction with that known to be presented in standard German. Additionally, closure durations and closure voicing are also systematically different across the two dialect regions (RhF and MF) and the regional groups differ in the way they employ these parameters for the fortis-lenis distinction.

In contrast to the German speakers, closure duration does differentiate the fortis-lenis categories for the Lorraine speakers as well as closure voicing makes a strong contribution to this differentiation in the Lorraine dialect communities (see Figures 4, 5, and 6).

These different production results shown in the study for the German and French speakers justify the use of the existing different cross-border transcription systems in the literature.

The production differences between the regions and between Germany and France were sufficient to hypothesize some differences in perceptual strategies. A perception experiment should clarify whether there was any difference in the way listeners from each of the communities process the properties known to influence the impression of fortis and lenis plosives.

## 5. CONCLUSION

The frequent different use of word-initial [p, t, k] and [b, d, g] in phonetic-phonological descriptions of MF-, RhF-and/or TR-dialects on both sides of the French-German border raises the question of the phonetic basis of this fortis-lenis opposition. Using two cross-border dialects of shared origin, the present study clearly shows that the audibly derived transcription conventions can be confirmed by instrumentally obtained production data. The results indicate systematic production differences which could underlie the divergent symbolic representations. Future work should be undertaken to test whether these production differences also reflect differing perceptual prototypes.

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