

# An Electropalatographic Study of Korean coronal obstruents

Yoonjung Kang<sup>1,2</sup>

Alexei Kochetov<sup>1</sup>

<sup>1</sup>*University of Toronto*

<sup>2</sup>*University of Toronto Scarborough*

**MOT**

**Carleton University**

**March 12-14, 2010**

# Introduction

- Place of articulation of Korean affricates:
  - Phonological interaction with high front vocoids
  - Post-alveolar, palatal, alveolo-palatal, etc.
  - [-anterior], [+high, -back] or V-pl [Coronal]
- Previous articulatory studies:
  - Closure: denti-alveolar
- Current EPG study:
  - Linguopalatal contact pattern during closure and frication portion of affricates compared with coronal stops and fricatives

# Korean coronal obstruents

	Lenis	Fortis	Aspirated
Stops	t	t'	t <sup>h</sup>
Affricates	c	c'	c <sup>h</sup>
Fricatives	s	s'	

# Phonological patterning of Korean affricates (i)

- Affrication (a.k.a. “Palatalization”)
    - Coronal stops become affricates before a high front vowel or glide.
    - Applies across morpheme boundaries only.
- |                       |                       |                      |
|-----------------------|-----------------------|----------------------|
| /mat-i/               | [maci]                | ‘the eldest’         |
| /kat <sup>h</sup> -i/ | [kac <sup>h</sup> i]  | ‘together’           |
| cf. /titi-ta/         | [titita] (< tɨjtɨjta) | *[cicita] ‘to tread’ |

# Phonological patterning of Korean affricates (ii)

- Yod-dropping

- Within a morpheme: \*Coronal obstruent + j
- Derived sequences of coronal obstruent + j

- Stops and fricatives: contrast Cj vs. C

/pʌtʰi-ʌ/ → [pʌtʰjʌ] ‘to withstand’

/masi-ʌ/ (→ [masjʌ]) → [maɕʌ] ‘to drink’

- Affricates

/kaci-ʌ/ (→ [kacjʌ]) → [kacʌ] ‘to have’

/tacʰi-ʌ/ (→ [tacʰjʌ]) → [tacʰʌ] ‘to get hurt’

# Phonological patterning of Korean affricates (iii)

- Umlaut

[api] ~ [æpi] 'father'

[aki] ~ [æki] 'baby'

- Intervening coronals, palatals (i.e., affricates and derived palatals) in particular, tend to block Umlaut.

[tacita] ~ \*[tæcita] 'to mince'

[kac<sup>h</sup>i] ~ \*[kæc<sup>h</sup>i] 'value'

# Feature specification

- Primary constriction:  
[-anterior]
- Secondary articulation:  
[-back, +high] or V-pl [Coronal]  
(Hume 1990, Kiparsky 1993, etc.)

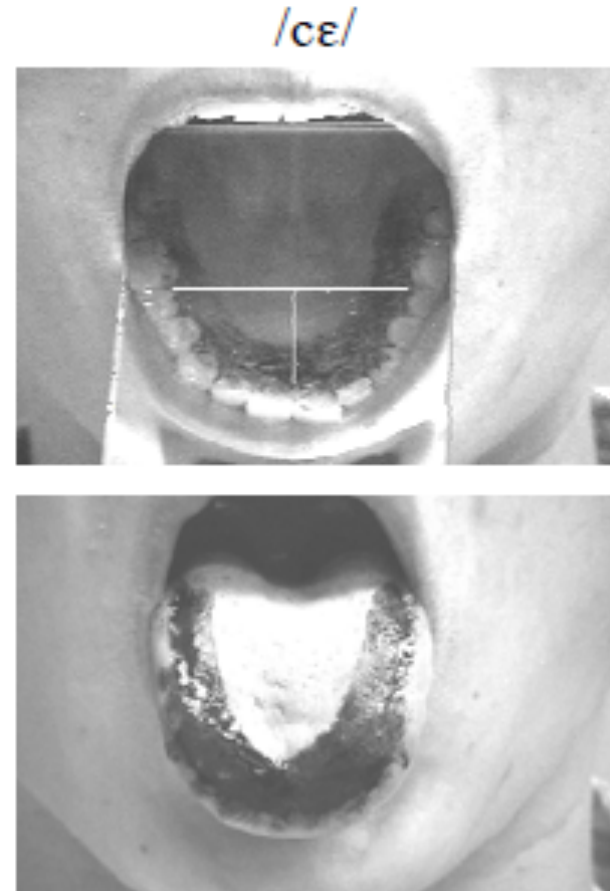
# Previous articulatory studies

- X-ray (Skaličková 1960, cited in H. Kim 2001)
- Static palatography (H. Kim 2001, Anderson et al. 2003)
- Electropalatography (Shin 1996, Baik 2003)
- MRI (H. Kim 2004)



# Previous studies: Primary constriction

- Denti-alveolar
- Laminal or apico-laminal



(Anderson et al. 2003)

# Previous studies: Secondary articulation

- Affricates have a relatively higher tongue body position than stops, although not as extreme as contrastively palatalized consonants such as Russian /tʃʲ/ (H. Kim 2005).

## Remaining question: primary constriction

- Previous studies on Korean affricates mostly focused on the closure portion.
- ***Does the release portion of affricates have “posterior” constriction?***

Cf. Recasens and Espinosa (2007):

- EPG study
- alveolar /ts dz/ vs. alveolopalatal /tʃ dʒ/ in two dialects of Catalan
- The anteriority contrast was more substantial during frication than during closure.

Remaining question:  
secondary articulation

- ***Do affricates have more palatalized tongue body position than alveolar stops or fricatives?***

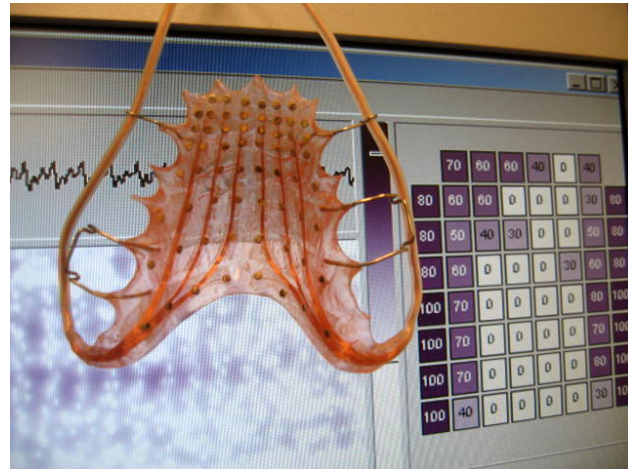
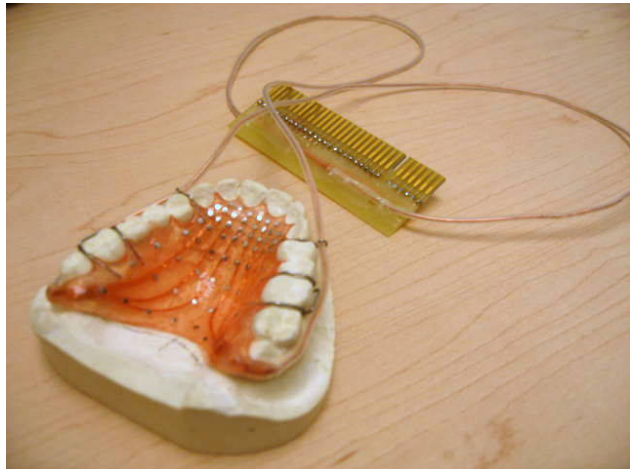
Cf. H. Kim (2004, 2005)'s MRI study is limited to stops vs. affricates in /a\_a/ context only.

# Design

- Participants
  - 1 male (M1) and 2 female (F1, F2) Seoul Korean speakers.
- Stimuli
  - C: t t' t<sup>h</sup> c c' c<sup>h</sup> s s' (p k h n l j)
  - V: a i u (ɨ ʌ jʌ)
  - “maCV”: mostly nonsense words; but some are real words.
  - Carrier Sentence:  
*ice maCV-rako malhæjo*      ‘Say maCV now.’
- 3 repetitions \* 2 rounds = 6 tokens per stimuli

# Electropalatography

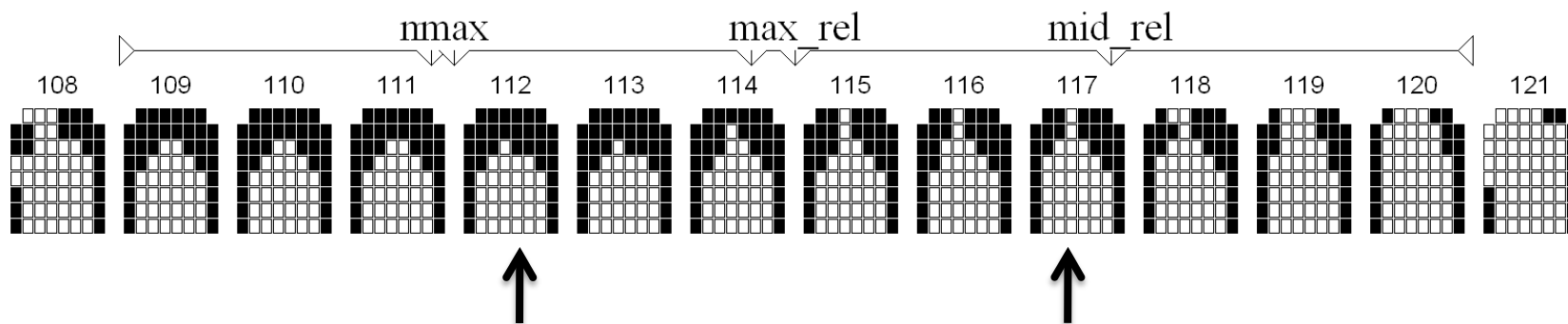
- Instrumentation:
  - A WinEPG system (Wrench et al. 2002) with EPG data sampled at 100 Hz, acoustics at 22,050 Hz.
  - Custom-made artificial palates with 62 electrodes constructed for each participant.

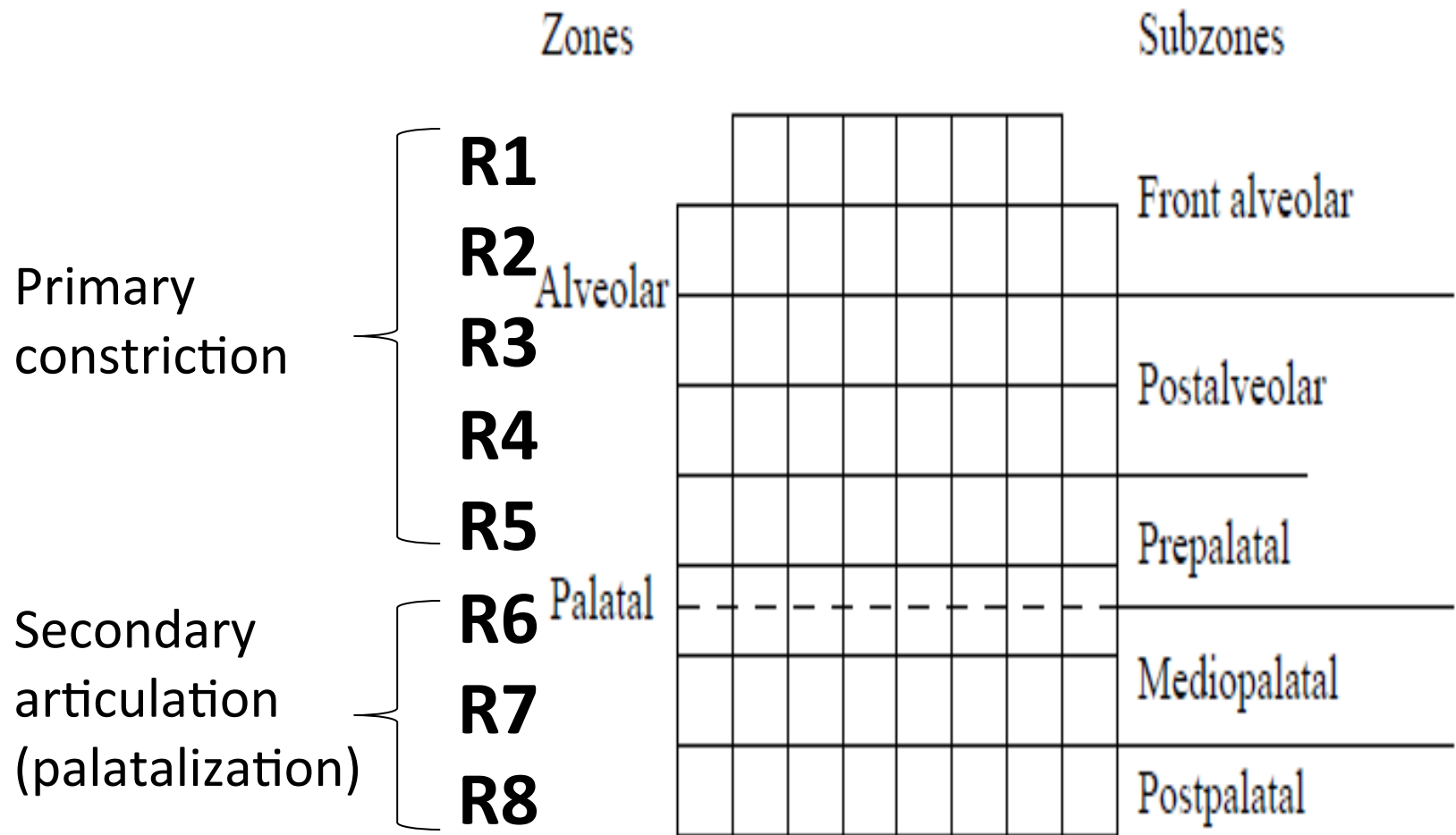


# Measurements

- Closure:
  - the frame of maximum EPG contact during the closure
- Frication:
  - the midpoint of frication. The onset and offset of frication was determined based on the spectrogram.

M1 /mac'a/





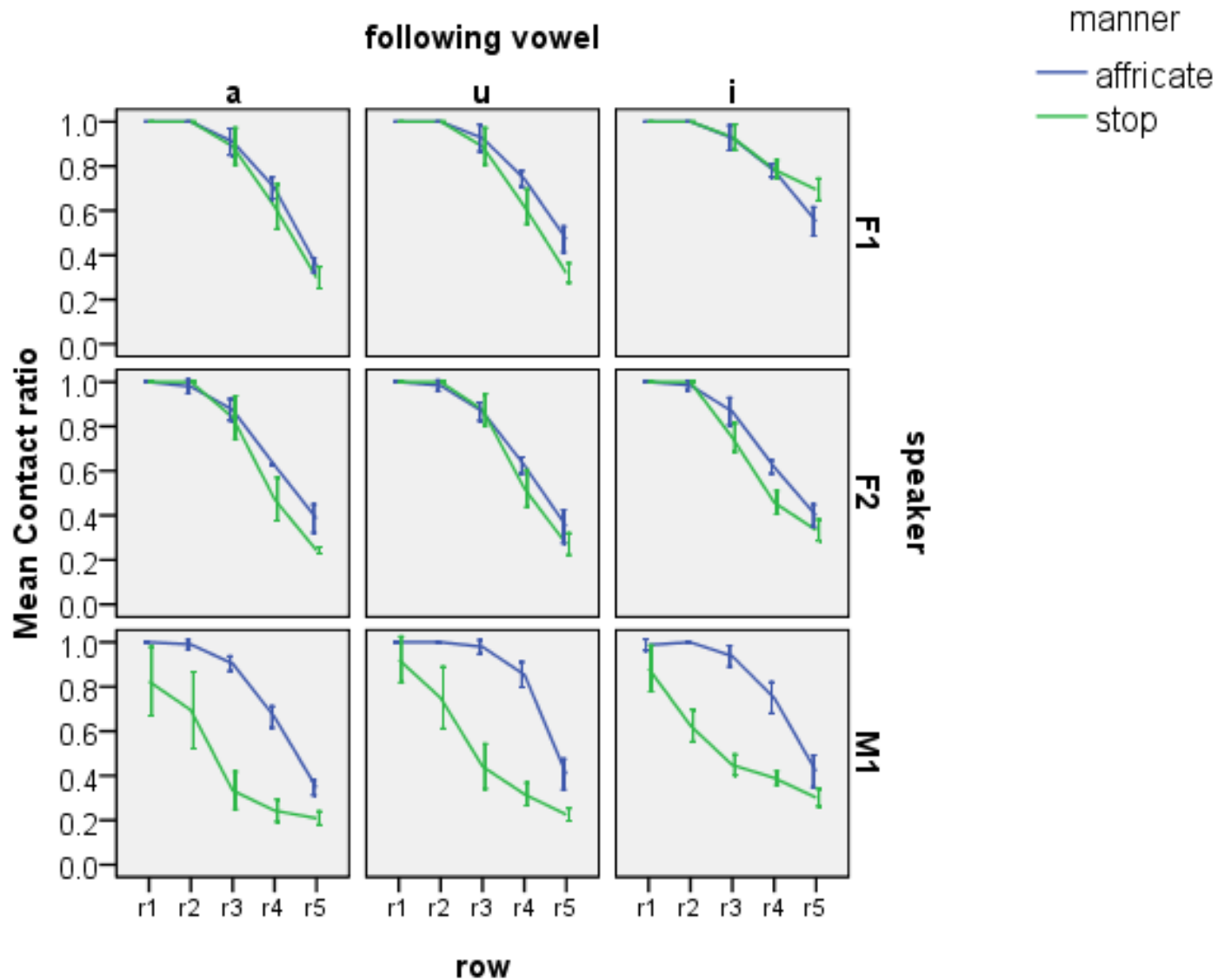
(Fontdevila, et al. 1994)



# Primary constriction: maximum closure

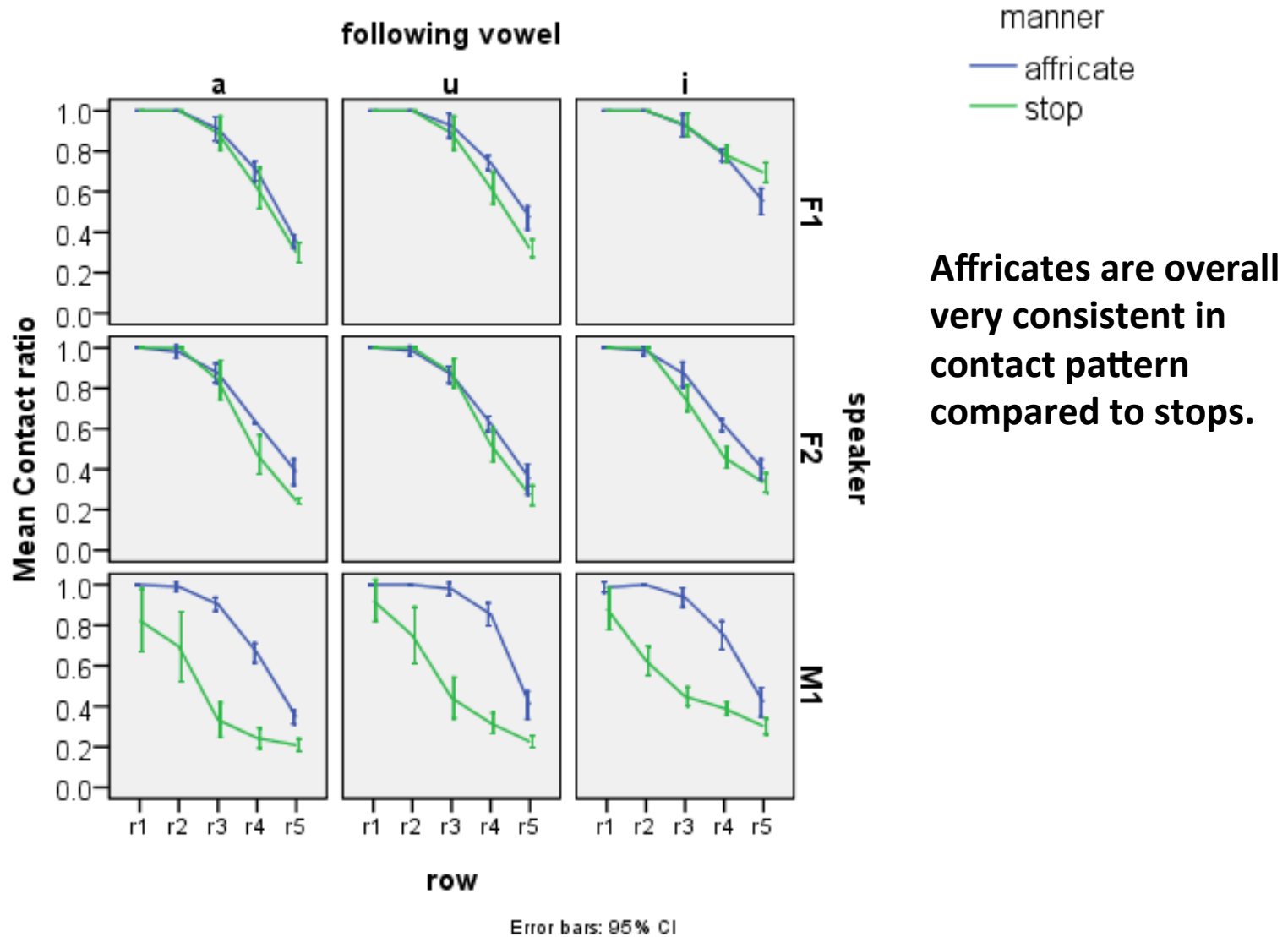
		maximum (closure)																																																																																																																										
		[mat'u]	[mac'u]	Stops	Affricates																																																																																																																							
M1	<table border="1"> <tr><td></td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>0</td><td>0</td><td>83</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>16</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>66</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> </table>		100	100	100	100	100	100	100	100	0	0	83	100	100	100	0	0	0	0	16	100	100	0	0	0	0	0	66	100	0	0	0	0	0	0	100	0	0	0	0	0	0	100	0	0	0	0	0	0	100	0	0	0	0	0	0	<table border="1"> <tr><td></td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>100</td><td>33</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>33</td><td>0</td><td>0</td><td>0</td><td>33</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> </table>		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	33	100	100	100	100	33	0	0	0	33	100	100	0	0	0	0	0	0	100	0	0	0	0	0	0	100	0	0	0	0	0	0	100	0	0	0	0	0	0	M1	alveolar ~ (postalveolar)	alveolar ~ (postalveolar)
	100	100	100	100	100	100																																																																																																																						
100	100	0	0	83	100	100																																																																																																																						
100	0	0	0	0	16	100																																																																																																																						
100	0	0	0	0	0	66																																																																																																																						
100	0	0	0	0	0	0																																																																																																																						
100	0	0	0	0	0	0																																																																																																																						
100	0	0	0	0	0	0																																																																																																																						
100	0	0	0	0	0	0																																																																																																																						
	100	100	100	100	100	100																																																																																																																						
100	100	100	100	100	100	100																																																																																																																						
100	100	100	100	100	100	100																																																																																																																						
100	100	100	33	100	100	100																																																																																																																						
100	33	0	0	0	33	100																																																																																																																						
100	0	0	0	0	0	0																																																																																																																						
100	0	0	0	0	0	0																																																																																																																						
100	0	0	0	0	0	0																																																																																																																						
100	0	0	0	0	0	0																																																																																																																						
F1	<table border="1"> <tr><td></td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>16</td><td>0</td><td>33</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>100</td></tr> </table>		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	16	0	33	100	100	100	0	0	0	0	0	100	100	0	0	0	0	0	100	100	0	0	0	0	0	100	100	0	0	0	0	0	100	<table border="1"> <tr><td></td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>0</td><td>33</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>50</td><td>0</td><td>0</td><td>16</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>100</td></tr> </table>		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0	33	100	100	100	100	50	0	0	16	100	100	100	0	0	0	0	0	100	100	0	0	0	0	0	100	100	0	0	0	0	0	100	F1,2	alveolar ~ (postalveolar)	alveolar ~ (postalveolar)							
	100	100	100	100	100	100																																																																																																																						
100	100	100	100	100	100	100																																																																																																																						
100	100	100	100	100	100	100																																																																																																																						
100	100	16	0	33	100	100																																																																																																																						
100	0	0	0	0	0	100																																																																																																																						
100	0	0	0	0	0	100																																																																																																																						
100	0	0	0	0	0	100																																																																																																																						
100	0	0	0	0	0	100																																																																																																																						
	100	100	100	100	100	100																																																																																																																						
100	100	100	100	100	100	100																																																																																																																						
100	100	100	100	100	100	100																																																																																																																						
100	100	0	33	100	100	100																																																																																																																						
100	50	0	0	16	100	100																																																																																																																						
100	0	0	0	0	0	100																																																																																																																						
100	0	0	0	0	0	100																																																																																																																						
100	0	0	0	0	0	100																																																																																																																						

# Mean contact ratio per row at maximum closure (R1-R5)

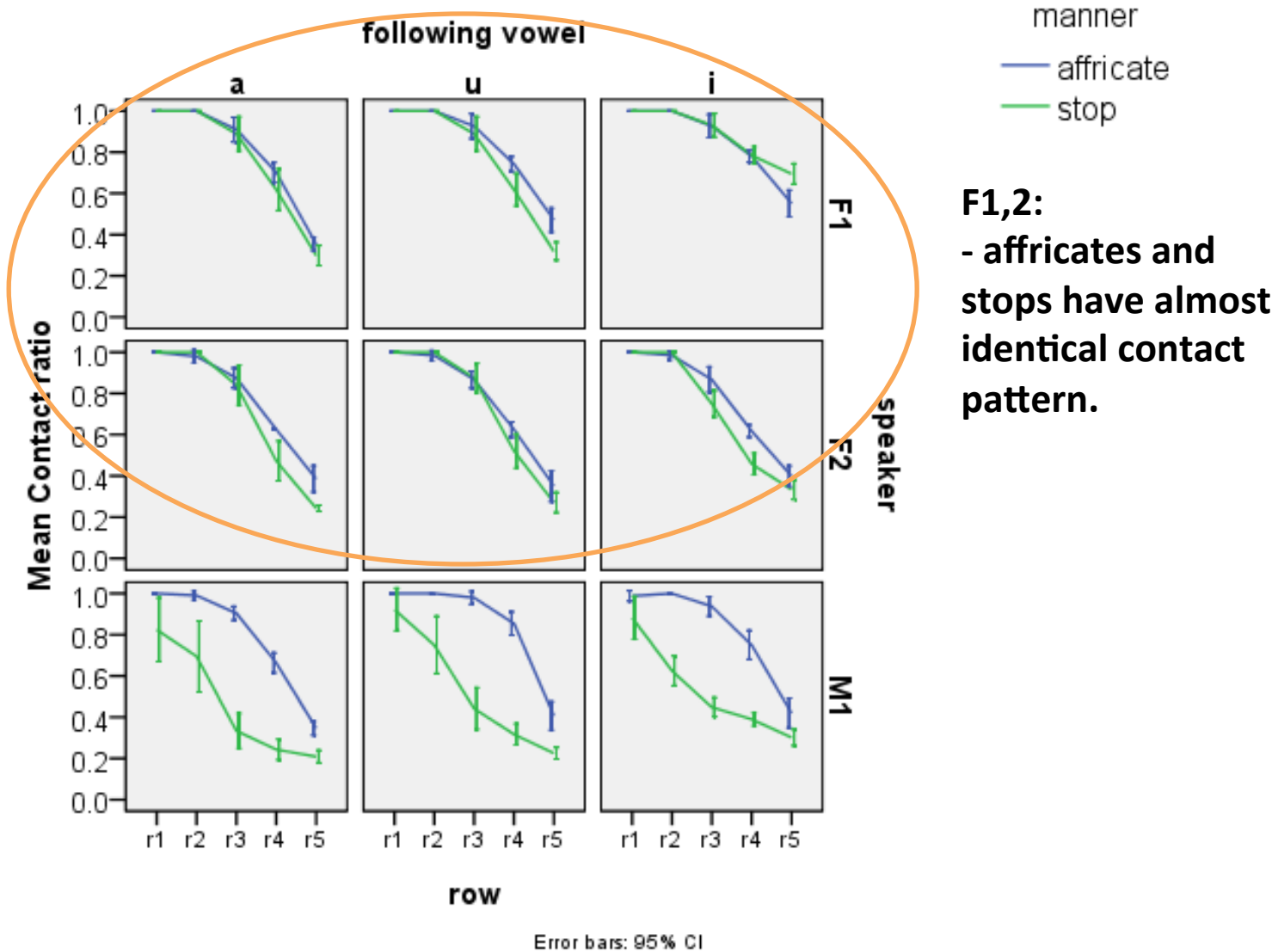


Error bars: 95% CI

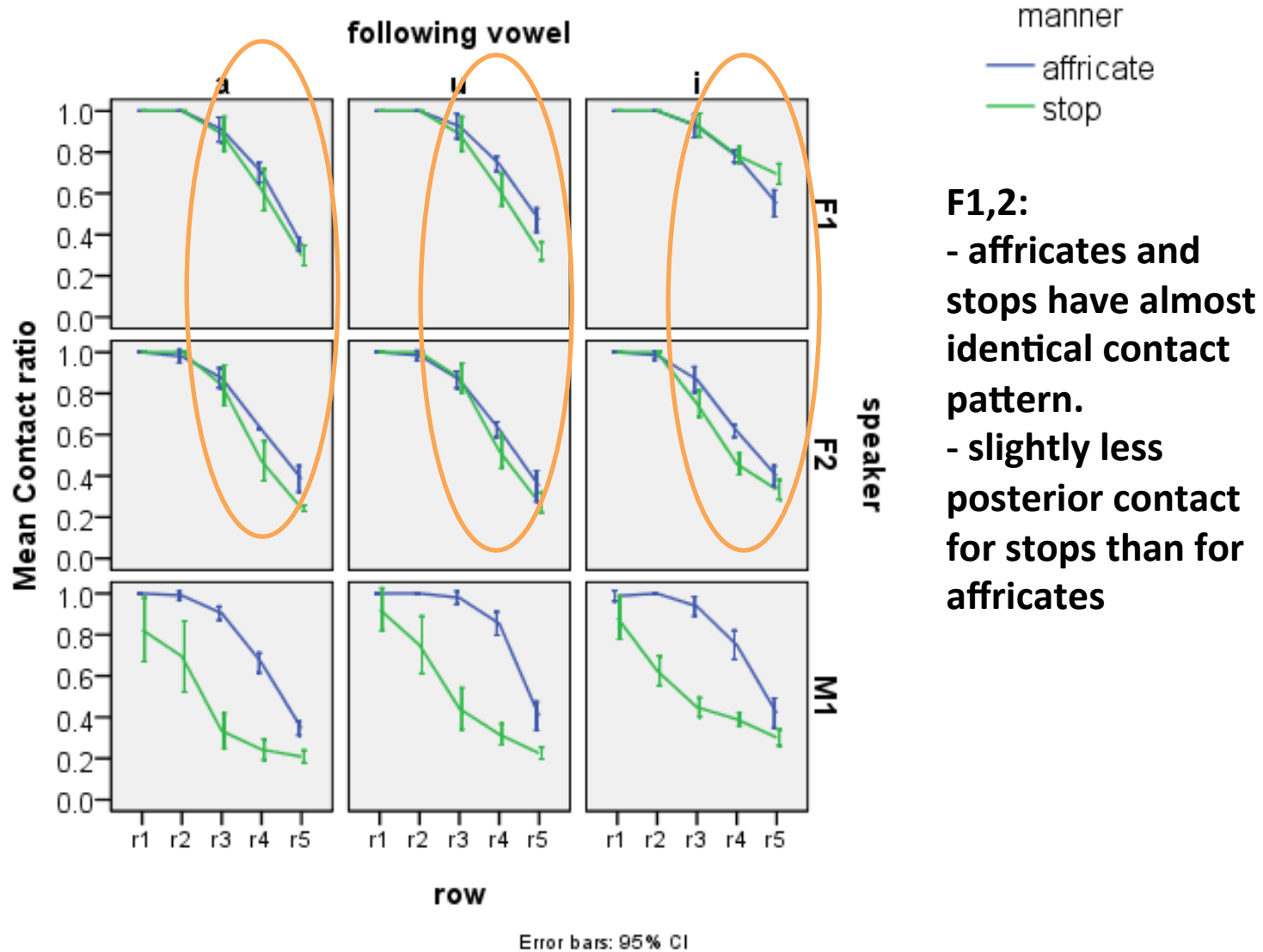
# Mean contact ratio at maximum closure (R1-R5)



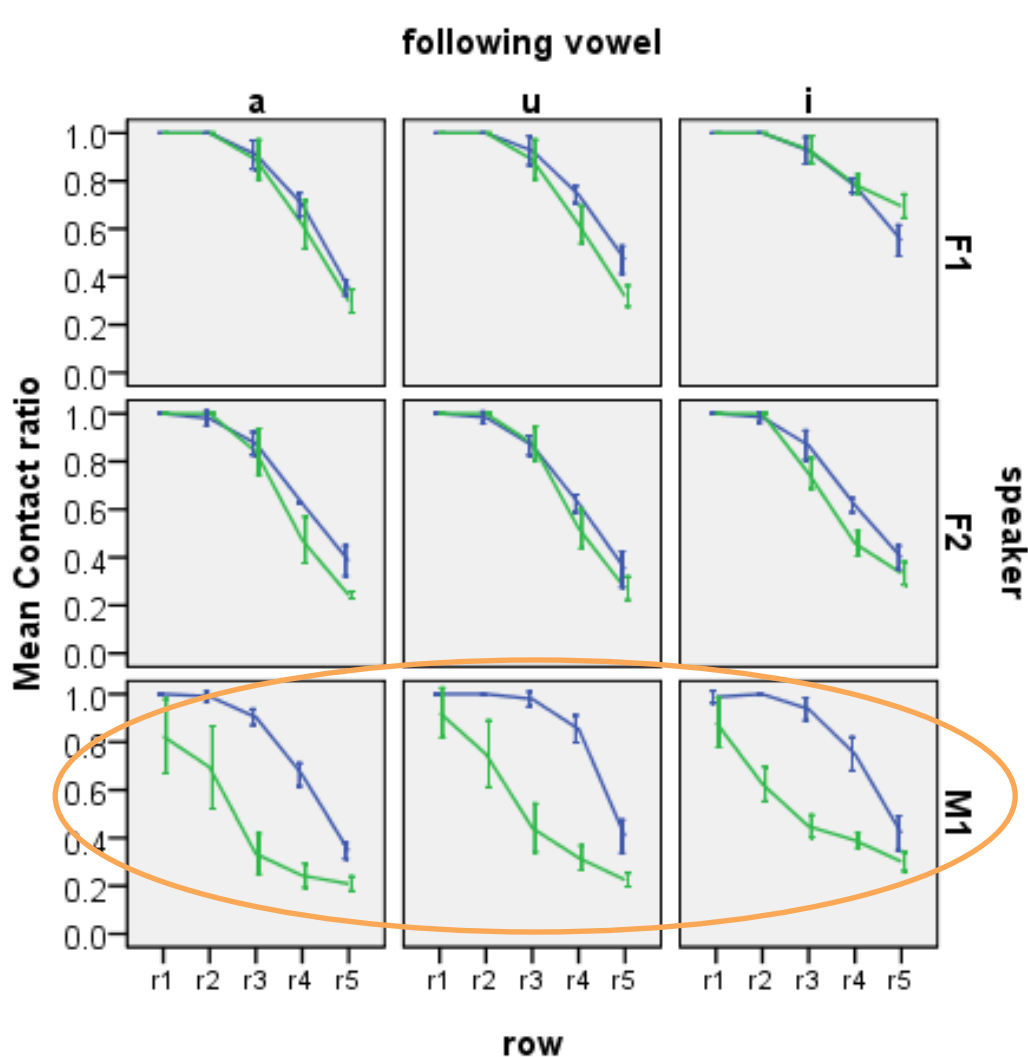
Mean contact ratio per row at maximum **closure**:  
 alveolar (R1-R2) and postalveolar(~prepalatal) (R3-R5) zones



Mean contact ratio per row at maximum **closure**:  
 alveolar (R1-R2) and postalveolar(~prepalatal) (R3-R5) zones



Mean contact ratio per row at maximum **closure**:  
 anterior (R1-R2) and postalveolar(~prepalatal) (R3-R5) zones



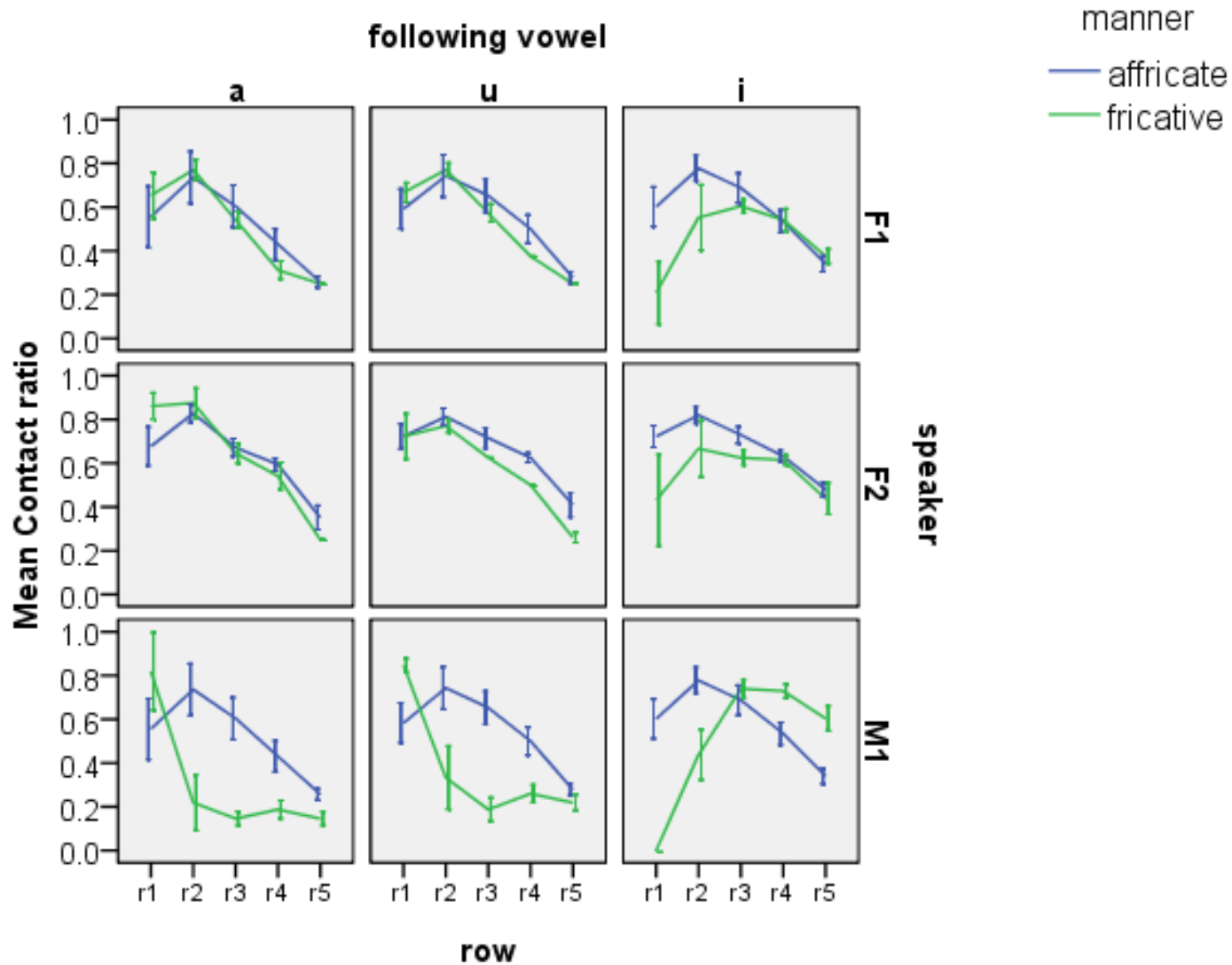
**M1:**  
 -stops are mainly denti-alveolar  
 -far less alveolar and posterior contact for stops than for affricates

Error bars: 95% CI

# Primary constriction: frication midpoint

		midpoint (frication/release)																Fricatives		Affricates																																																																																																																																			
		[masu]							[macu]																																																																																																																																														
M1	[a u]	<table border="1"> <tr><td>83</td><td>0</td><td>0</td><td>100</td><td>100</td><td>100</td><td></td><td></td></tr> <tr><td>100</td><td>100</td><td>0</td><td>0</td><td>100</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>0</td><td>0</td><td>0</td><td>50</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>100</td></tr> </table>							83	0	0	100	100	100			100	100	0	0	100	100	100	100	100	100	0	0	0	50	100	100	100	0	0	0	0	0	100	100	100	0	0	0	0	0	0	100	100	0	0	0	0	0	0	100	100	0	0	0	0	0	0	100	100	0	0	0	0	0	0	100	<table border="1"> <tr><td>100</td><td>16</td><td>0</td><td>100</td><td>100</td><td>100</td><td></td><td></td></tr> <tr><td>100</td><td>100</td><td>100</td><td>0</td><td>100</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>50</td><td>0</td><td>33</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>0</td><td>0</td><td>0</td><td>33</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>33</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>100</td></tr> </table>							100	16	0	100	100	100			100	100	100	0	100	100	100	100	100	100	50	0	33	100	100	100	100	100	0	0	0	33	100	100	100	0	0	0	0	0	33	100	100	0	0	0	0	0	0	100	100	0	0	0	0	0	0	100	100	0	0	0	0	0	0	100			M1		alveolar		alveolar ~ (postalveolar)	
		83	0	0	100	100	100																																																																																																																																																
100	100	0	0	100	100	100	100																																																																																																																																																
100	100	0	0	0	50	100	100																																																																																																																																																
100	0	0	0	0	0	100	100																																																																																																																																																
100	0	0	0	0	0	0	100																																																																																																																																																
100	0	0	0	0	0	0	100																																																																																																																																																
100	0	0	0	0	0	0	100																																																																																																																																																
100	0	0	0	0	0	0	100																																																																																																																																																
100	16	0	100	100	100																																																																																																																																																		
100	100	100	0	100	100	100	100																																																																																																																																																
100	100	50	0	33	100	100	100																																																																																																																																																
100	100	0	0	0	33	100	100																																																																																																																																																
100	0	0	0	0	0	33	100																																																																																																																																																
100	0	0	0	0	0	0	100																																																																																																																																																
100	0	0	0	0	0	0	100																																																																																																																																																
100	0	0	0	0	0	0	100																																																																																																																																																
		F1,2		alveolar ~ (postalveolar)																																																																																																																																																			
M1	[i]	<table border="1"> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td></td><td></td></tr> <tr><td>50</td><td>16</td><td>0</td><td>0</td><td>0</td><td>50</td><td>83</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>0</td><td>0</td><td>0</td><td>66</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>0</td><td>0</td><td>0</td><td>16</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>16</td><td>0</td><td>0</td><td>0</td><td>0</td><td>83</td><td>100</td></tr> <tr><td>100</td><td>33</td><td>0</td><td>0</td><td>0</td><td>0</td><td>66</td><td>100</td></tr> <tr><td>100</td><td>66</td><td>0</td><td>0</td><td>0</td><td>0</td><td>83</td><td>100</td></tr> <tr><td>100</td><td>33</td><td>0</td><td>0</td><td>0</td><td>0</td><td>50</td><td>100</td></tr> </table>							0	0	0	0	0	0			50	16	0	0	0	50	83	100	100	100	0	0	0	66	100	100	100	100	0	0	0	16	100	100	100	16	0	0	0	0	83	100	100	33	0	0	0	0	66	100	100	66	0	0	0	0	83	100	100	33	0	0	0	0	50	100	<table border="1"> <tr><td>83</td><td>16</td><td>16</td><td>100</td><td>100</td><td>100</td><td></td><td></td></tr> <tr><td>100</td><td>100</td><td>83</td><td>0</td><td>100</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>33</td><td>0</td><td>33</td><td>100</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>100</td><td>0</td><td>0</td><td>0</td><td>50</td><td>100</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>83</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>33</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>16</td><td>100</td></tr> <tr><td>100</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>16</td><td>100</td></tr> </table>							83	16	16	100	100	100			100	100	83	0	100	100	100	100	100	100	33	0	33	100	100	100	100	100	0	0	0	50	100	100	100	0	0	0	0	0	83	100	100	0	0	0	0	0	33	100	100	0	0	0	0	0	16	100	100	0	0	0	0	0	16	100					postalveolar		alveolar ~ (postalveolar)	
		0	0	0	0	0	0																																																																																																																																																
50	16	0	0	0	50	83	100																																																																																																																																																
100	100	0	0	0	66	100	100																																																																																																																																																
100	100	0	0	0	16	100	100																																																																																																																																																
100	16	0	0	0	0	83	100																																																																																																																																																
100	33	0	0	0	0	66	100																																																																																																																																																
100	66	0	0	0	0	83	100																																																																																																																																																
100	33	0	0	0	0	50	100																																																																																																																																																
83	16	16	100	100	100																																																																																																																																																		
100	100	83	0	100	100	100	100																																																																																																																																																
100	100	33	0	33	100	100	100																																																																																																																																																
100	100	0	0	0	50	100	100																																																																																																																																																
100	0	0	0	0	0	83	100																																																																																																																																																
100	0	0	0	0	0	33	100																																																																																																																																																
100	0	0	0	0	0	16	100																																																																																																																																																
100	0	0	0	0	0	16	100																																																																																																																																																

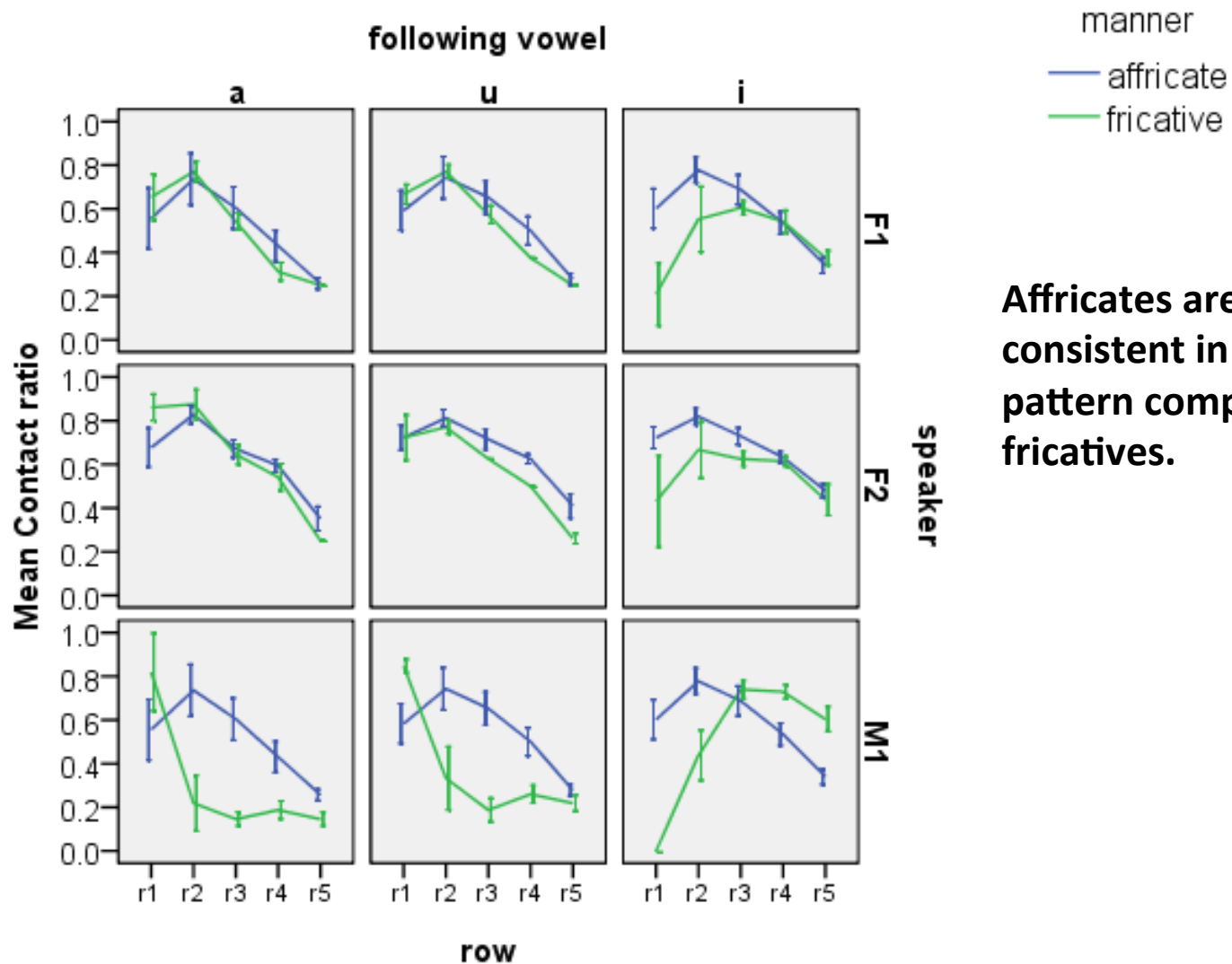
# Mean contact ratio per row at **frication** midpoint (R1-R5)



Error bars: 95% CI



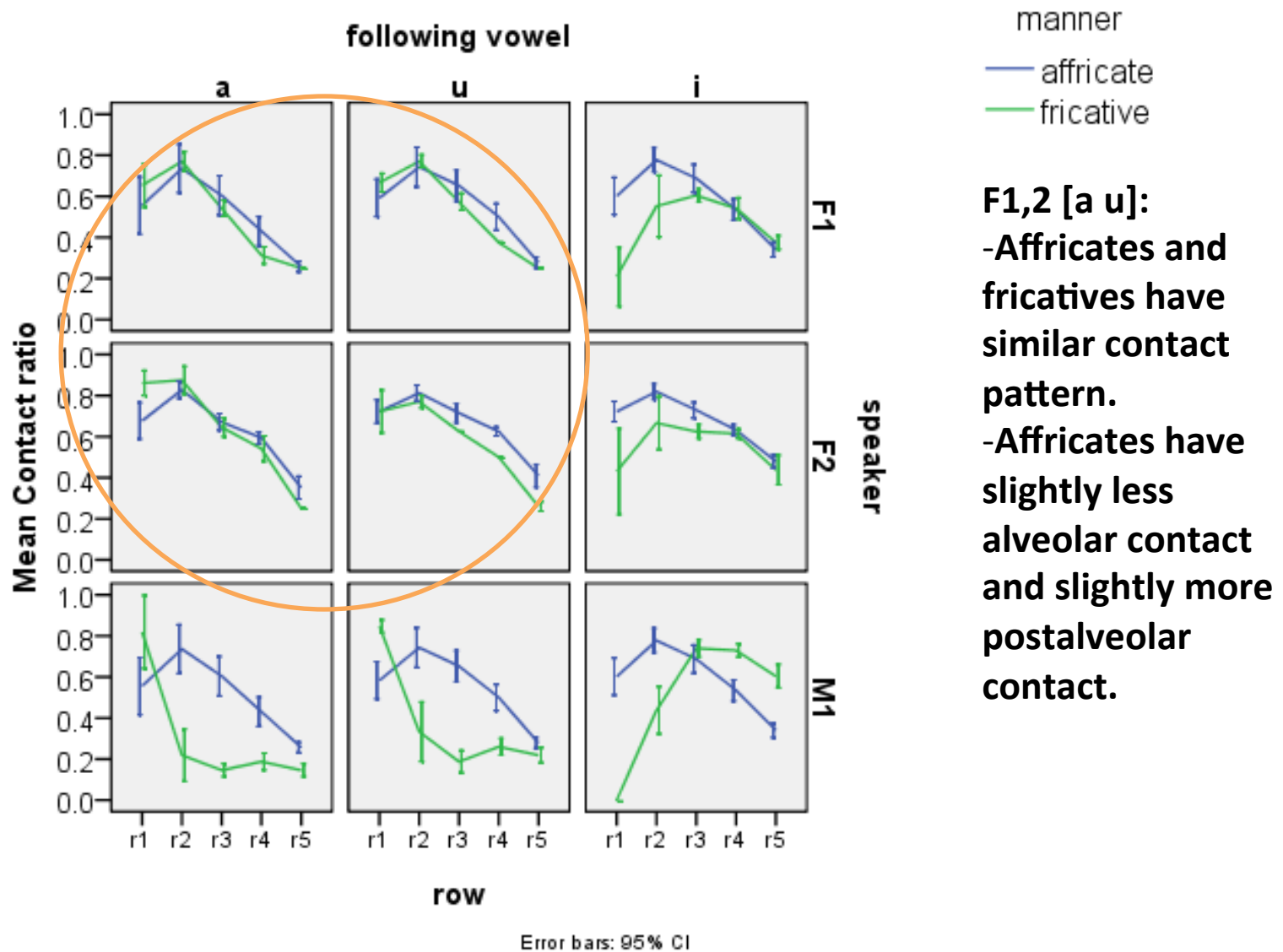
Mean contact ratio per row at **frication** midpoint:  
 alveolar (R1-R2) and postalveolar (~prepalatal) (R3-R5)



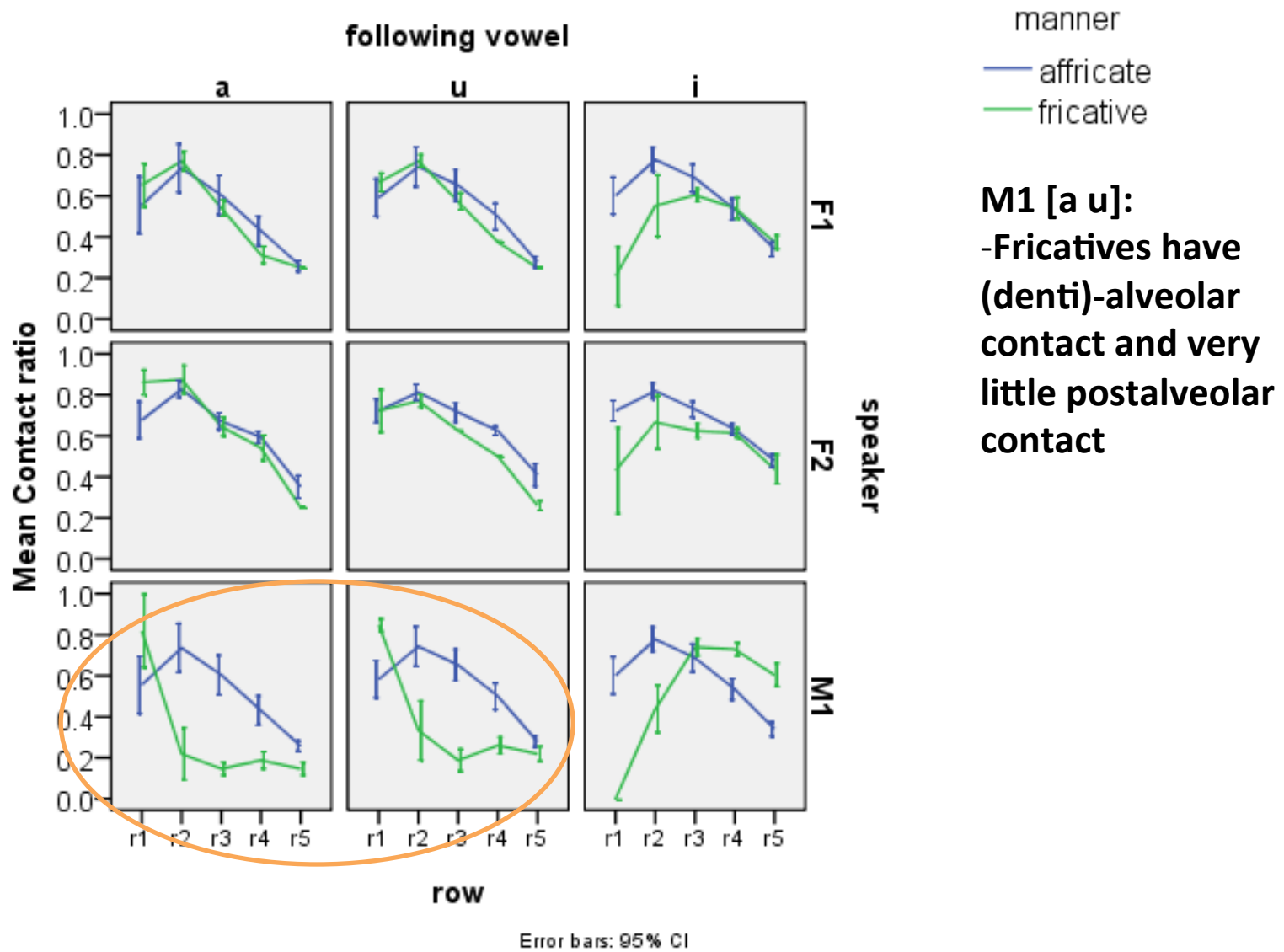
**Affricates are overall consistent in contact pattern compared to fricatives.**

Error bars: 95% CI

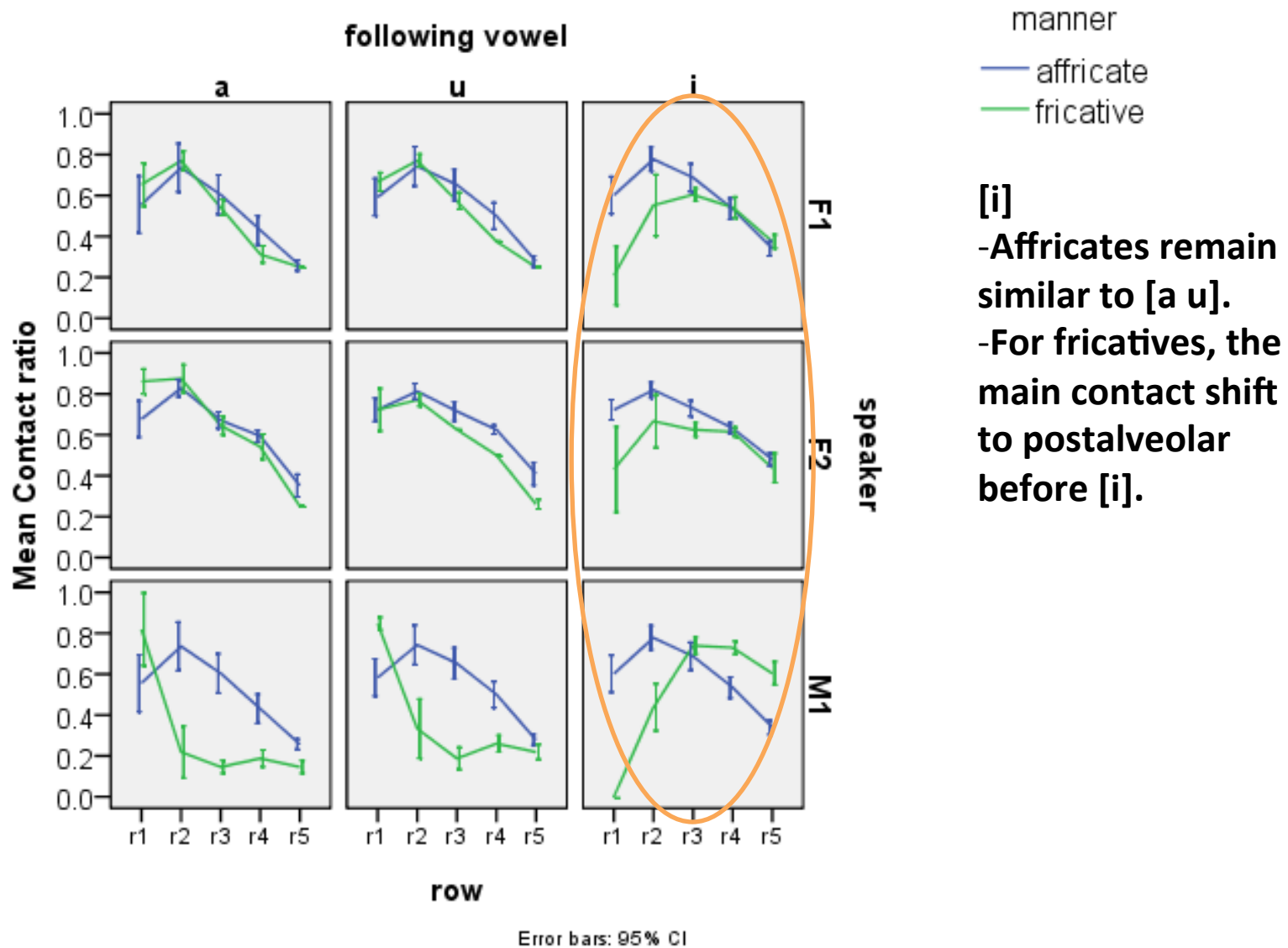
Mean contact ratio per row at **frication** midpoint:  
 alveolar (R1-R2) and postalveolar (~prepalatal) (R3-R5)



Mean contact ratio per row at **frication** midpoint:  
 alveolar (R1-R2) and postalveolar (~prepalatal) (R3-R5)



Mean contact ratio per row at **frication** midpoint:  
 alveolar (R1-R2) and postalveolar (~prepalatal) (R3-R5)



- [i]  
 -Affricates remain similar to [a u].  
 -For fricatives, the main contact shift to postalveolar before [i].

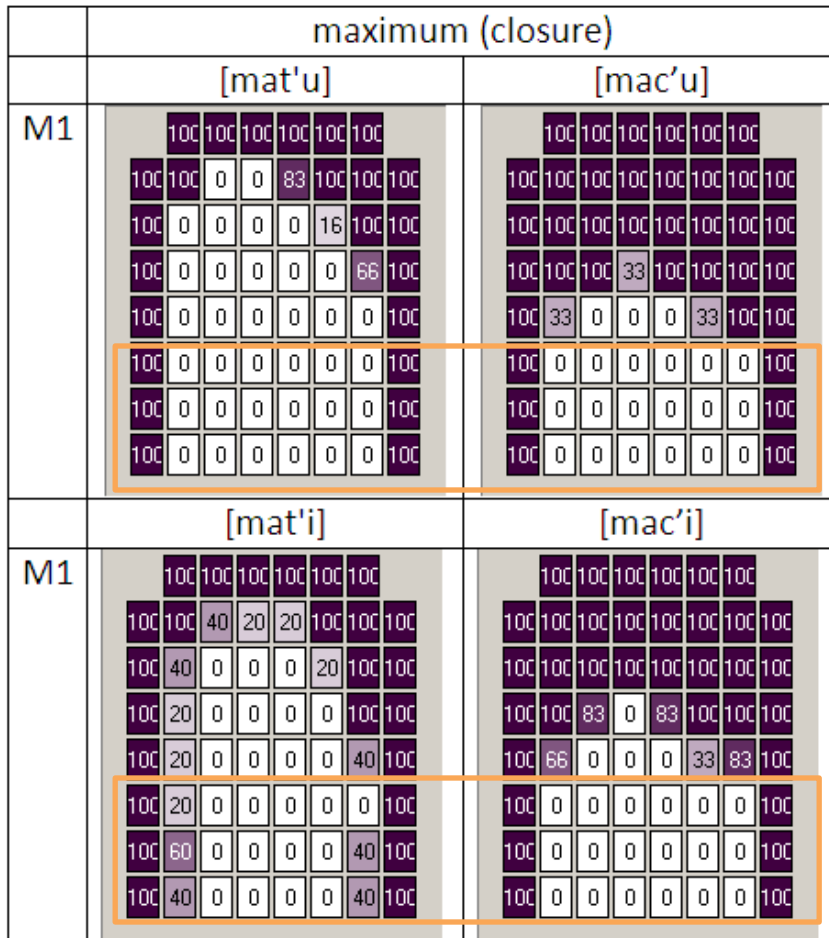
## Interim summary: primary constriction

- ***Q1: Does the release portion of affricates have “posterior” constriction?***
  - No.
  - The closure and the release portion of Korean affricates have similar constriction location.
  - The affricate release and the fricative have similar constriction location.
- The affricate constriction is sometimes but not always more posterior than that of corresponding stops and fricatives.

# Interim summary: primary constriction

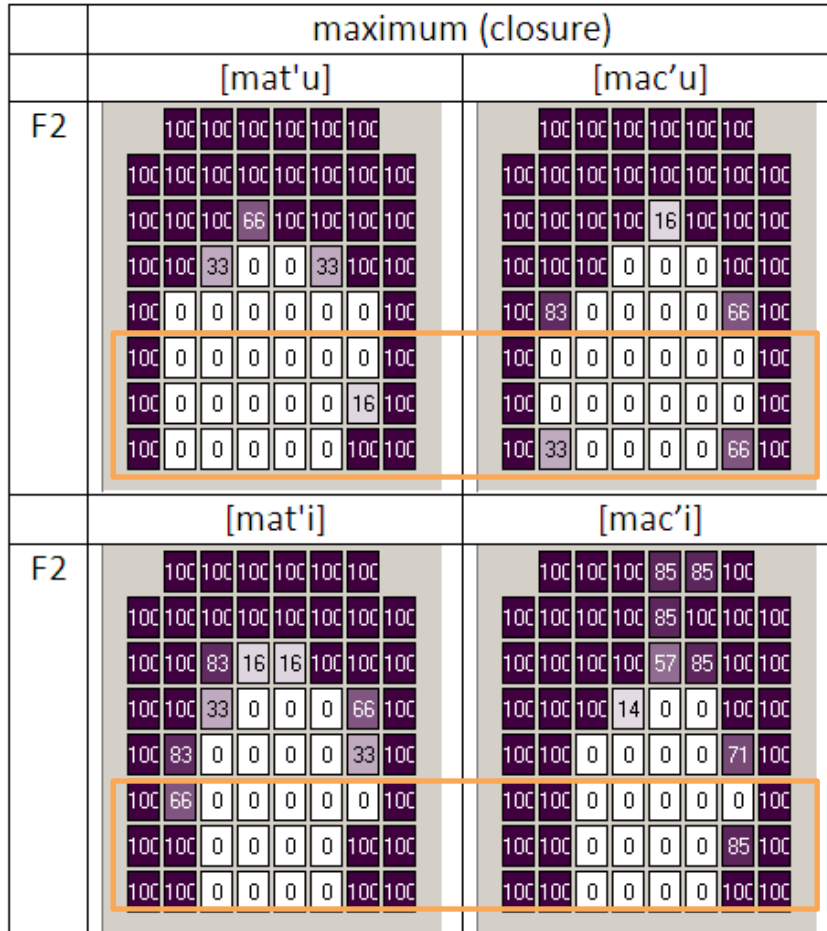
- But, affricates have more **stable** realization overall compared to stops and fricatives.
  - Affricates **consistently** show alveolar(~postalveolar) constriction:
    - across speakers
    - across vowel contexts and
    - both during the closure and the release
  - Stops and fricatives show more **variation**:
    - denti-alveolar
    - alveolar(~postalveolar)
    - postaveolar

# Palatal contact (R6-R8) at maximum closure (M1, F1)



M1, F1	Stops	Affricates
[a u]	minimal contact	minimal contact
[i]	more extensive contact	minimal contact

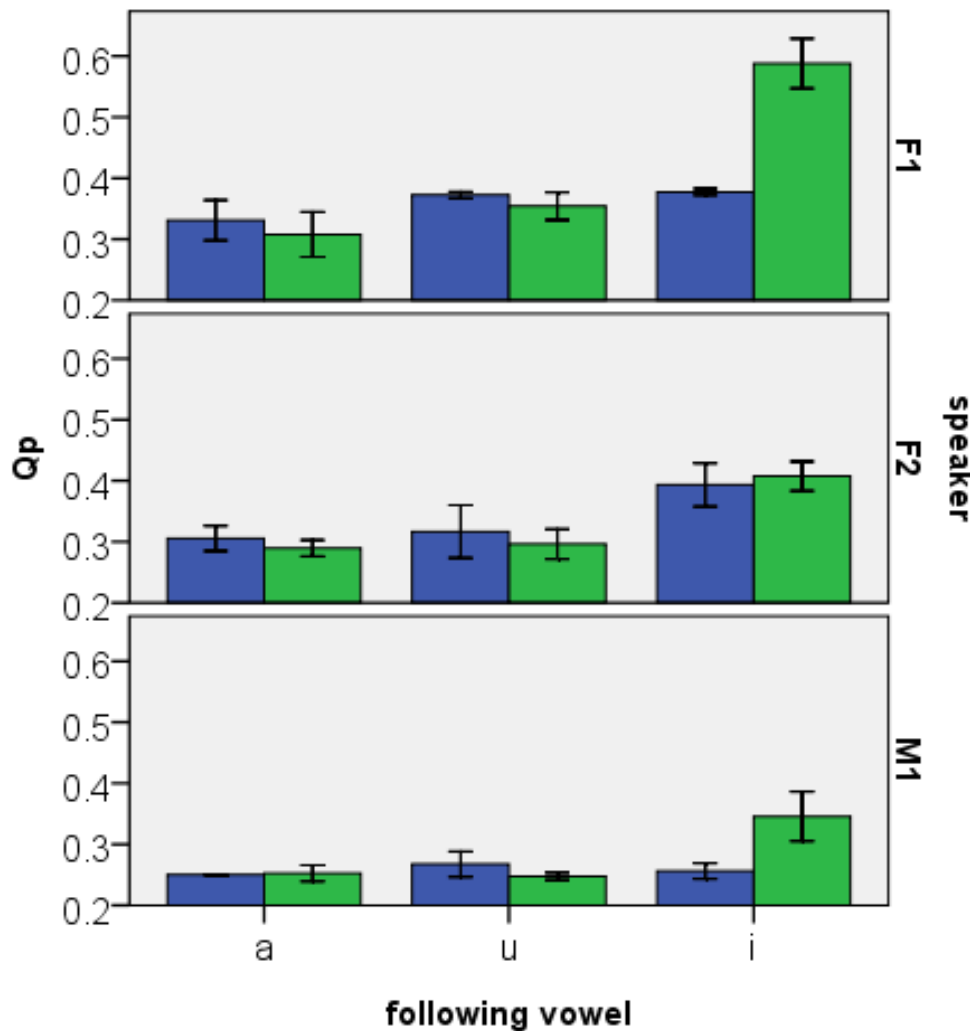
# Palatal contact (R6-R8) at maximum closure (F2)



F2	Stops	Affricates
[a u]	minimal contact	
[i]	more extensive contact	



# Palatal contact (R6-R8) at maximum closure



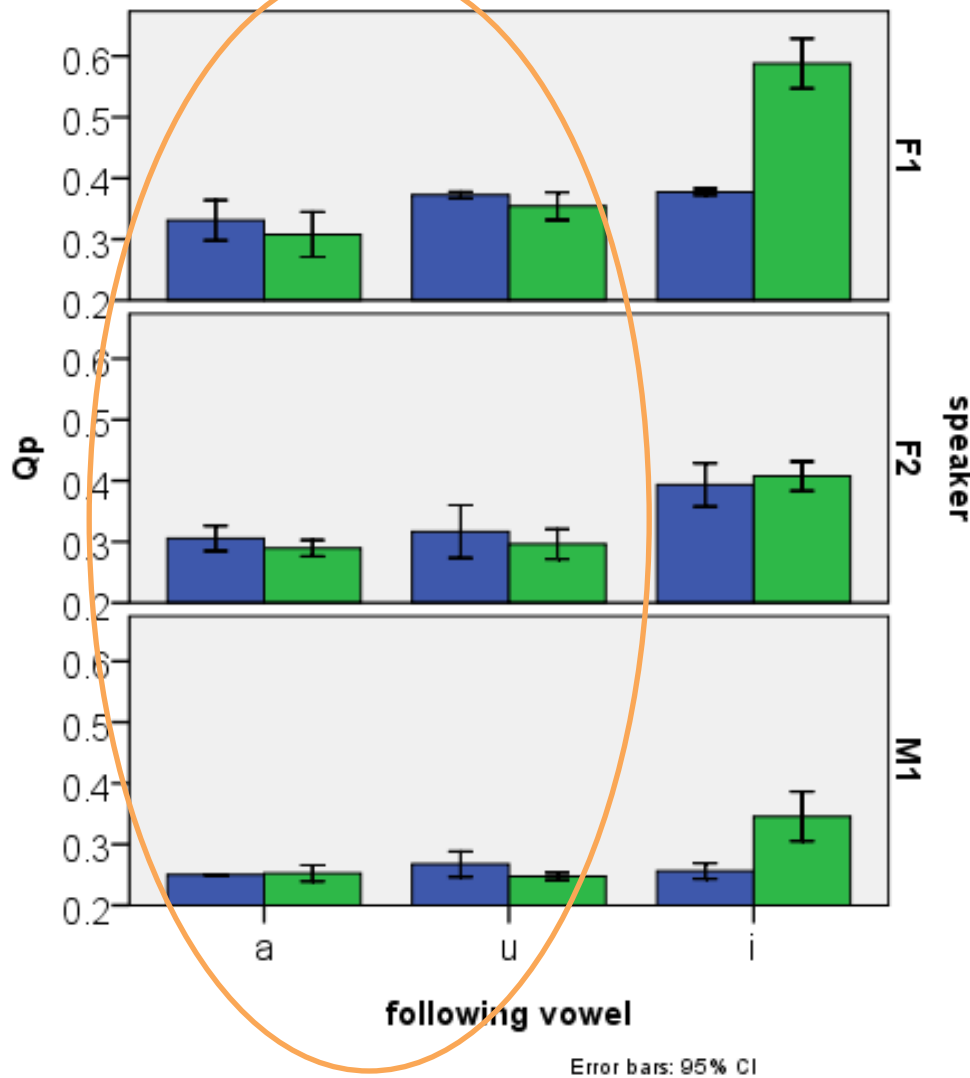
Error bars: 95% CI

manner  
■ affricate  
■ stop

Quotient of palatal contact (Qp)

$$Qp = [(R6 + R7 + R8)/24]$$

# Secondary articulation at maximum closure: palatal contact (R6-R8)

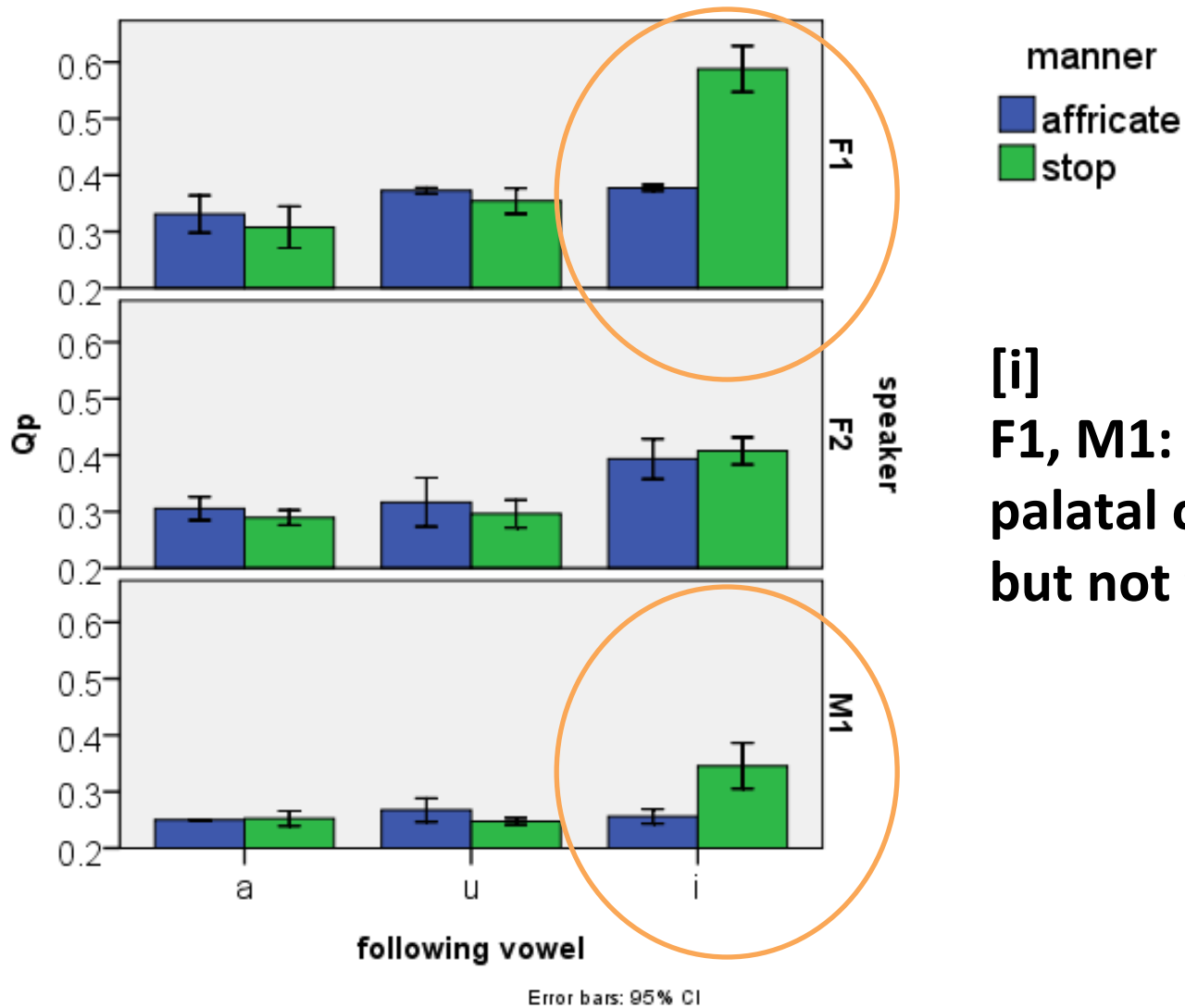


manner  
■ affricate  
■ stop

**[a u]: no clear difference  
between affricates and  
stops**

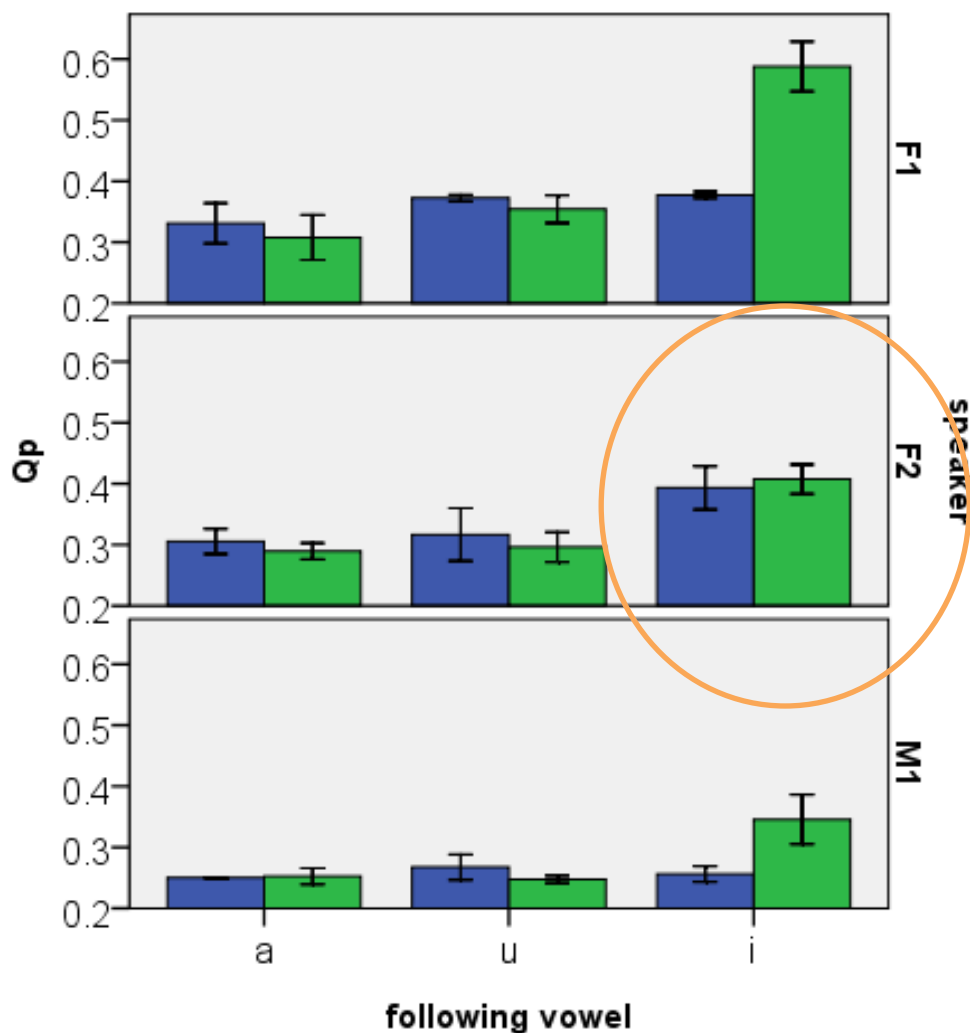
Error bars: 95% CI

## Secondary articulation at maximum closure: palatal contact (R6-R8)



[i]  
F1, M1: increased  
palatal contact for stops  
but not for affricates

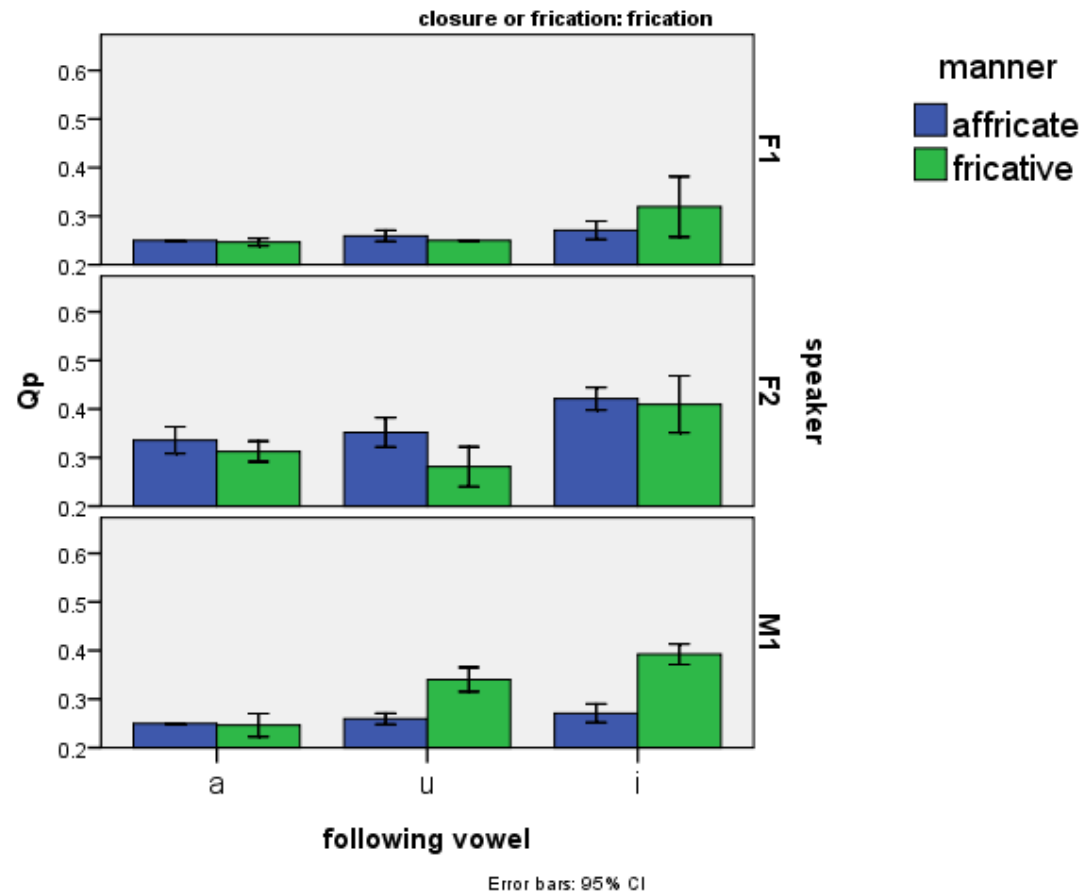
## Secondary articulation at maximum closure: palatal contact (R6-R8)



Error bars: 95% CI

[i]  
F2: increased palatal  
contact for both stops  
and affricates

# Secondary articulation at frication midpoint: palatal contact (R6-R8)



# Interim summary: palatal contact

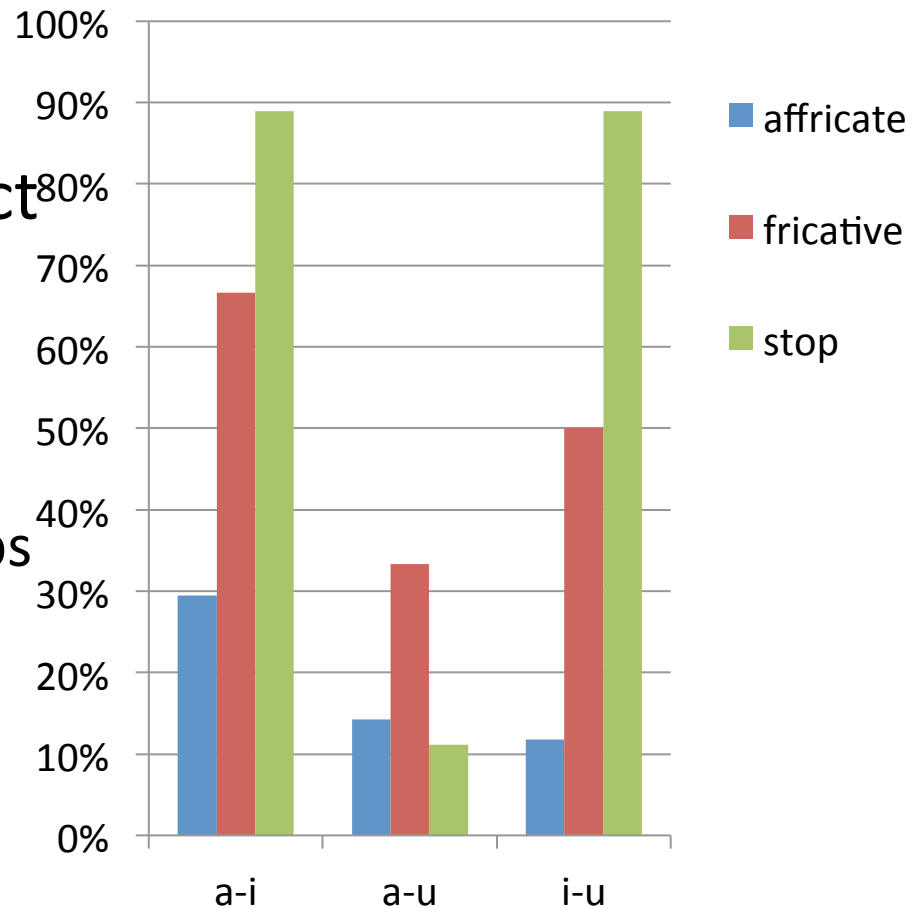
- ***Q2: Do affricates have more palatalized tongue body position than alveolar stops or fricatives?***
  - No. Contrary to H. Kim (2005) we did not find evidence for higher/fronter tongue body position in affricates than in stops (or fricatives).
  - For two speakers (M1, F1), in [i] context, stops and fricatives had significantly **more** palatal contact than affricates.
- In general, the affricates have more **stable** palatal contact pattern than the stops or fricatives.
  - More resistant to coarticulatory influence of the following vowel.

# Discussion

- The affricates are different from the corresponding stops and fricatives:
  - not so much in the primary constriction location or the degree of palatalization per se,
  - but in the stability of its articulatory realization.
    - The affricates are consistently alveolar-postalveolar while the stops and the fricatives are more variable.
    - The affricates have a more stable tongue body target while the palatalization in stops and fricatives are more contextually determined.

# Lingual coarticulation

- Proportion of contexts where coarticulatory difference in palatal contact ( $Q_p$ ) is statistically significant (Scheffe,  $p < .05$ )
- Coarticulatory resistance
  - Affricates > Fricatives > Stops
  - Cf. Recasens (1995)
  - factors affecting lingual coarticulation
    - coupling effects with primary articulator
    - aerodynamic requirement





# Coarticulatory resistance and phonological activity

- Post-consonantal glides in Korean are phonetically realized as secondary articulation on the consonants.
- The difference in coarticulatory resistance is compatible with the asymmetrical patterning of affricates and non-affricates in yod-dropping.
  - \*Affricate + j
  - Stop + j: ok
  - Fricative +j: ok

# References

- Anderson, V., I. Ko, W. O'Grady, & M. Choo. (2004).** A palatographic investigation of place of articulation in Korean coronal obstruents. *Korean Linguistics* 12, 1-24.
- Baik, W. (2003).** An EPG study of the articulatory difference between Korean and English affricates. *Speech Sciences* (The Korean Association of Spech Science Quarterly) 10.4, 57-62.
- Kim, H. (2001a).** A phonetically based account of phonological stop assibilation. *Phonology* 18, 81-108.
- Kim, H. (2001b).** The place of articulation of the Korean plain affricate in intervocalic position: an articulatory and acoustic study. *Journal of the International Phonetic Association* 31, 229–237.
- Kim, H. (2004).** Stroboscopic-cine MRI data on Korean coronal plosives and affricates: Implications for their place of articulation as alveolar. *Phonetica* 61, 234-251.
- Recasens, D. & A. Espinosa (2007).** Affricates and fricatives in two Catalan dialects. *Journal of the International Phonetic Association* 37, 143–172.

...

More

# Acknowledgements

- Thanks to Sohyun Hong and Bojana Radovanovic for assistance with labeling EPG data and to the participants
- Work supported by the Connaught New Staff Matching Grant to Alexei Kochetov and by the Connaught New Staff Matching Grant to Yoonjung Kang

# M1 mapi

	0	0	0	0	0	0	
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	50
0	0	0	0	0	0	0	100
100	0	0	0	0	0	0	100
100	0	0	0	0	0	0	100
100	83	0	0	0	0	83	100
100	83	0	0	0	0	100	100

# M1 mapa

	0	0	0	0	0	0	
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	66