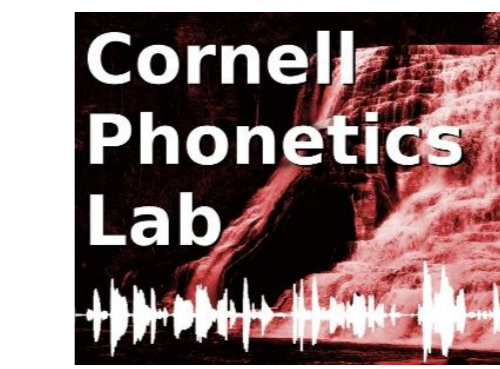


A Gestural Interpretation of Variation and Variability in Minor Syllables



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Becky Butler, Cornell University
bbt24@cornell.edu



Sesquisyllables

Sesquisyllabic words comprise two types of syllables:

- a heavy major syllable, which is right-aligned and is the locus of phonological contrast
- a light, reduced minor syllable

Variation across languages in the types of segments appearing in minor syllables

- [rə.ˈbin] ‘gourd’ Bunong
- [t̪ə.ˈpah] ‘to slap each other’ Pacoh (Watson 1964)
- [ti.ˈjɔk] ‘to point’ Jahai (Burenhult 2001)
- [m.ˈləm] ‘one’ Stieng (Haupers 1969)

Unaccounted-for variability within individual languages regarding the phonetic realization of minor syllables

- [mteh] ~ [məˈteh] ‘pepper’ Khmer
- [ptʃəp] ~ [pəˈtʃəp] ‘attach’ Khmer

Articulatory Phonology

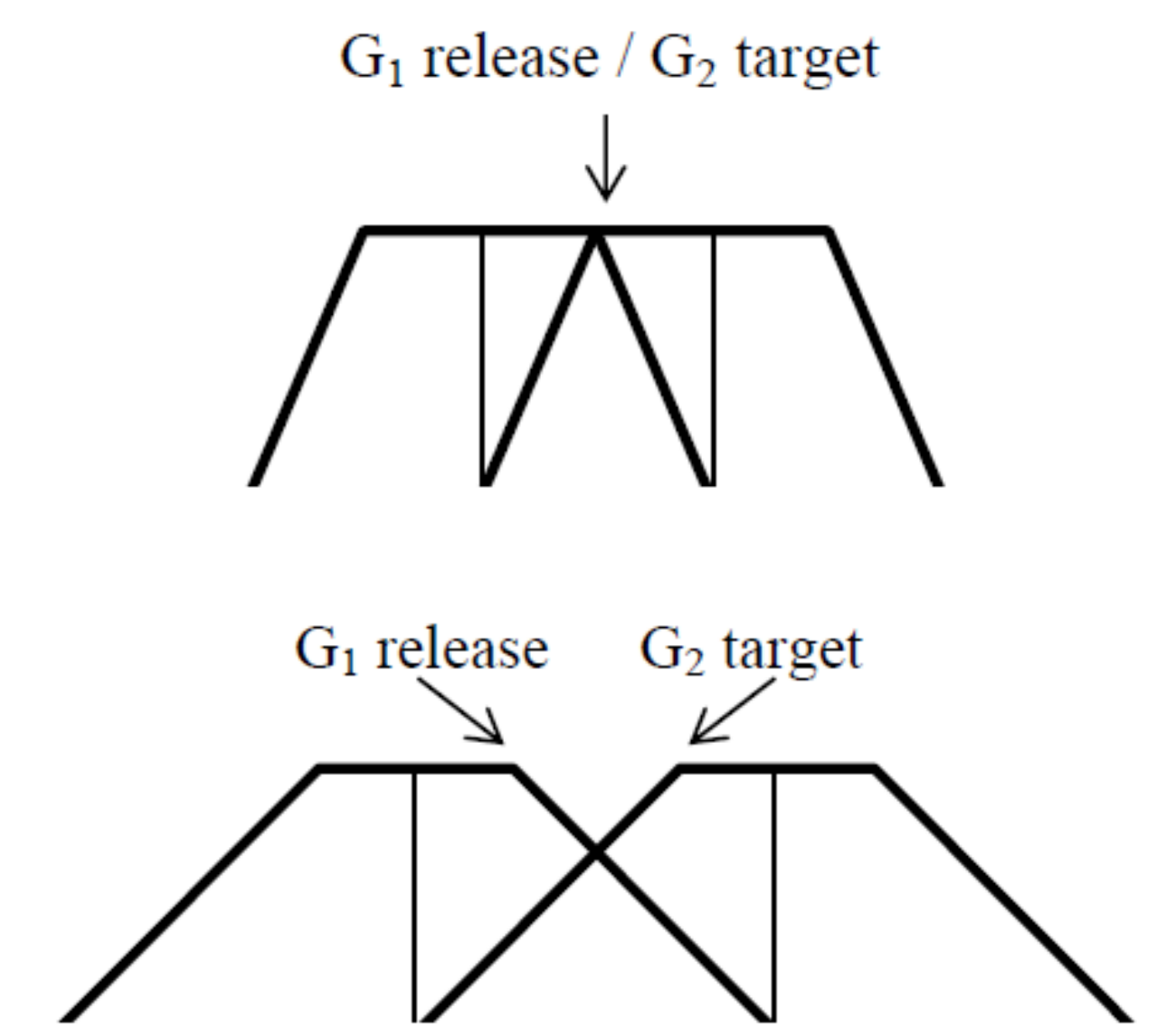
Speech is composed of coordinated dynamical gestures
(Browman and Goldstein 1986 *et seq.*; Saltzman and Kelso 1987)

Gestures

- articulatory movements toward targets of the vocal tract
- can overlap or underlap

Gesturally-based studies on initial consonant clusters and phonological nature of schwa

- French (Kühnert et al. 2006)
- Italian (Hermes et al. 2008)
- Georgian (Goldstein et al. 2007)
- Tashlhiyt Berber (Ridouane and Fougeron 2011)



Question: How can a gestural interpretation of minor syllables account for their inter-language variation and intra-language variability?

Set-up

Speakers: 18, ages 18 – 44 ($\mu = 27$),
recorded in Phnom Penh
Stimuli: C(ə/ə)CVC: 20, C Δ (C).CVC: 4, C Δ C: 13
Frame: [nijj ____ mɔŋ tjet], 3 repetitions

Distribution

- C1 is voiced ([m] or [l])
Underlap in 93% of tokens
Underlap is voiced 100% of the time
- C1 is voiceless ([p] or [t])
Underlap in 95% of tokens
Underlap is voiceless 99% of the time

Durations

- CəCVC vs. CəCVC
Linear regression after accounting for C1 and C2 type
Underlap duration not significantly different ($p = 0.757$)
Cə/əC duration not significantly different ($p = 0.993$)
- CəCVC vs. C Δ (C).CVC
Highly significant difference in duration ($p < 0.0001$)

Formants

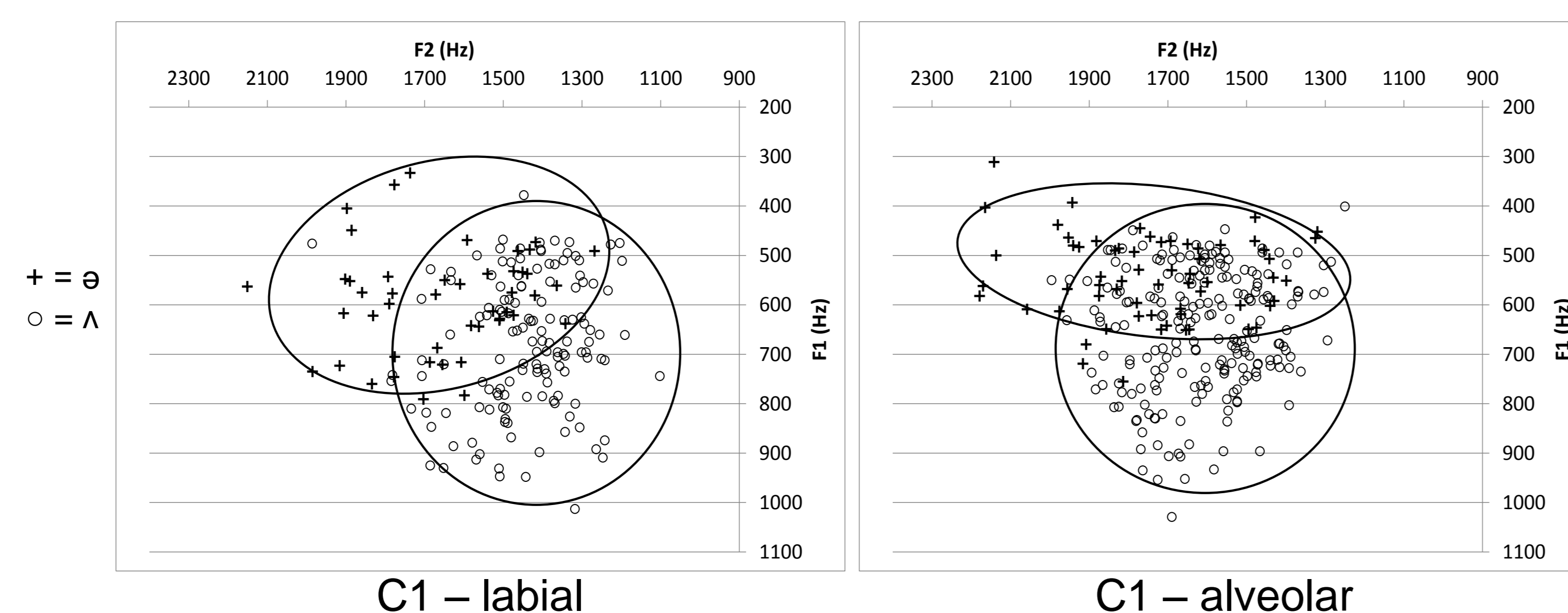
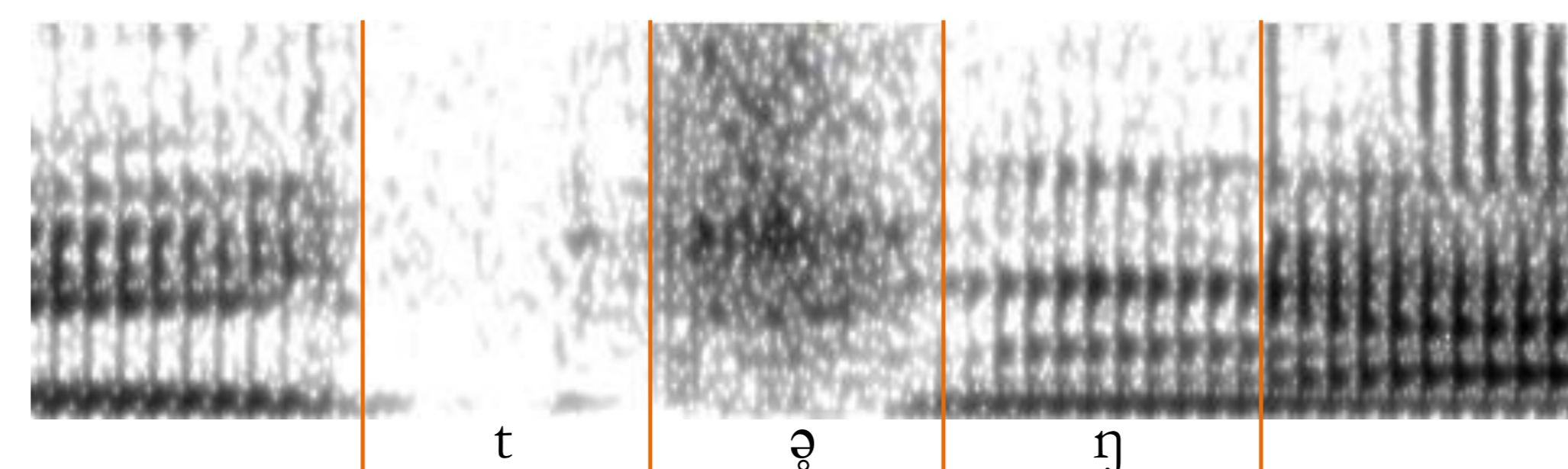
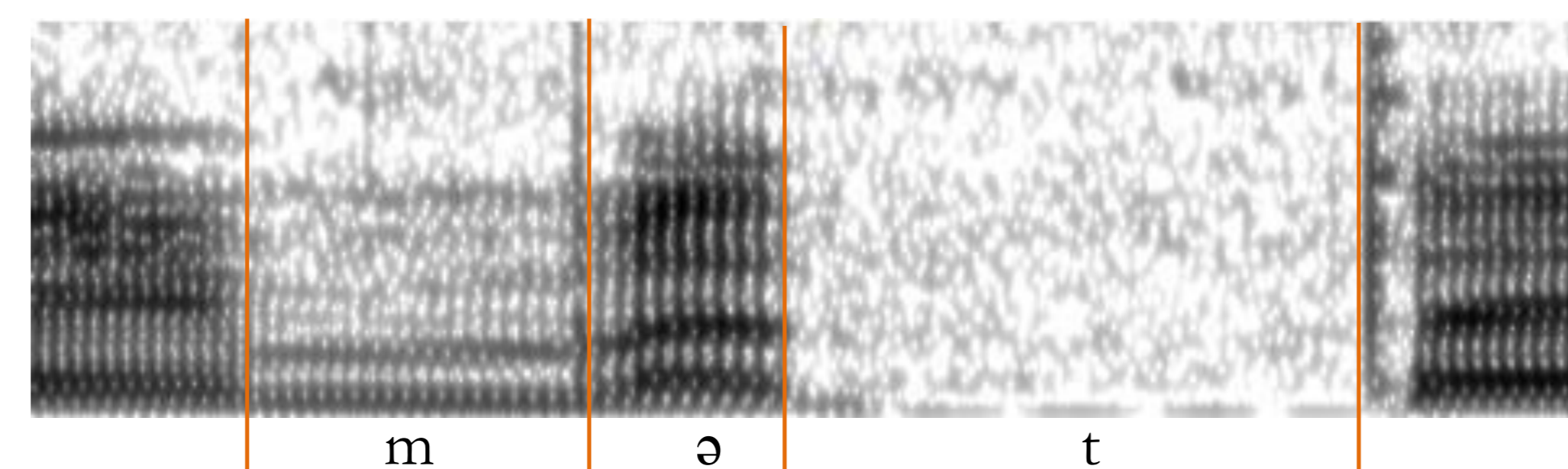
- CəCVC vs. C Δ (C).CVC and C Δ C
[ə] is higher than [ɐ] and more susceptible to influence from neighboring consonants

Conclusions

- [ə] is qualitatively and quantitatively distinct from /ɐ/
- “Minor syllable” nuclei in Khmer do **not** have an associated gesture

Khmer

C1 \ C2	s	h	r	l	p	t	tʃ	k	m	n	ɲ	ʔ	b	d
p	ps	ph	pr	pl	pt	ptʃ	pk	pn	pn	pn	pʔ			pd
t		th	tr	tl	tp		tk	tn	tn	tʃ	tʃ		tb	
tʃ		tʃh	tʃr	tʃl	tʃp		tʃk	tʃn	tʃn	tʃʃ	tʃʃ		tʃb	tʃd
k	ks	kh	kr	kl	kp	kt	ktʃ	km	kn	kʃ	kʃ			
s			sr	sl	sp		sk	sm	sn	sʃ	sʃ	sʔ	sb	sd
m	ms	mh	mr	ml	mp	mt	mtʃ	mn	mn	mp	mʃ	mʃ		
l		lh		lp			lk	lm		ln	lʃ	lʃ	lb	



Set-up

Speakers: 12, ages 22 – 36 ($\mu = 28$),
recorded in Monduliri Province
Stimuli: CCVC: 7, Cə.CVC: 12, C Δ C: 21
Frame: [lah nau ____], 3 repetitions

Distribution

- Cr clusters ([sr, mr, ɲr])
Underlap in 89% of tokens
Underlap is voiced 100% of the time
- Cl clusters
[k] – Underlap in 98% of tokens
[ŋ] – Underlap in 13% of tokens
Underlap is always voiceless in both

Durations

- Minor syllable schwa Cə.CVC is:
significantly longer than CCVC transitions
significantly shorter than C Δ C vowels
($p < 0.0001$)

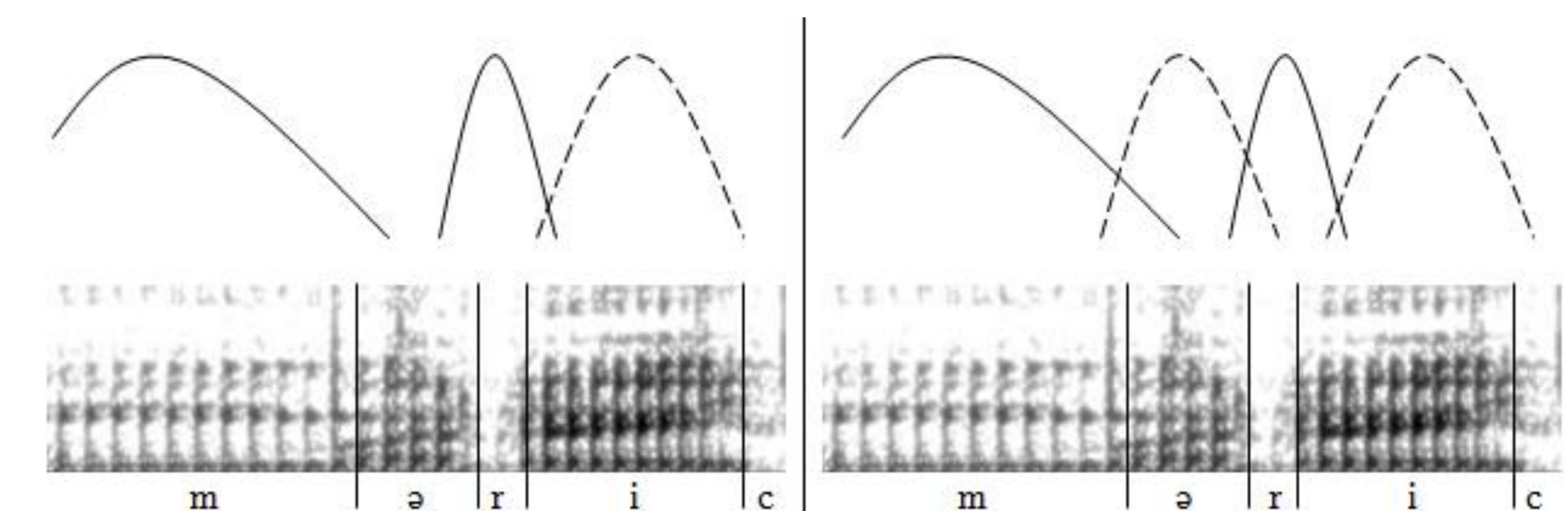
Formants

- F1 is significantly higher for CCVC than for Cə.CVC
- F1 is not significantly different for Cə.CVC and C Δ C
- No significant differences in F2, but unusually high or low F2 values for Cə.CVC are positively correlated with shorter vowel duration

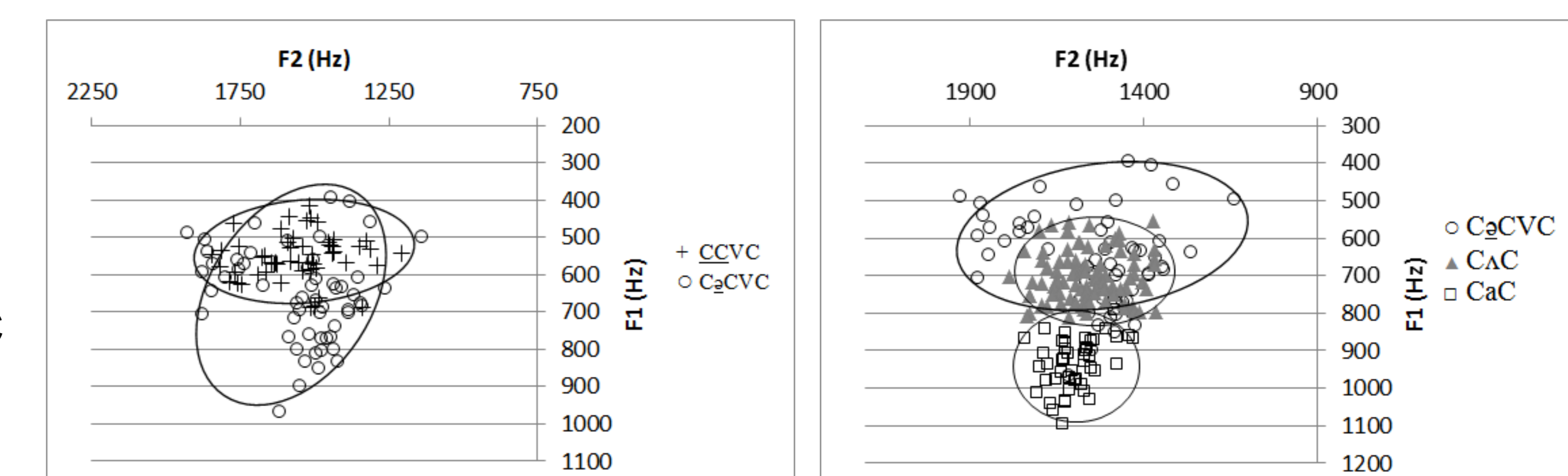
Conclusions

- Bunong minor syllable /ə/ is distinct from underlap, and it is shorter than /ɐ/ because it is unstressed
- Minor syllable vowels in Bunong are phonologically real and **have** an associated gesture

Bunong



Monosyllable C Δ CVC		Sesquisyllable C Δ ə.C Δ VC		
C1	C2	C1	v	C2
any consonant	r l w j	p p ^h c ^h k r l	ə	any consonant, except liquids or glides



Conclusions

1. The minor syllable is not a coherent phonological entity.
2. Variation in minor syllables across languages is due to the fact that some minor syllable nuclei have associated gestures, while others do not.
3. Variability in the presence of the minor syllable “vowel” in languages like Khmer is due to variability in gestural alignment, but the minor syllable vowel of Bunong is always realized because it has an associated gesture..