

Monolingual and trilingual production of Northern Standard German vowels



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Introduction – Background

- mutual influence of L1 and L2 categories in production and perception (cf. Baker & Trofimovich 2005; Flege, Schirru & MacKay 2003)
 - cross-linguistic interactions suggest a common phonological space (cf. Bond, Stockmal & Markus 2006; Guion 2003; Flege 1995; Grosjean 1989)
- despite language-specific categories and near-monolingual-like performance effects of cross-linguistic interference in vowel productions (Guion 2003; MacLeod, Stoel-Gammon & Wassink 2009)
 - large-scale phonetic convergence in the context of regional bilingualism (Mayr, Morris, Mennen & Williams 2015; cf. Bullock and Gerfen 2004)
 - monolingual-like productions were observed in the languages that have the wider communicative range and larger speech community

Introduction – Trilingualism in Saterland

Heeringa *et al.* (2015): cross-linguistic comparison of vowel productions of Saterland trilinguals

→ Saterland Frisian (SF), Low German (LG), and Northern Standard German (NSG)

Main finding:

- no systematic differences between the two local languages (SF, LG), but between the two local languages and NSG, spoken by several millions of speakers in Northern Germany

Introduction – Motivation & Study Aim

Do the deviant realizations of NSG vowels point at an orientation towards the broader speech community of NSG?

Expansion of Heeringa *et al.* (2015):

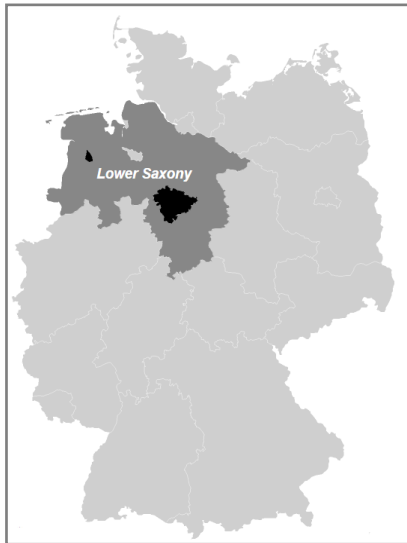
- studying the substrate effect of SF and LG on the standard language
- comparison of the NSG vowel productions of the trilingual Saterland speakers reported in Heeringa *et al.* (2015) with monolingual speakers of NSG from Hanover – representing the wider speech community of Northern Germany

Scharrel:

trilingual
speakers
(SF, LG, NSG)

Hanover:

monolingual
speakers (NSG)



Method

Speakers:

23 male speakers aged between 50-75 years

- 11 trilingual speakers (TRI)
- 12 monolingual speakers (MON)

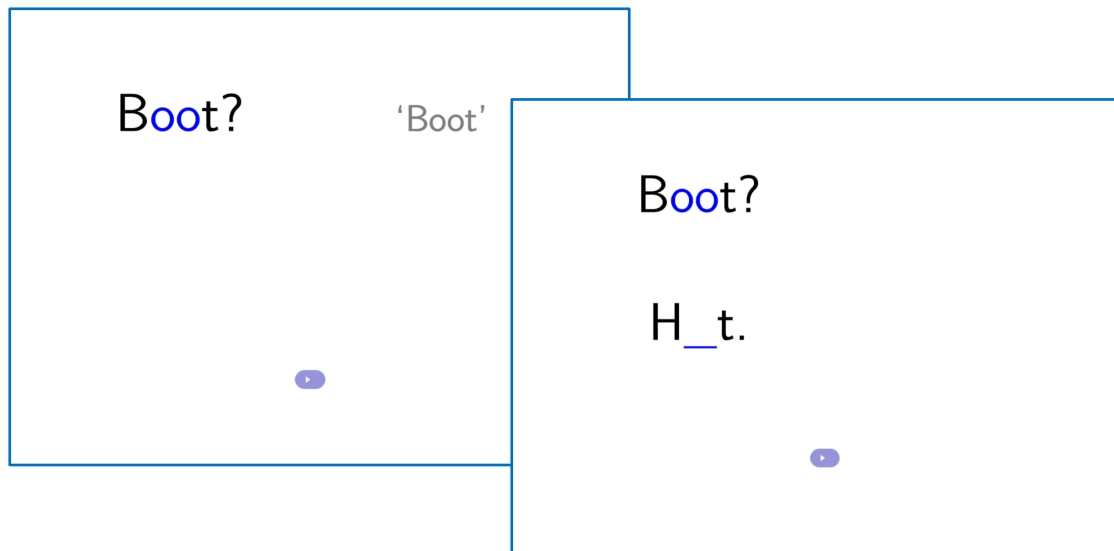
Material:

- all 15 NSG monophthongs

monolingual			trilingual		
i:	y:	u:	i:	y:	u:
ɪ	ʏ	ʊ	ɪ	ʏ	ʊ
e:	ø:	o:	e:	ø:	o:
ɛ:/ε	œ	ɔ	ɛ:	œ:	ɔ:
			ε	œ	ɔ
	a a:			a a:	

Method – Recording Procedure

- monosyllabic /hVt/ context
- elicitation via rhymes in sequences of High German triggers followed by the /hVt/ target word
- sequences were presented in a controlled randomized order
- each sequence was presented three times per speaker
- falling intonation contour on /hVt/ target words



Method – Data Processing

Acoustic variables:

- vowel duration (ms)
→ absolute duration & duration ratio of long/tense vs. short/lax vowels
- vowel quality: F1, F2 at vowel midpoint (50%)

Normalization of frequency values (after Guion 2003, cf. Yang 1996):

- 1) conversion of Hertz data to Bark scale (Traunmüller 1990)

$$z = [26.81/(1+1960/F_i)] - 0.53$$

- 2) multiplication of Bark values with a speaker-specific k factor, derived by dividing one fixed subject's average F3 ($F_3 S_{\text{median}}$) of the open vowel (/a/) by speaker j's mean F3 ($F_3 S_j$).

$$k_j = \text{mean } F_3 S_{\text{median}} / \text{mean } F_3 S_j$$

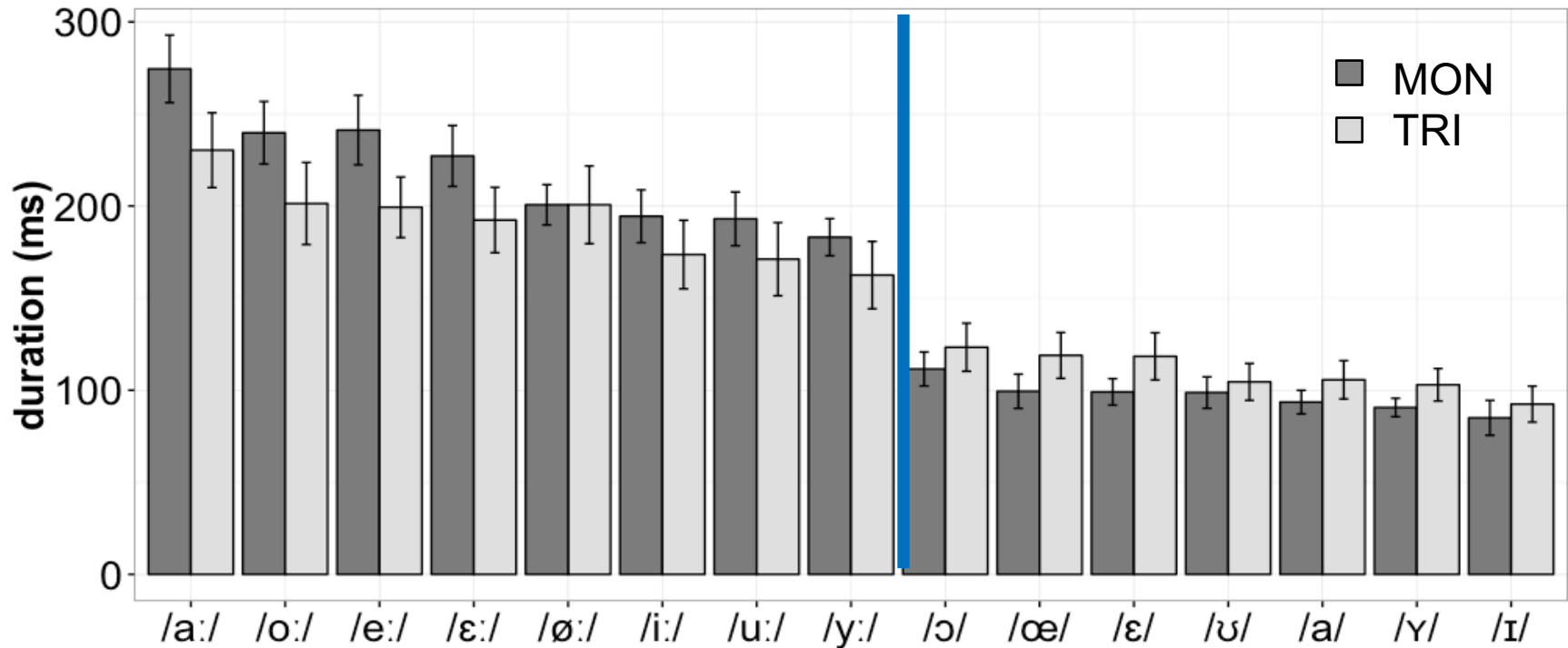
Method – Statistical Processing

Linear mixed effects models in R with function `lmer` from *lme4* package

Full model (speaker group comparison)	
dependent variables	<i>duration, duration ratio, F1, F2</i>
fixed effects	<i>speaker group, repetition</i>
random effects	random intercepts: speaker, vowel/vowel pair random slopes: by-vowel (pair) random slopes for the effect of <i>speaker group</i> , by-speaker random slopes for the effect of <i>repetition</i>

- backward elimination of non-significant effects of each full model using the step function of the *lmerTest* package
- all *p*-values were calculated using the Satterthwaite approximation in the *lmerTest* package

Results – Vowel Duration



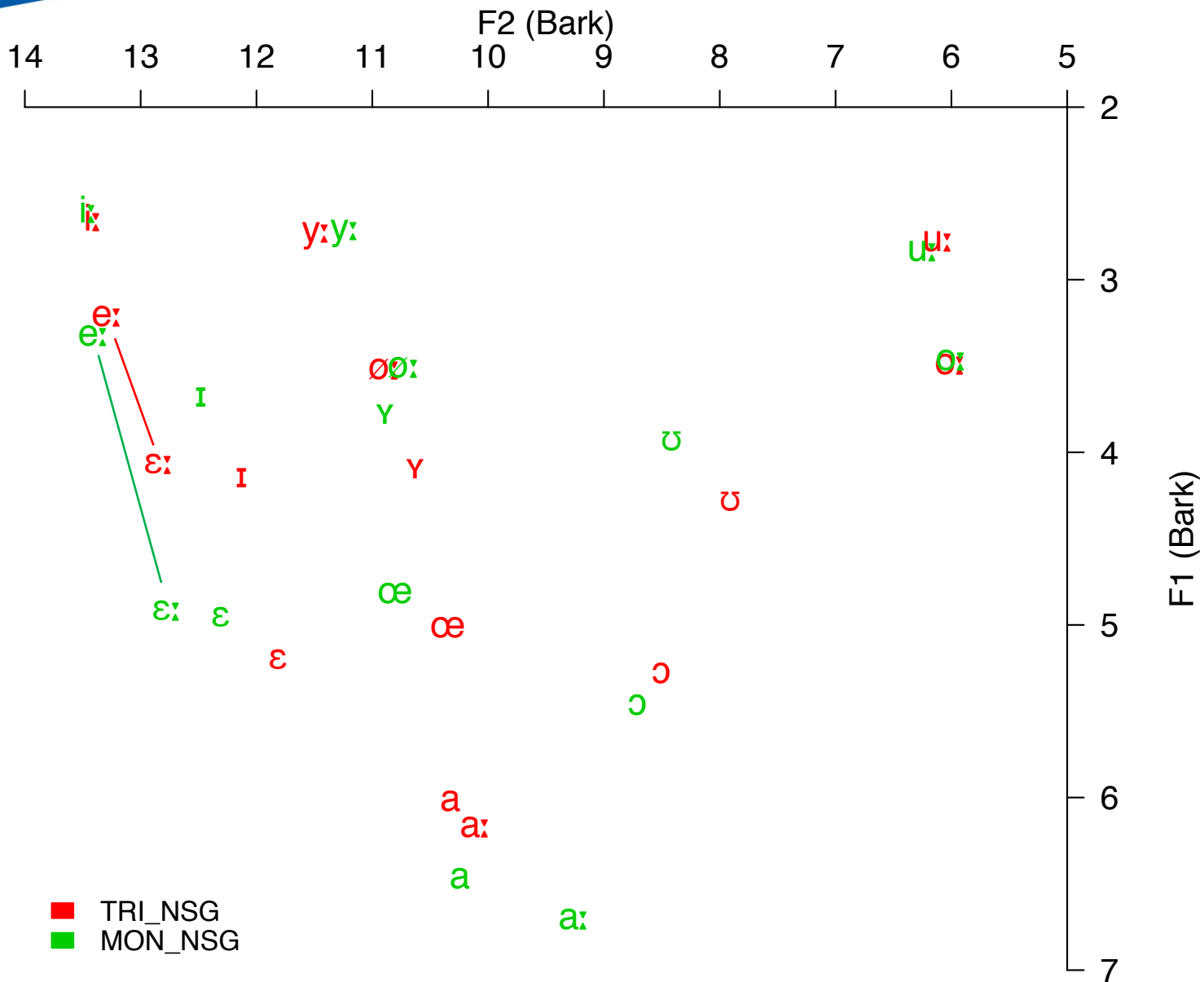
- clear separation between long and short vowels in both groups
- no general effects of *speaker group*
- only individual long vowel categories are longer for MON than for TRI:
/a: / and */e: /*

Results – Duration Ratio

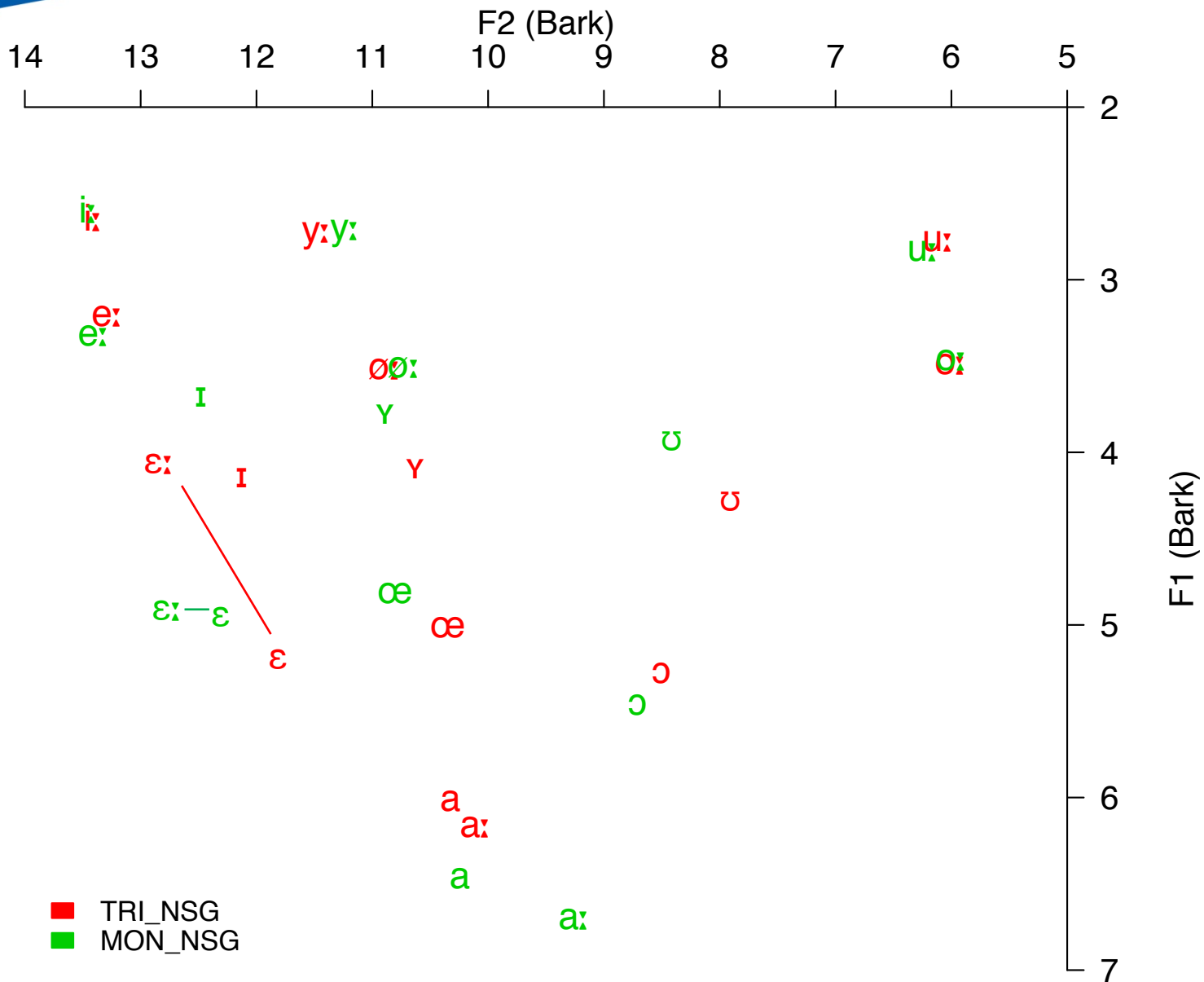
	ratio monoling.	ratio triling.	β	SE	$t(df)$	p
a: - a	3.0	2.3	0.75	0.20	3.84(23)	<.001
ɛ: - ɛ	2.3	1.7	0.71	0.16	4.43(21)	<.001
e: - ɛ	2.5	1.8	0.75	0.20	3.73(23)	<.01
ø: - œ	2.2	1.7	0.47	0.16	2.88(23)	<.01
o: - ɔ	2.3	1.7	0.57	0.17	3.32(23)	<.01
i: - ɪ	2.5	1.9	0.56	0.21	2.70(23)	<.05
y: - ʏ	2.1	1.6	0.31	0.10	2.99(23)	<.01
u: - ʊ	2.0	1.7	-	-	-	n.s.
mean	2.4	1.8				

→ duration differences in phonological short/lax and long/tense oppositions are smaller for TRI than for MON

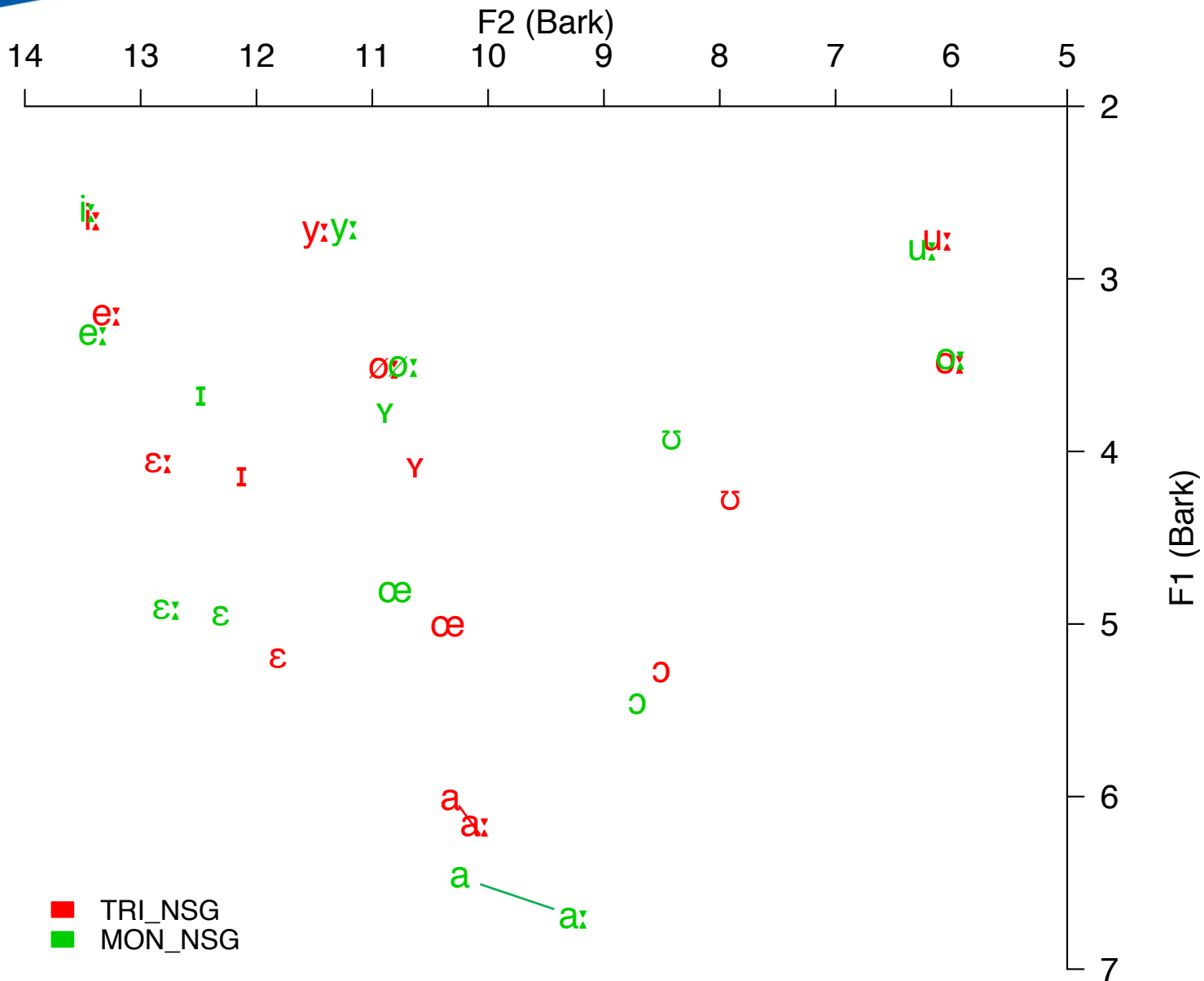
Results – Formant Frequencies



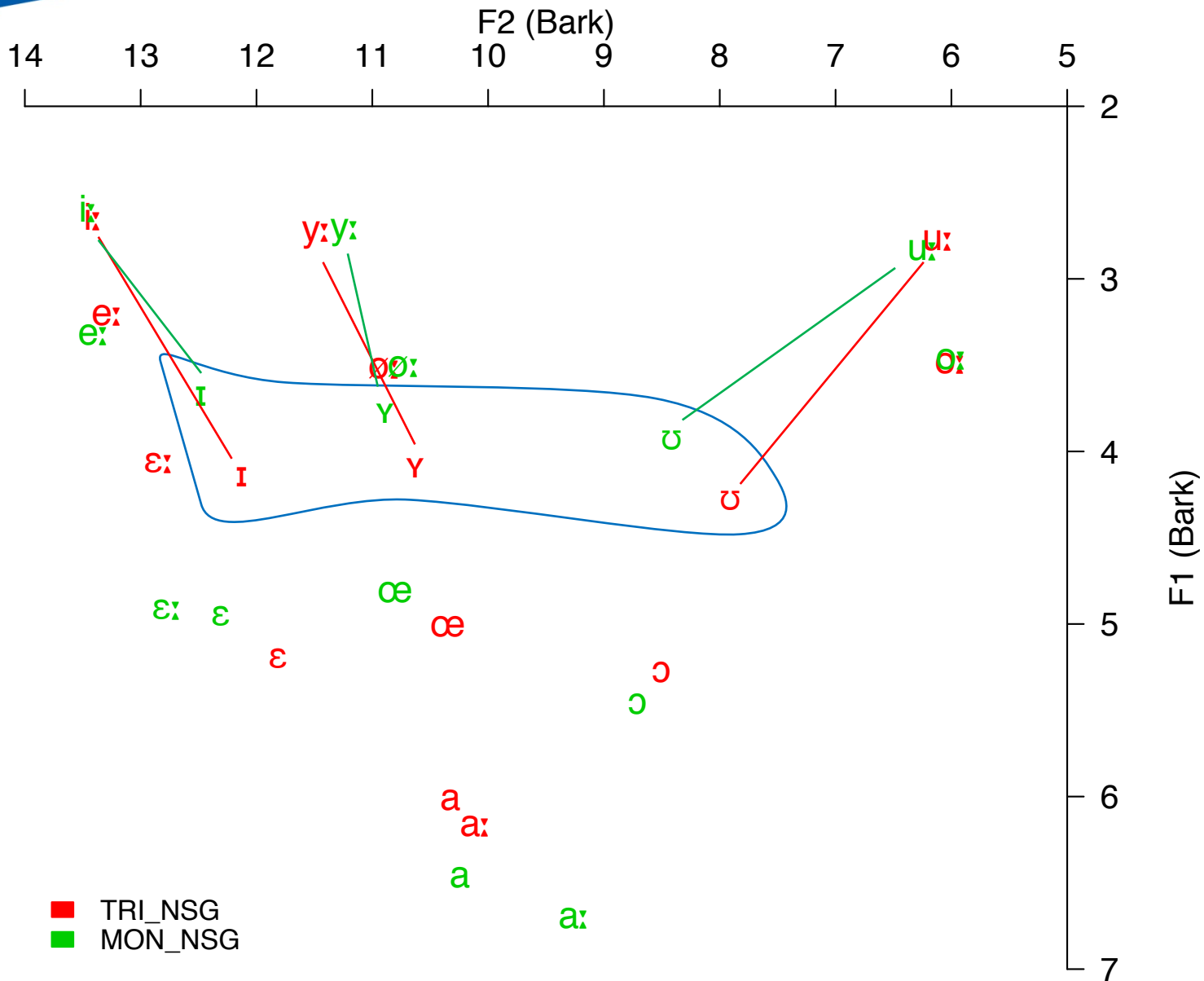
Results – Formant Frequencies



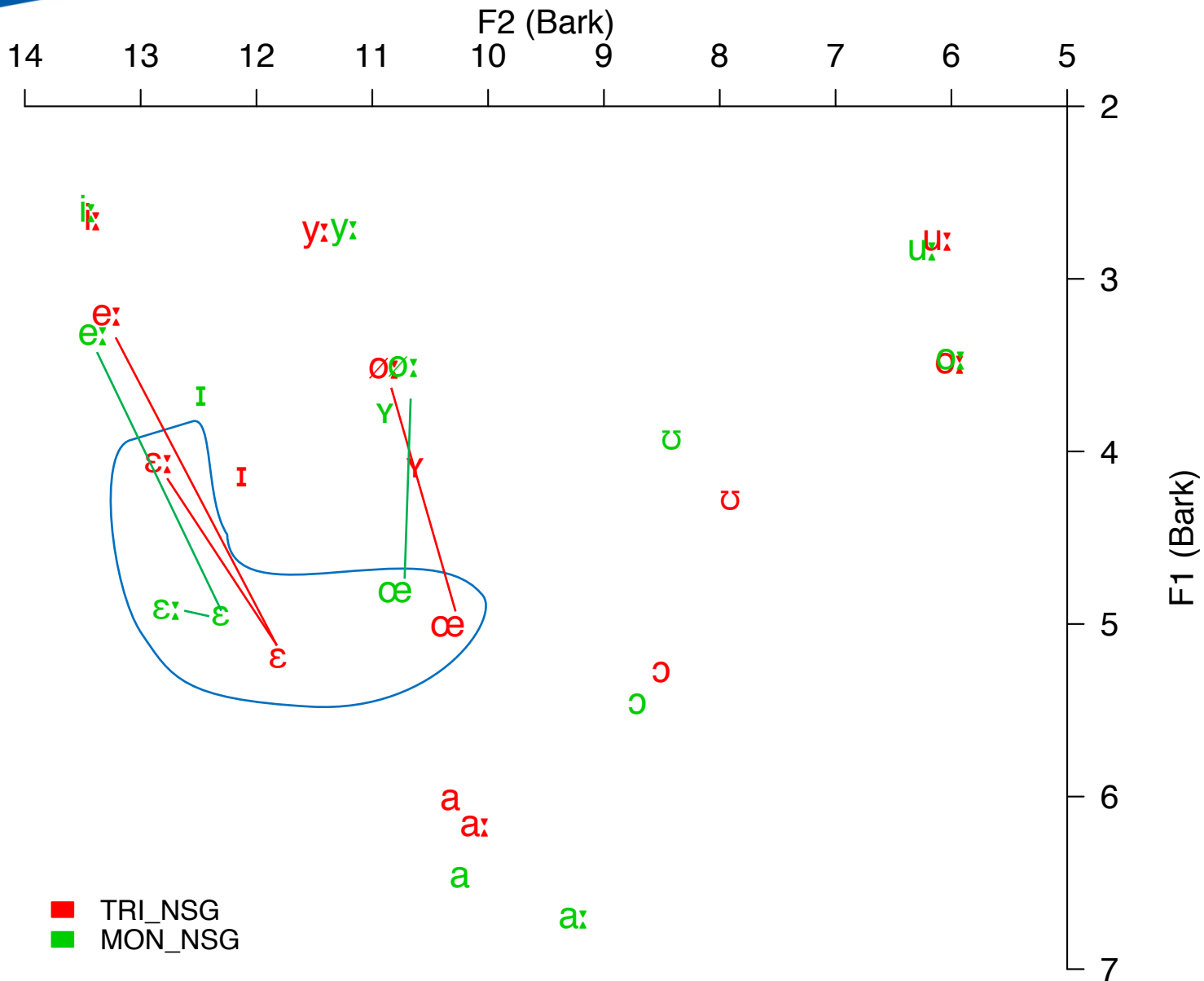
Results – Formant Frequencies



Results – Formant Frequencies



Results – Formant Frequencies



Comparison with Heeringa *et al.* 2015

Heeringa *et al.* (2015)

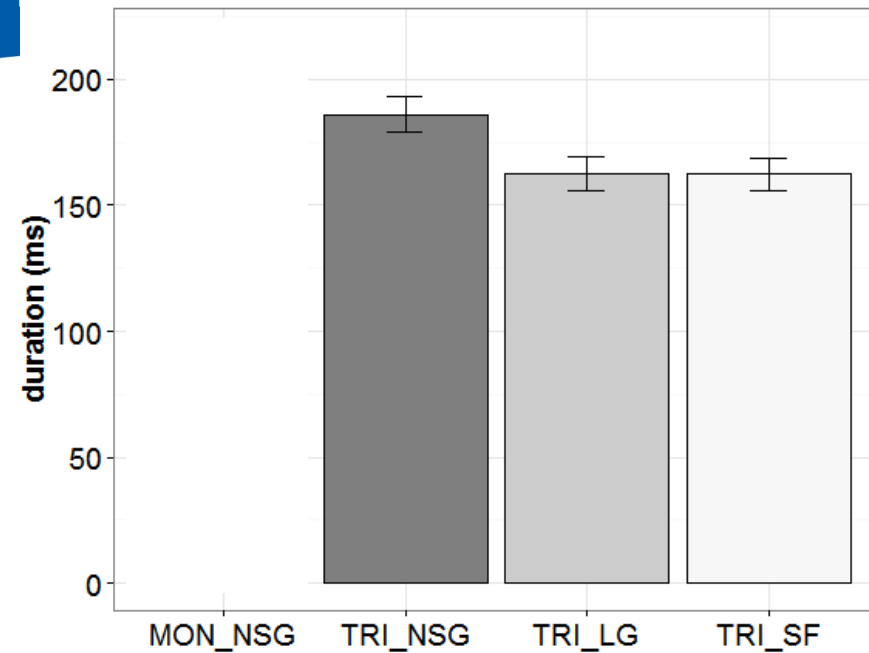
- no differences between SF and LG;
longest mean durations in NSG
→ effect most pronounced in long
vowels

Present study

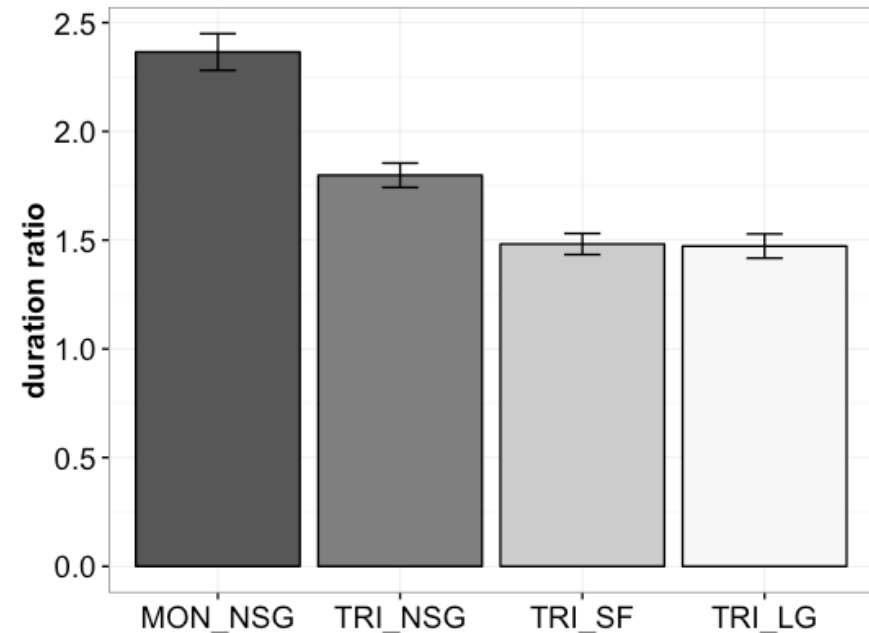
- mean long vowel duration of the
MON exceeds all of the TRI values
- differences in the duration ratios are
similar to the differences in absolute
durations

$MON_NSG \geq TRI_NSG > TRI_LG/SF$

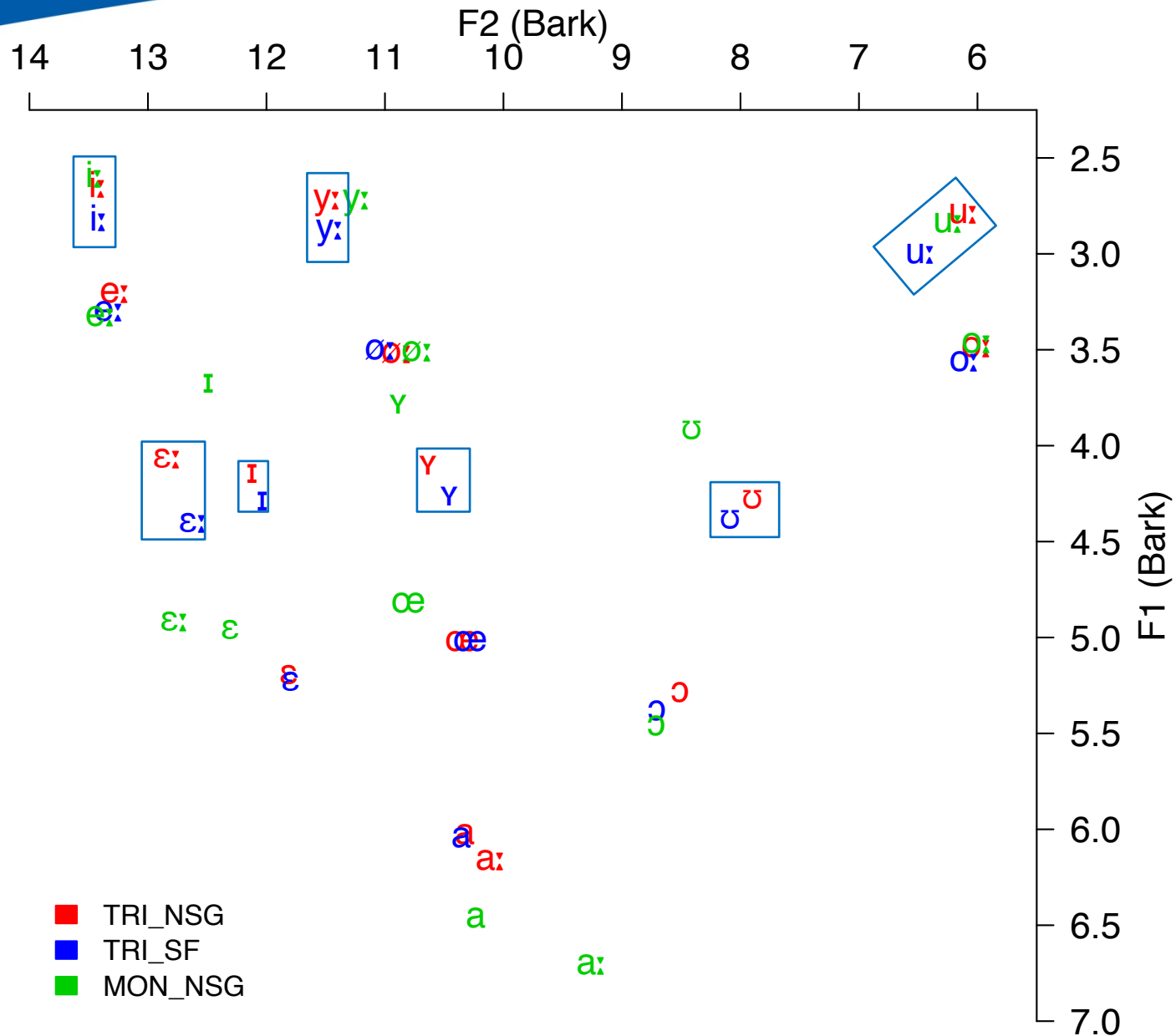
Duration (ms) of NSG long monophthongs



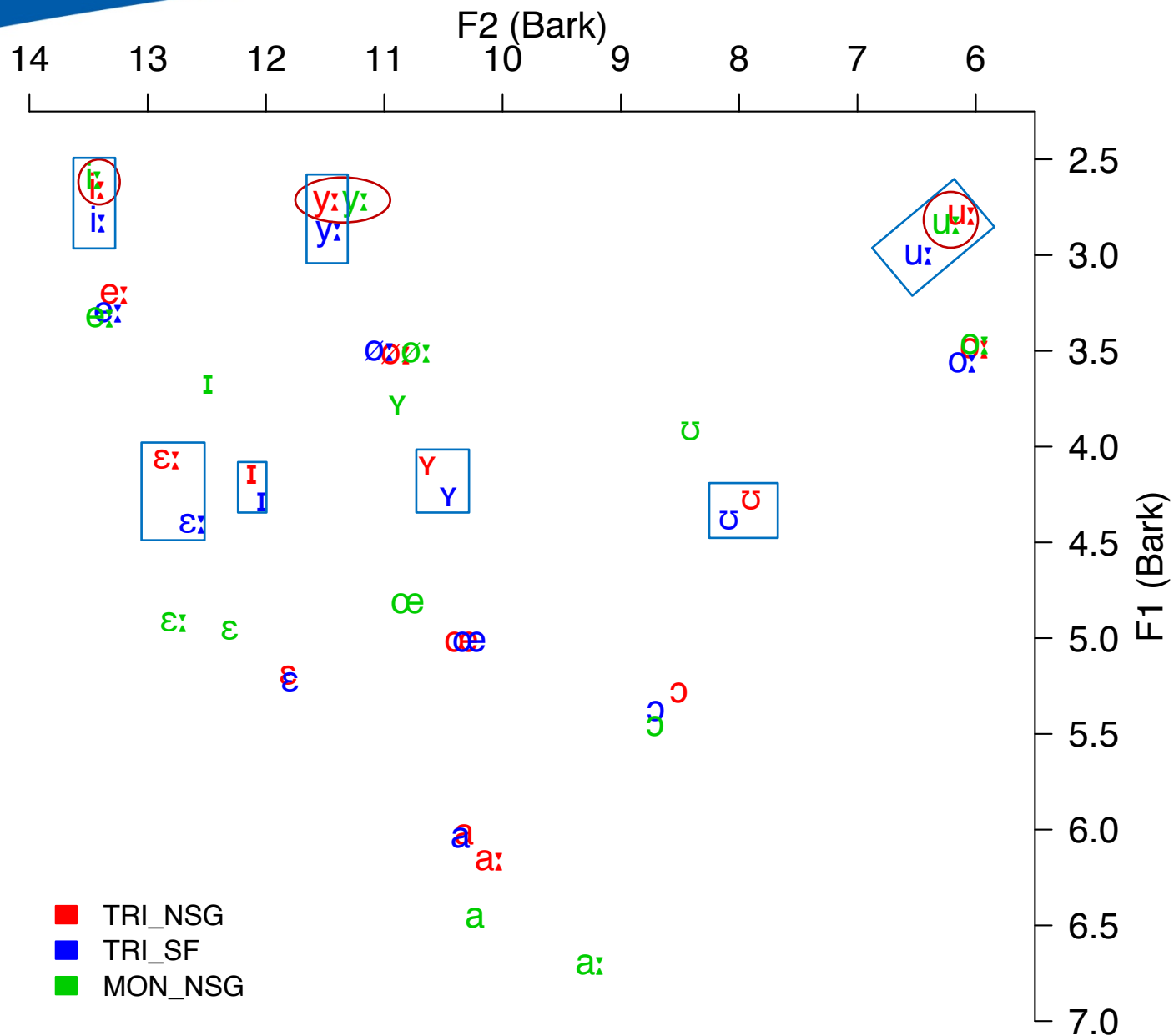
Duration ratio of long-short NSG monophth.



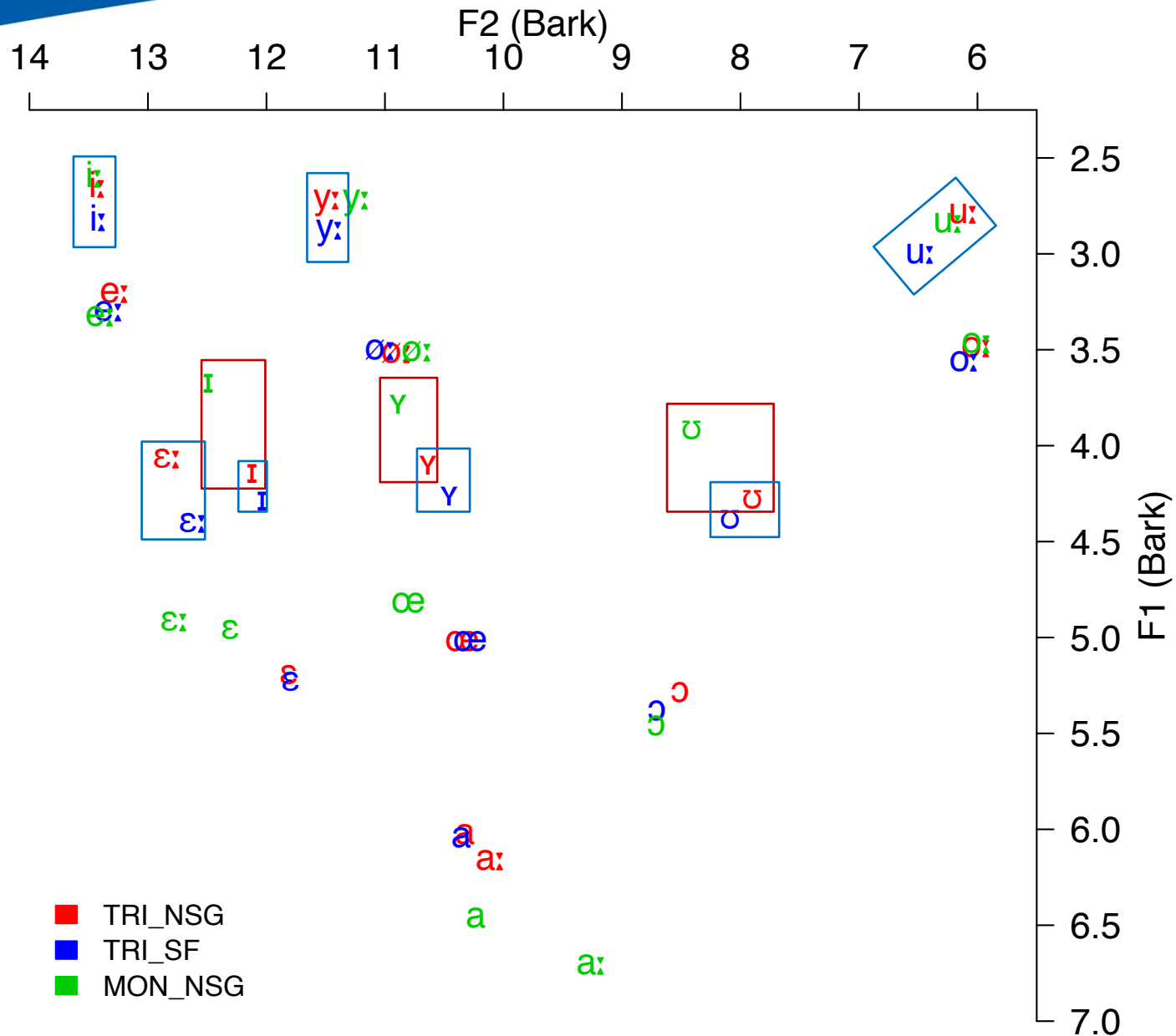
Comparison with Heeringa et al. 2015



Comparison with Heeringa et al. 2015



Comparison with Heeringa et al. 2015



Conclusion

NSG productions of trilinguals approach or are similar to productions of NSG monolinguals

- in F1/F2 for 10 of 14 categories
- in vowel duration, especially long vowels
- in vowel duration ratios

Comparison with results from prior studies:

- Monolingual-like vowel production is language with wider speech community? ✓
- Language-specific intermediate categories (Guion (2003) & hypothesis #6 of the SLM (Flege 1995)? ✓
- Contact-induced phonetic convergence (cf. Mayr *et al.* 2015)? ✓

THANK YOU

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