Cross-linguistic vowel variation in Saterland: Saterland Frisian, Low German, and High German

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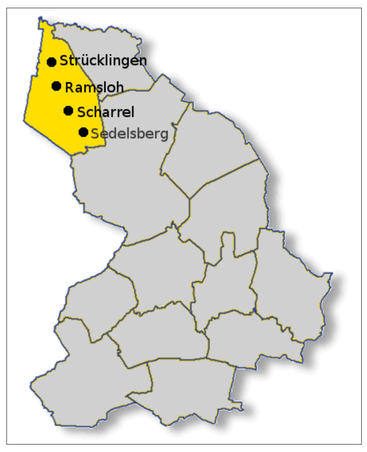
Introduction

- 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 High German and Low 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		
iː	yː	uː	iː	yː	uː	iː	yː	uː
eː	øː	oː	eː	øː	oː	eː	øː	oː
ɪ	ʏ	ʊ	ɪ	ʏ	ʊ	ɪ	ʏ	ʊ
ɛː	œː	ɔː	ɛː	œː	ɔː	ɛː		
ɛ	œ	ɔ	ɛ	œ	ɔ	ɛ	œ	ɔ
			aː			aː		
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 /ai̯/, /au̯/, and /ɔy̯/ are shared by all three languages.

Research questions

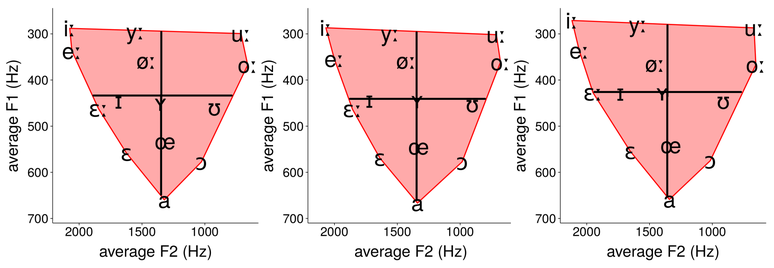
1. Do the three languages' vowel systems differ in vowel space and dispersion? [1]
2. Does the inter-language variability of individual vowels correlate with the number of vowels in the vowel systems of the three languages? [2]
3. Are there systematic differences between the three languages in duration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

Method

- All shared vowels were elicited in a /hVt/ context for each of the three languages.
- After the speaker had read aloud a real monosyllabic trigger word, each target word was presented as a H_t frame. The target word had to be read so that it rhymes with the trigger word.
- If a trigger word with a final /t/ was not available, an intermediate form was shown between the trigger word and the target word.
- Each trigger word was presented twice, thus two /hVt/ samples were obtained per speaker and per vowel. Trigger words were presented in controlled randomized order.
- Acoustic variables were measured with PRAAT [4]. 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: average (Euclidean) distance to the vowel space center. 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.
- The vowel space center is the centroid (or geometric center) defined by the hull (or polygon).



Saterland Frisian | Low German | High German

- No significant differences between vowel spaces were found at the 5% level.
- High German monopthongs are more dispersed than Saterland Frisian vowels.
- Dispersion in F1: High German closed vowels are more dispersed than the vowels of the other languages. Saterland Frisian close-mid vowels are more dispersed than those of the other languages. Low-German open-mid vowels are more dispersed than Saterland Frisian vowels.

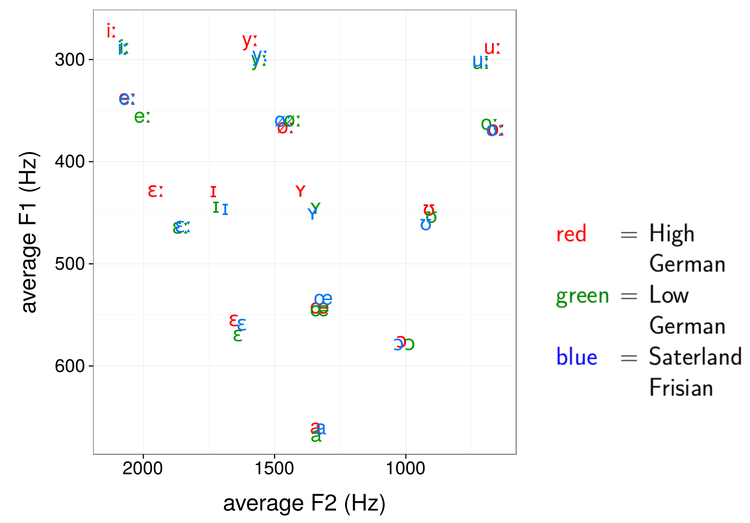
2 Inter-language variability of vowels

- 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	near-close	close-mid	open-mid	diph
dur.	H>L		H>L	H>L	H>L			H>S
	H>S		H>S	H>S	H>S			
			L>S					
F1					H>L		H<L	
				H>S	H>S		H<S	
				L>S	L<S	L<S		
F2		H>S						
					L>S	L>S		

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	near-close	close-mid	open-mid	diph
dur.	L<H	L<H	L<H	L<H				L>H
	S<H	S<H	S<H	S<H	S<H			S<H
F1	L>H	L<H		L>H		L>H		
	S>H			S>H		S>H		
F2	L<H	L<H						
	S<H	S<H	S>H					

Conclusions

1. No vowel space size differences were found.
2. High German monophthongs are more dispersed than Saterland Frisian monophthongs.
3. 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.
4. High German monophthongs have longer durations than Low German and Saterland Frisian monophthongs; among the diphthongs, Low German shows 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.

   ⇒ 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. [4] Boersma, Paul & Weenink, David 2015. *Praat: doing phonetics by computer* [Computer program]. Version 5.4.14, retrieved 24 July 2015 from http://www.praat.org/.

Acknowledgements: This work was funded by the Deutsche Forschungsgemeinschaft (DFG) under Grant No. PE 793/2-1.