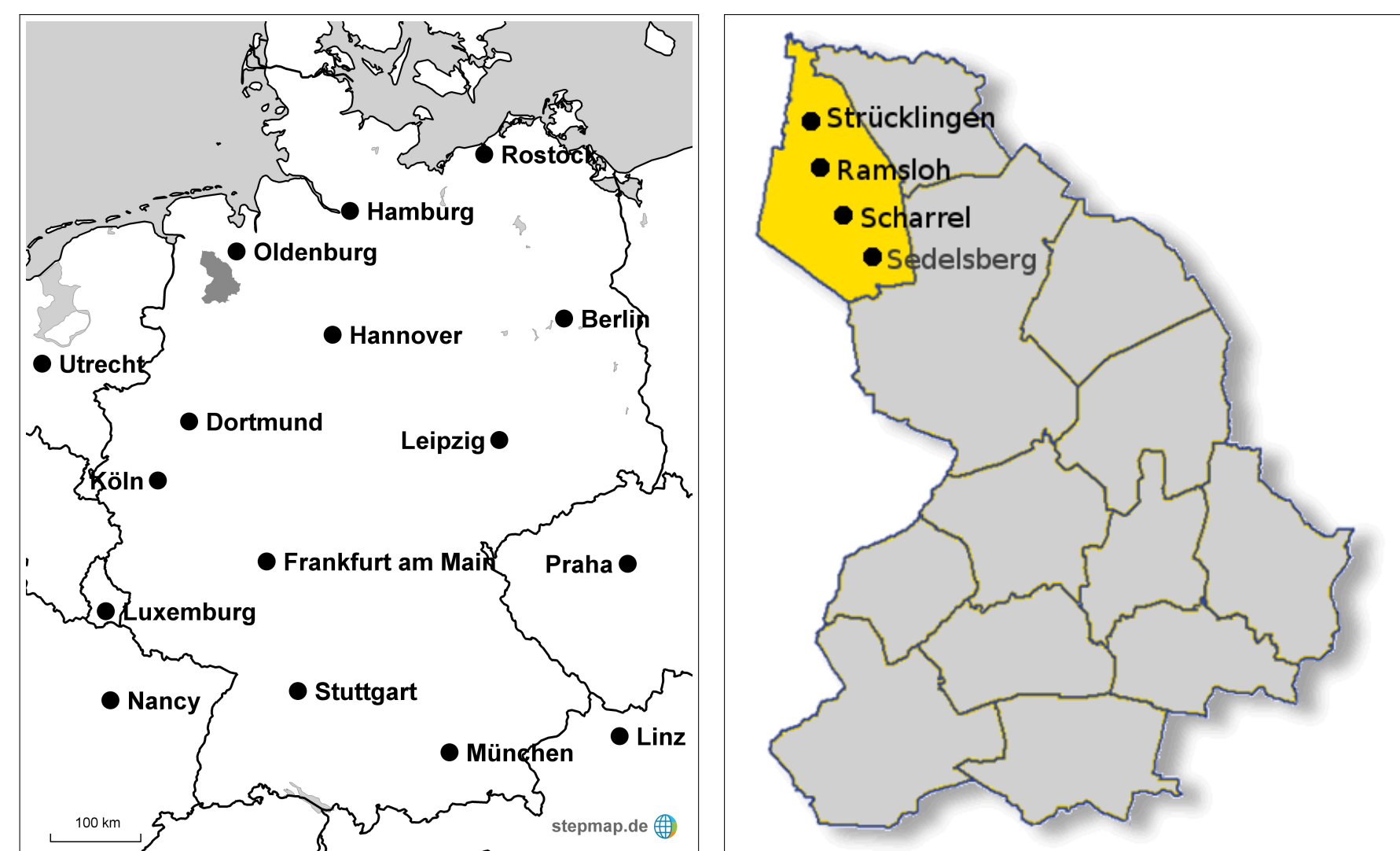


Introduction

- Saterland Frisian is the only remaining living variety of East Frisian.
- It is spoken in three small villages – Strücklingen, Ramsloh and Scharrel – by 2250 speakers.
- Many of these speakers are trilingual. In addition to Saterland Frisian, they speak Low German, and High German.
- We recorded 11 trilingual male speakers, aged between 51 and 75 years. All speakers were born and raised in Scharrel.



Vowel inventory

- Monophthongs, which were attested in closed syllables in the data we collected:

Saterland Frisian	Low German	High German
i: y: u:	i: y: u:	i: y: u:
e: ø: o:	e: ø: o:	e: ø: o:
ɪ ʏ ʊ	ɪ ʏ ʊ	ɪ ʏ ʊ
ɛ: œ: ɔ:	ɛ: œ: ɔ:	ɛ:
ɛ œ ɔ	ɛ œ ɔ	ɛ œ ɔ
a	a	a

- 13 diphthongs were attested for Saterland Frisian, 7 for Low German, and 3 for High German in closed syllables. The High German diphthongs /ai/, /au/, and /ɔy/ are shared by all three languages.

Research questions

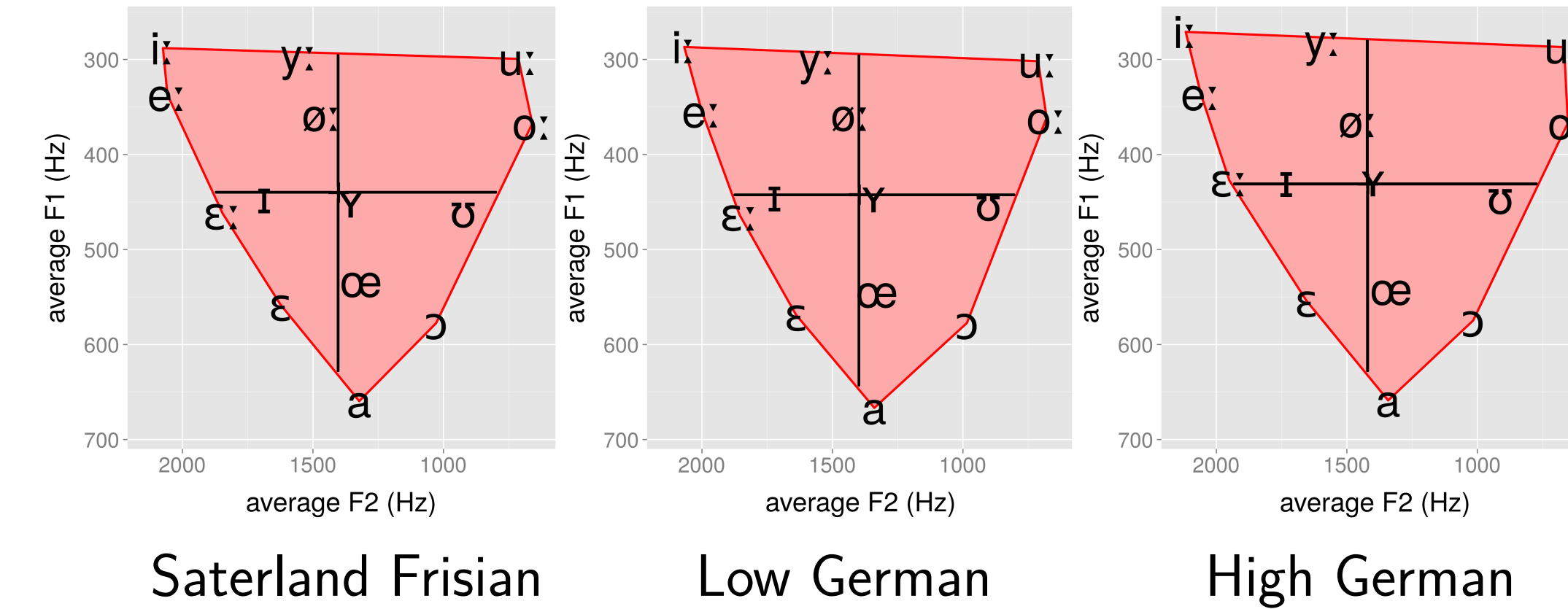
- Do the three languages' vowel systems differ in vowel space and dispersion? [1]
- Does the inter-language variability of individual vowels correlate with the number of vowels in the vowel systems of the three languages? [2]
- Are there systematic differences between the three languages in duration and in mid-vowel F1 and F2, which are relevant for a language-specific base-of-articulation effect? [3]

Method

- All shared vowels were elicited in a /hVt/ context for each of the three languages. /hVt/ words were cued by reading aloud real rhyming monosyllabic words immediately preceding the production of the /hVt/ target word.
- If this was not possible, an intermediate form was shown between the trigger and the target word.
- Each such sequence was presented twice, thus two /hVt/ samples were obtained per speaker and per vowel. Sequences were presented in controlled randomized order.
- Acoustic variables were measured with PRAAT. For each vowel we measured the vowel duration and mid-vowel F1 and F2 (in Hertz).

1 Vowel space and dispersion

- Vowel space sizes were computed on the basis of the averaged locations of the vowels in the F1/F2 plane. For each language and speaker, the subset of vowels which lie on the hull of the vowel points as well as the area within the hull was measured.
- Dispersion in F1: average distance to the vowel space center in the F1 dimension. Dispersion in F2: average distance to the vowel space center in the F2 dimension.



- Neither significant differences between vowel spaces nor dispersion differences in either F1 or F2 were found at the 5% level.

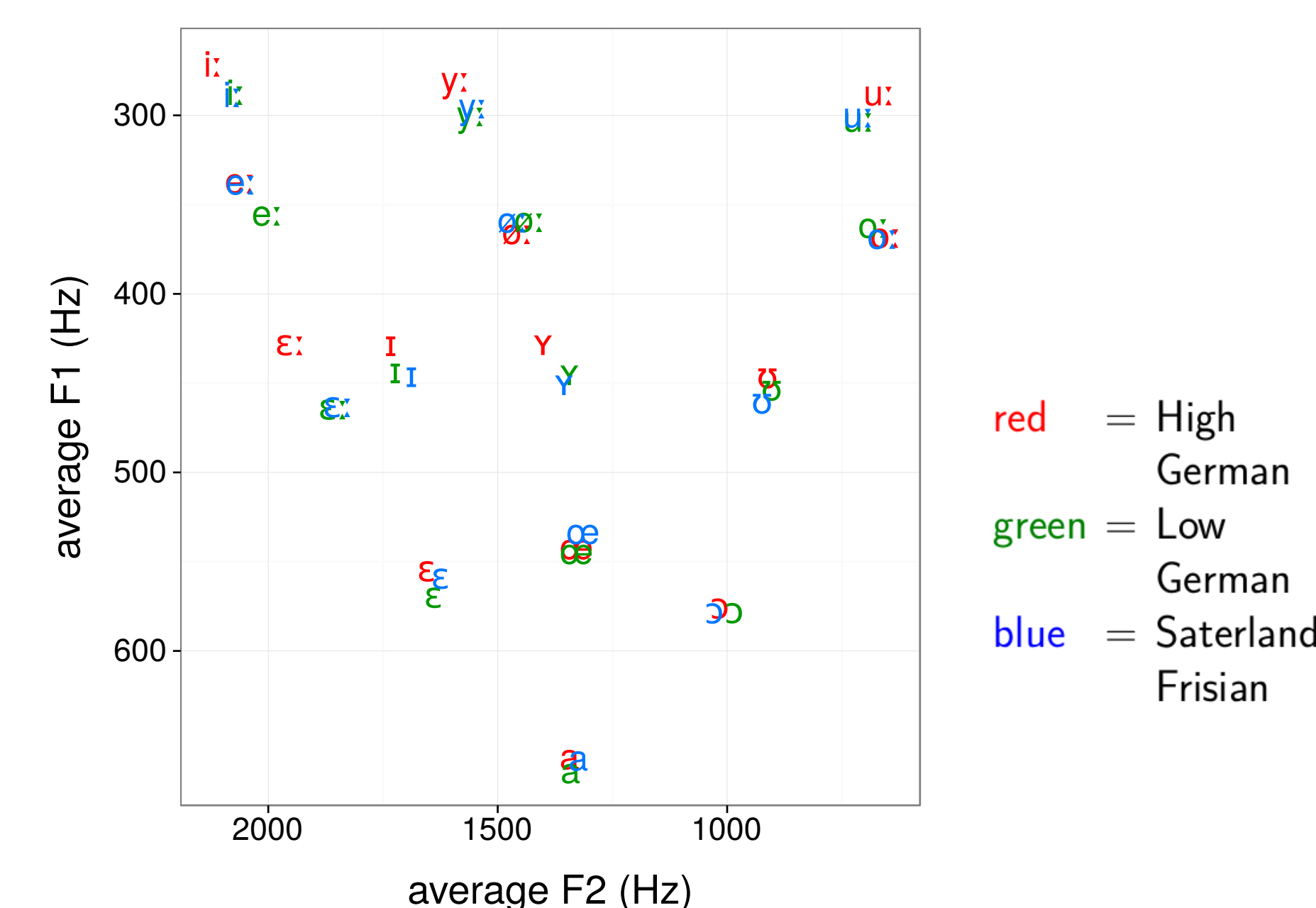
2 Inter-language variability of vowels

- For each variable – duration, F1 and F2 – we measured the standard deviation of the 11 speakers per vowel and per language. For any pair of languages the standard deviations of corresponding vowels were compared.

	mono	front	back	close	open	diph
dur.	H>L	H>L	H>L	H>S	H>S	H>S
F1	H<L	H<L	H<L	H<L	H<L	H<L
F2	H>L	H>L	H>L	H>L	H>L	H>L

H=High German, L=Low German, S=Saterland Frisian. Significances at the $\alpha = 0.05$ level are indicated by > or <, meaning that the first language has respectively a larger or smaller measurement than the second language.

3 Differences in duration and F1/F2



Location of Saterland Frisian, Low German, and High German vowels in the F1/F2 plane.

- A linear mixed-effect model was used for each acoustic variable and per category, with *language* as fixed factor and *speaker* and *vowel* as random intercepts, and *language* as random slope of *vowel* only when this improves the model.

	mono	front	back	close	open	diph
dur.	H>L	H>L	H>L	H<L	H<L	H<L
F1	H<L	H<L	H<L	H<L	H<L	H<L
F2	H>L	H>L	H>L	H>L	H>L	H>L

Conclusions

- No vowel space size differences and dispersion differences were found.
- Durations of monophthongs vary stronger in High German than in the other two languages; durations of diphthongs vary stronger in High German than in Saterland Frisian; for F1 and F2 no overall effect was found.
- High German monophthongs have longer durations than Low German and Saterland Frisian monophthongs; among the diphthongs, Low German showed the highest durational values; as for F1 and F2, High German monophthongs are more closed and more fronted than Saterland Frisian and Low German monophthongs. \Rightarrow These results suggest that the subjects may use the same base-of-articulation for Saterland Frisian and Low German but not for High German.

References: [1] Liljencrants, J., Lindblom, B. 1972. Numerical simulation of vowel quality systems: The role of perceptual contrast. *Language* 48, 839–862. [2] Lindblom, B. 1986. Phonetic universals in vowel systems. In: Ohala, J., Jaeger, J., (eds), *Experimental Phonology*. New York: Academic Press 13–44. [3] Bradlow, A. R. 1995. A comparative acoustic study of English and Spanish vowels. *The Journal of the Acoustical Society of America* 97(3), 1916–1923.

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