

Myanmar (Burmese) Plosives

Three-way voiceless contrast?

Orthographic Contrasts

	Bilabial	Dental	Alveolar	Velar
Series 1	ပ	ဒ	တ	က
Series 2	ဖ		စ	ခ
Series 3	တ ဖ	ဒ (allophone)	တ ခ	က ဃ

- ▶ Myanmar script makes a three-way contrast for:
 - ▶ Bilabial plosives
 - ▶ Alveolar plosives
 - ▶ Velar plosives
- ▶ Myanmar script has one symbol for their dental plosive.
 - ▶ The dental stop has an allophone that fits in “Series 3”

Previous Descriptions

	Bilabial	Dental	Alveolar	Velar
Voiceless	p	θ	t	k
Aspirated	p ^h		t ^h	k ^h
Voiced	b	ð (allophone)	d	g

- ▶ The three-way contrast is said to be:
 - ▶ Voiceless
 - ▶ Aspirated
 - ▶ Voiced
- ▶ Usually the dental plosive is described as a fricative.
- ▶ “Voiced” has also been described as:
 - ▶ Partially voiced (Shiwaruangrote 2000)
 - ▶ Only voiced intervocalically (Armstrong and Pe Maung Tin 1925)



Our Study

- ▶ We recorded 2 men and 2 women (ages 19 – 38).
- ▶ The speakers are ethnically Burmese born in Yangon (ရန်ကုန်သား).
- ▶ The word list was about 200 nouns.
 - ▶ There are only a couple of verbs that begin with a Series 3 plosive.
- ▶ Words were recorded in isolation and in frame.



Methodology

- ▶ We used a guessing game to elicit the data.
- ▶ We had two speakers play the game as we recorded them.
- ▶ The guessing game was to avoid:
 - ▶ List intonation
 - ▶ Reading intonation
 - ▶ Formal speech register

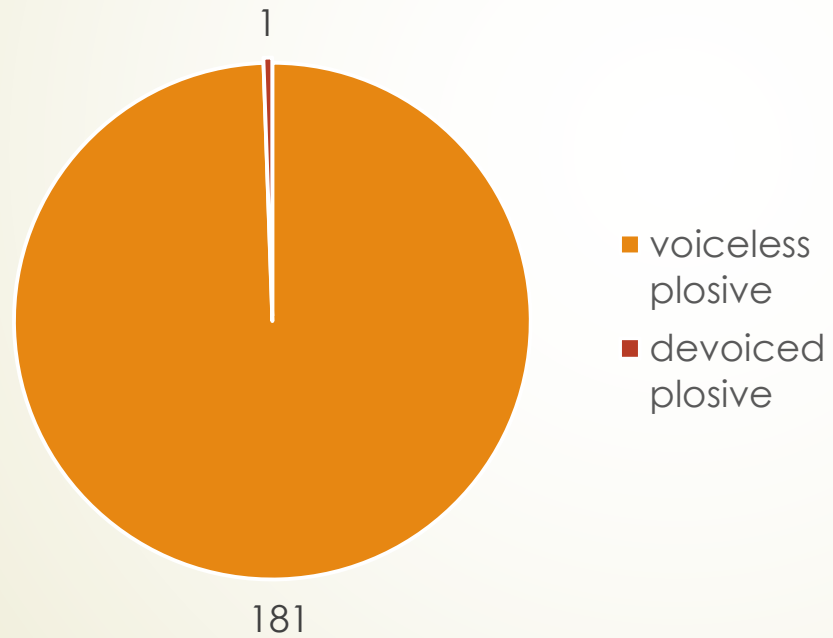
Voicing Results

		Bilabial	Dental	Alveolar	Velar
Series 1	“voiceless”	ʋ	ɖ	ʈ	ʞ
Series 2	“aspirated”	ʋ̥		ʈ̥	ʞ̥
Series 3	“voiced”	ʋ̬ ʋ̂	ɖ̬ (allophone)	ʈ̬ ʈ̂	ʞ̬ ʞ̂

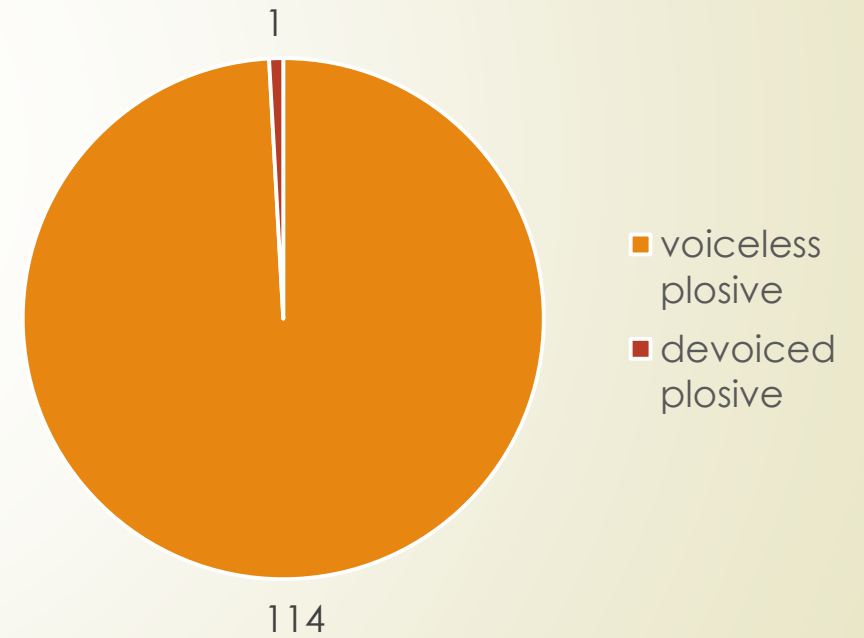
- ▶ Series 2 is always voiceless and aspirated.
- ▶ In isolation, Series 1 and 3 are almost always voiceless.
- ▶ In frame, Series 1 and 3 each have many realizations.

Voicing in Isolation

Series 1 (“voiceless”)

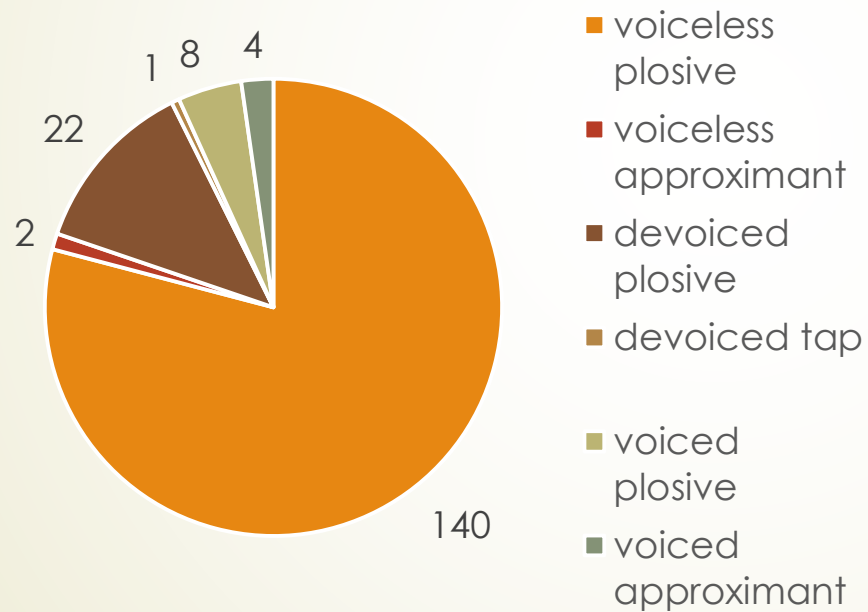


Series 3 (“voiced”)

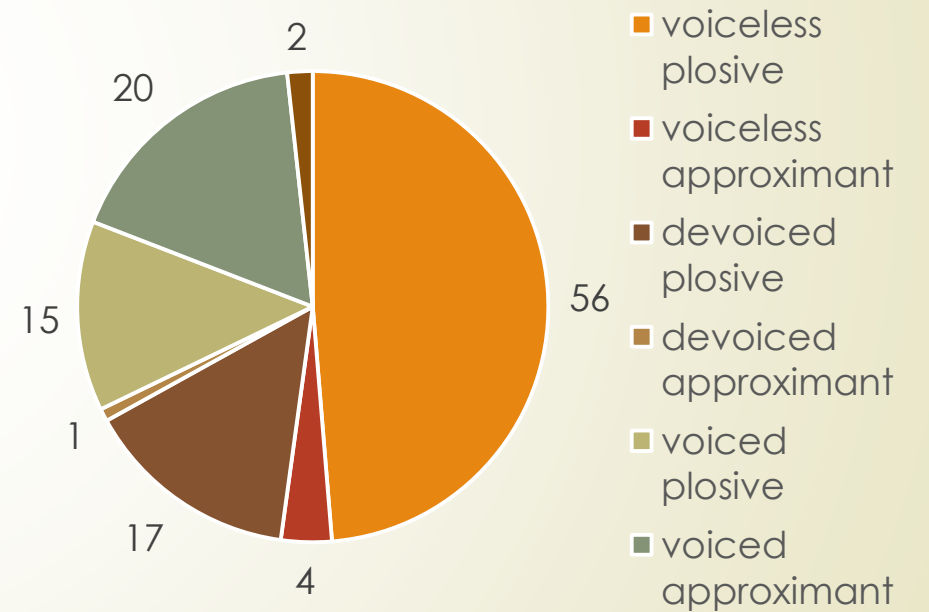


Voicing in Frame

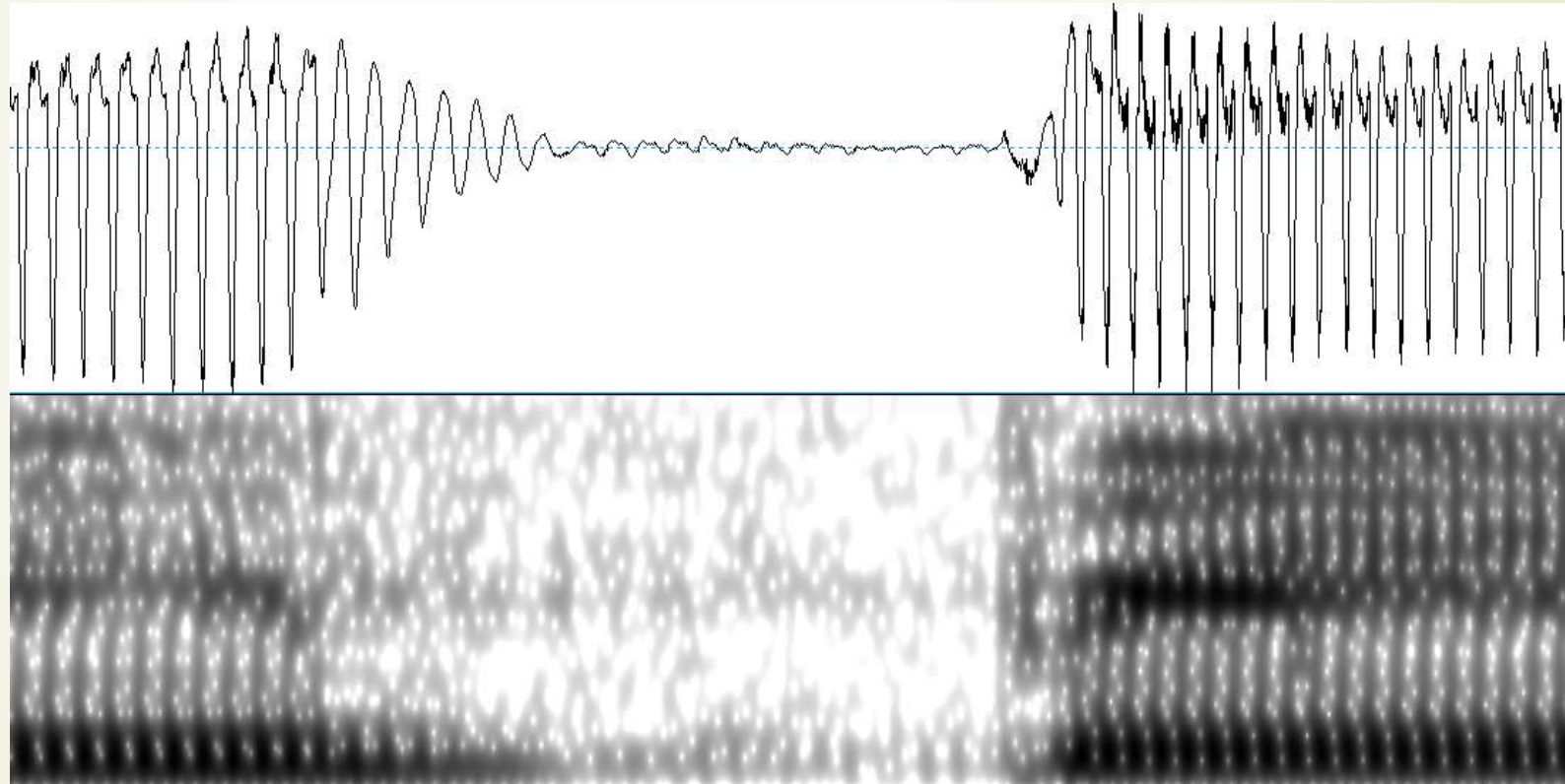
Series 1 ("voiceless")



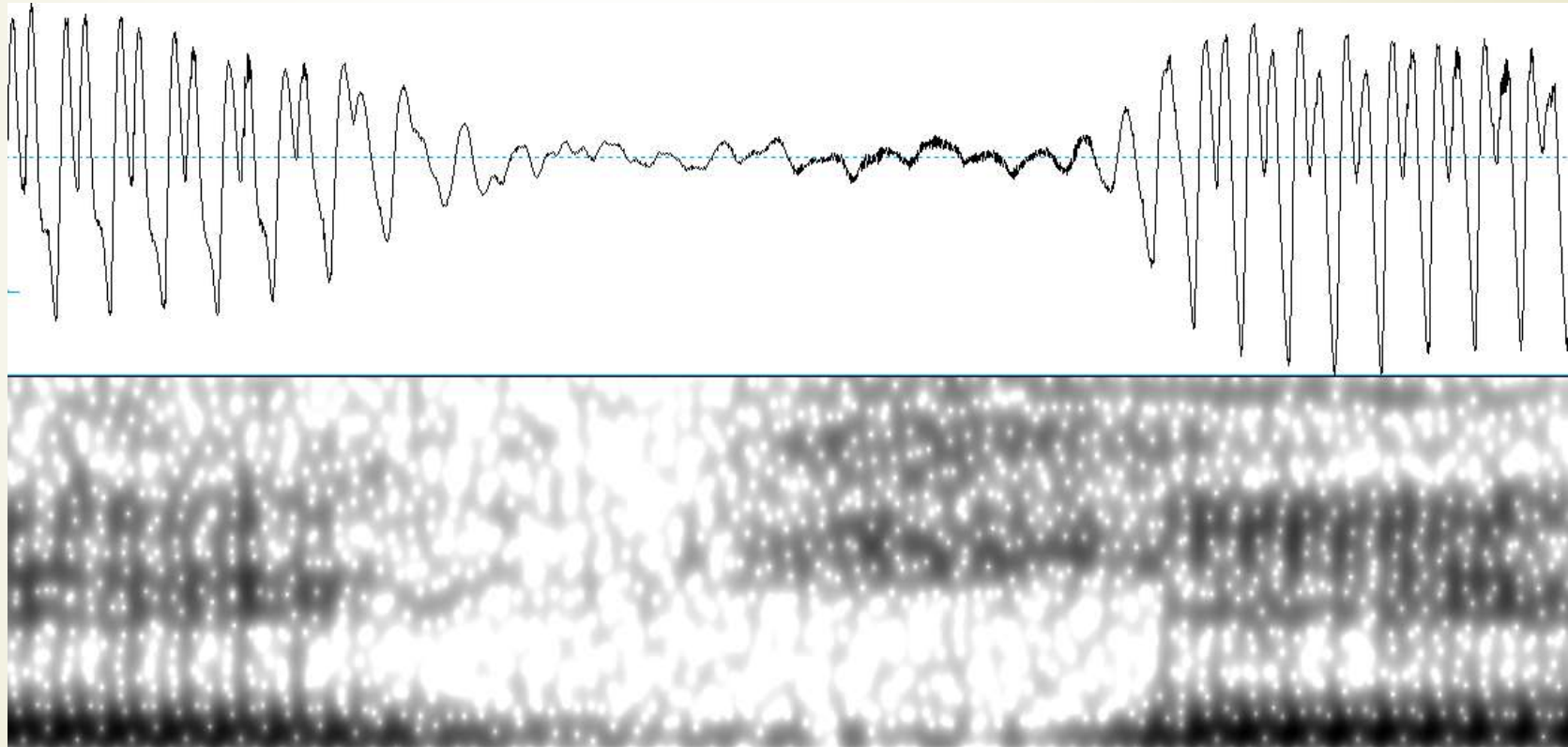
Series 3 ("voiced")



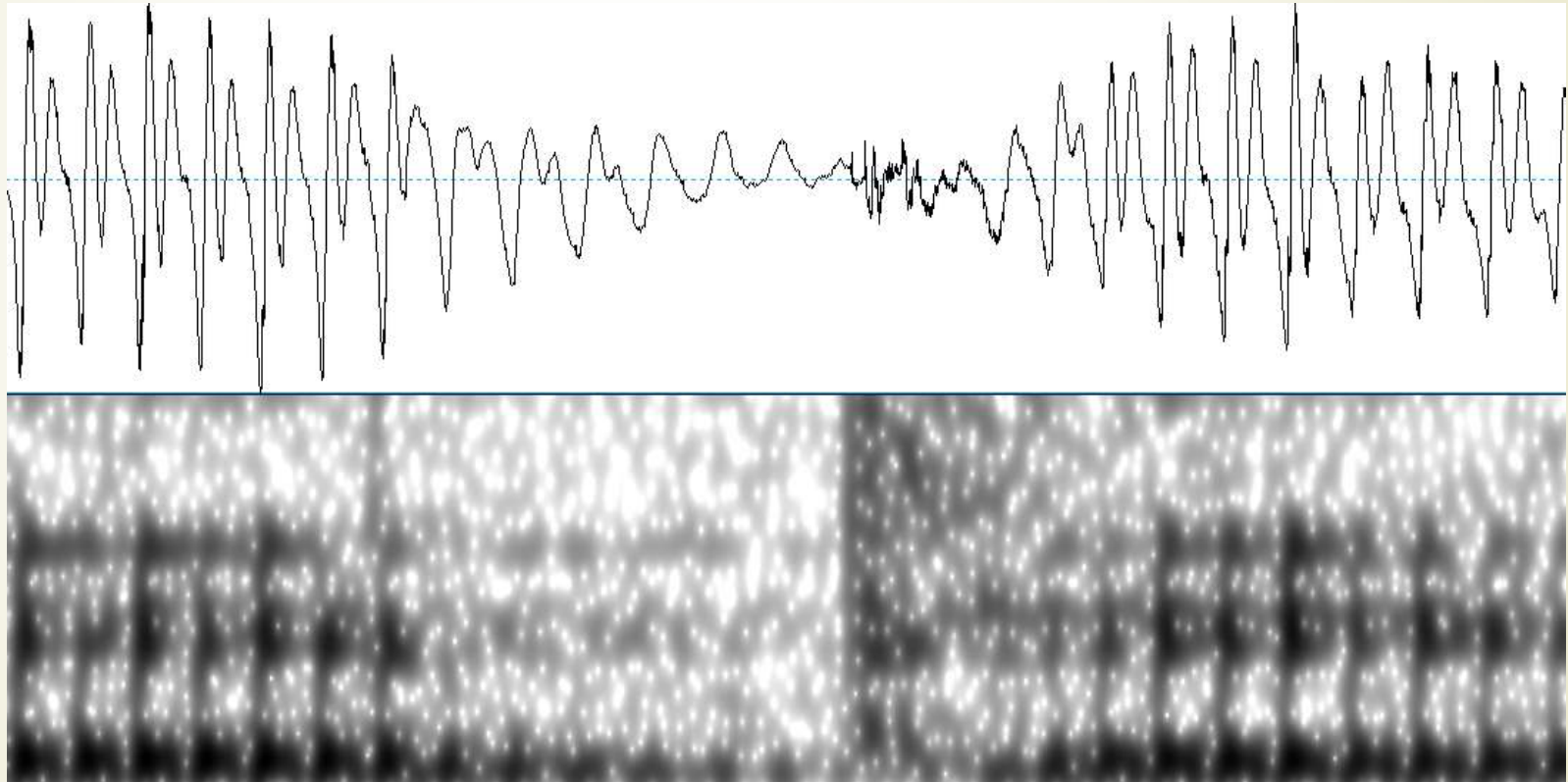
voiceless plosive [p] (ပီယဆေး: 'charm')



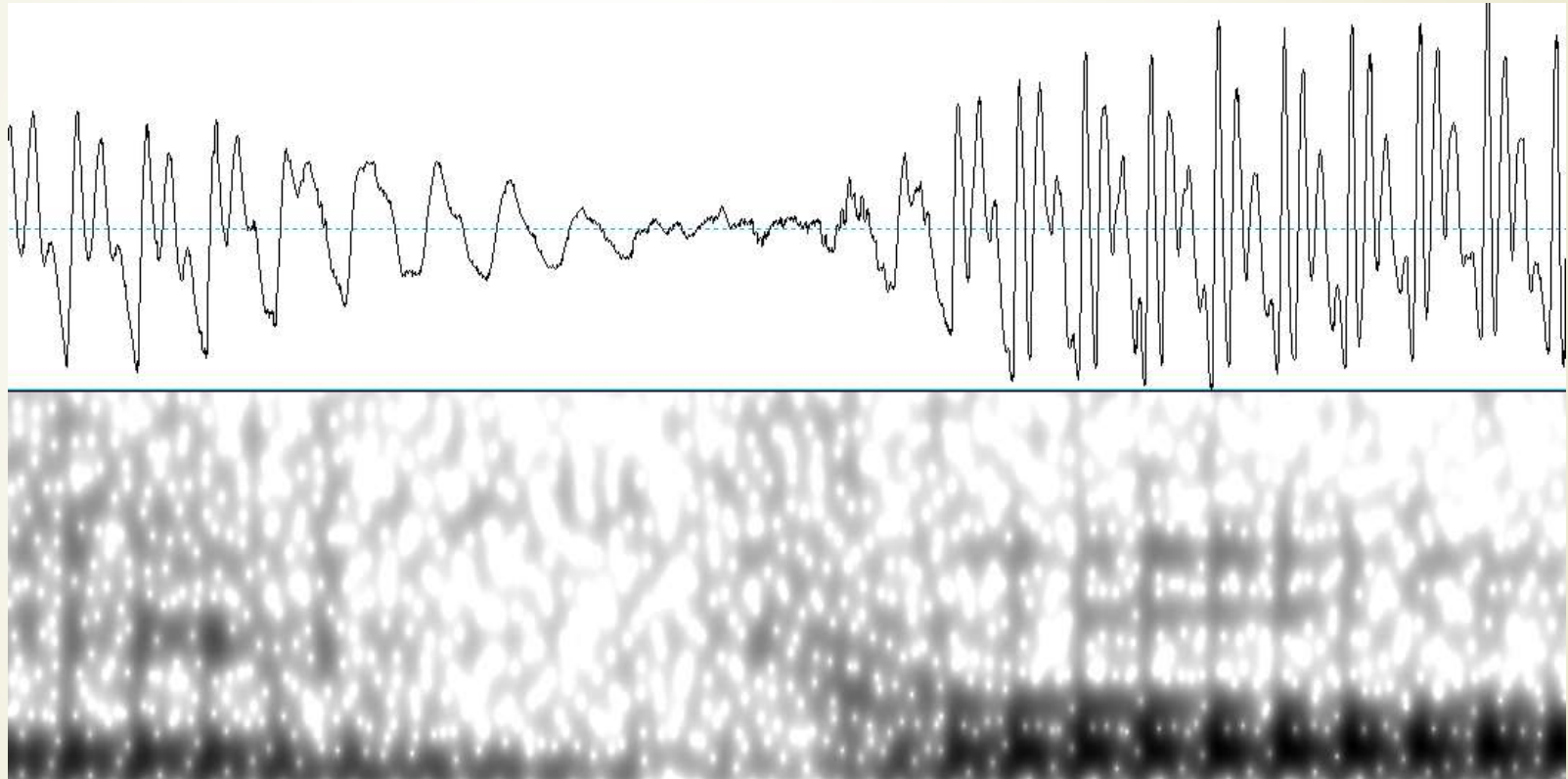
voiceless approximant [ɣ̥] (ကြီးမား 'kind of snack')



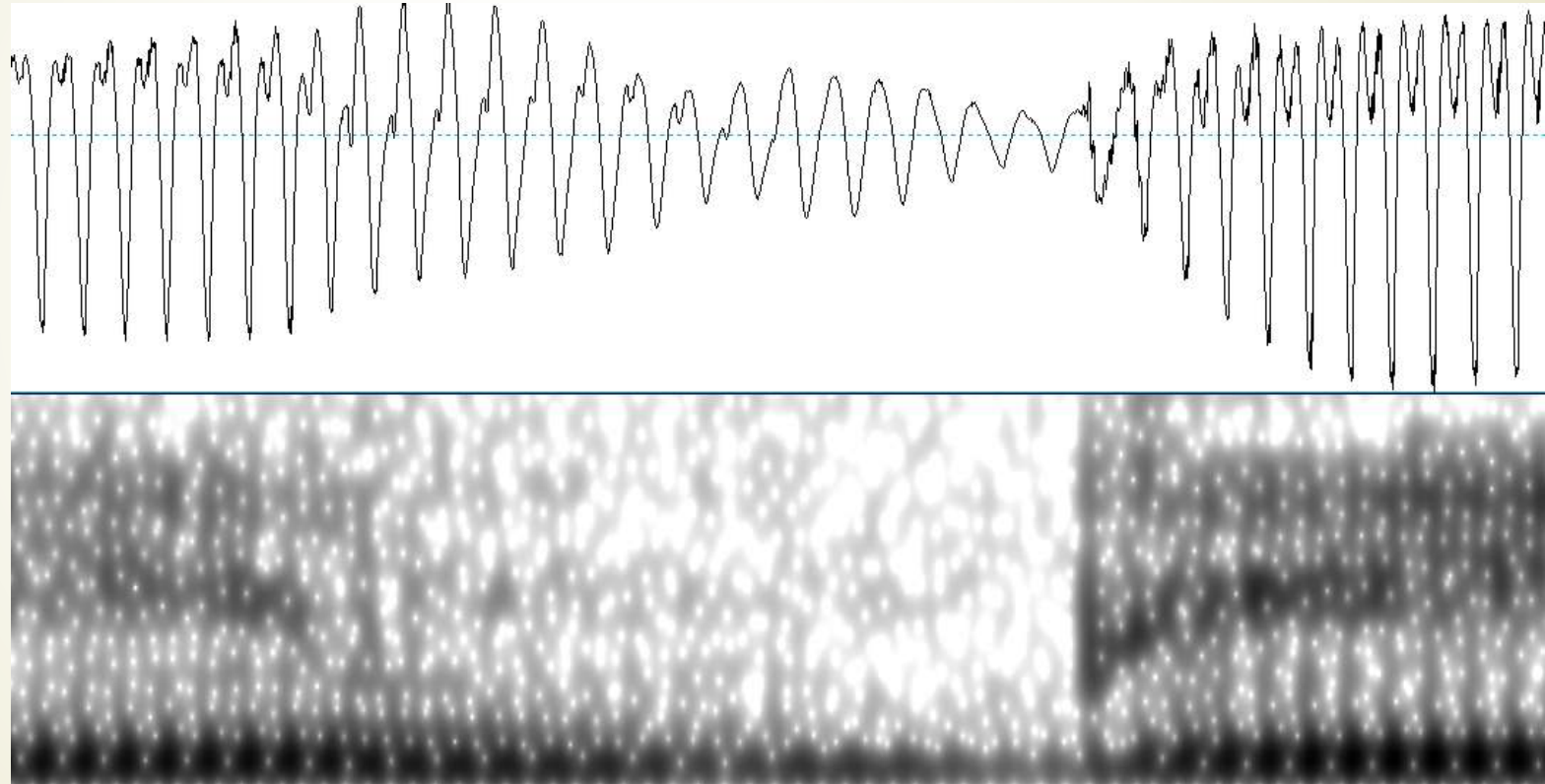
devoiced plosive [t̚] (တီကောင် 'earthworm')



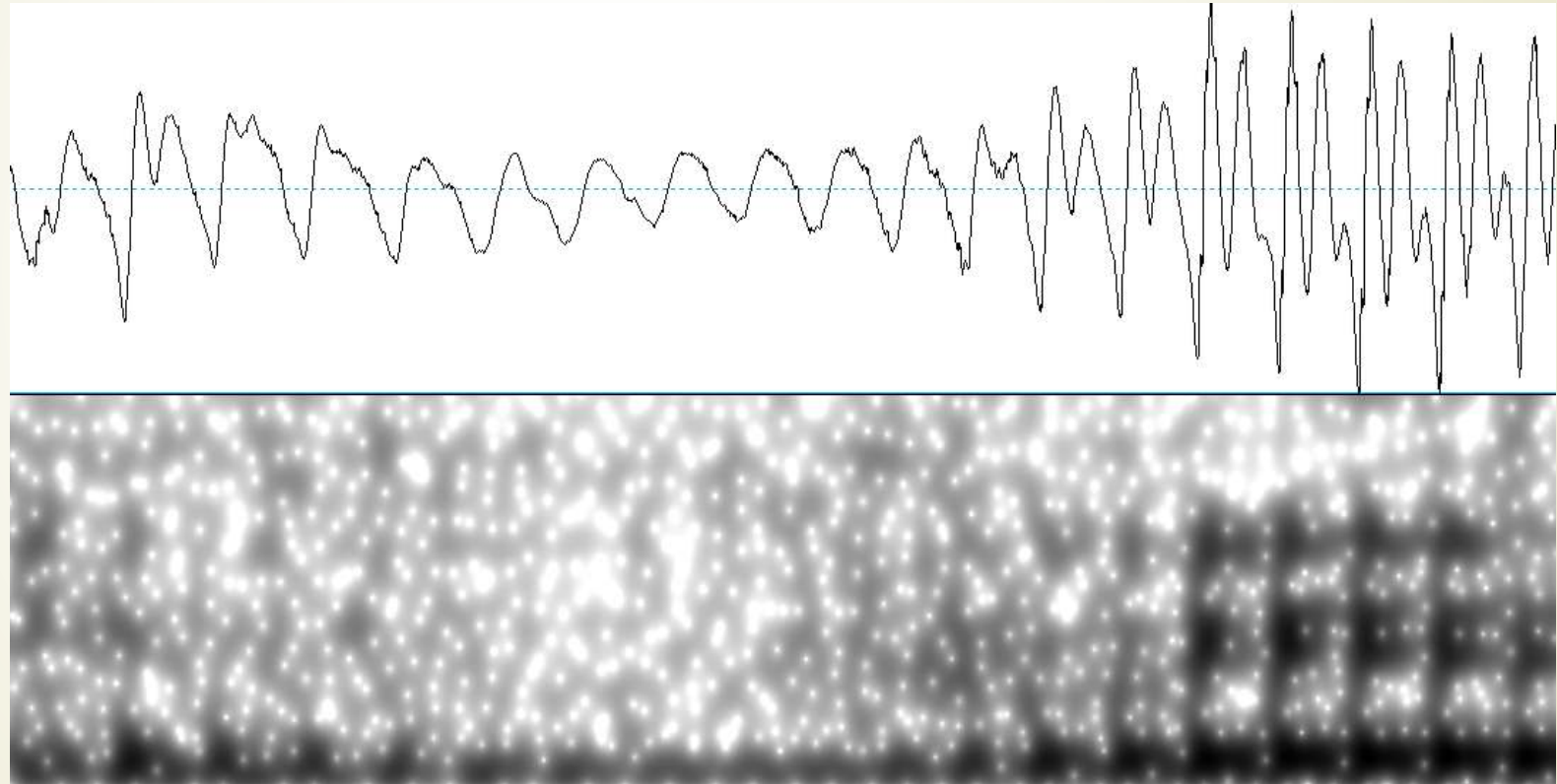
devoiced approximant [β̥] (∞o 'life')



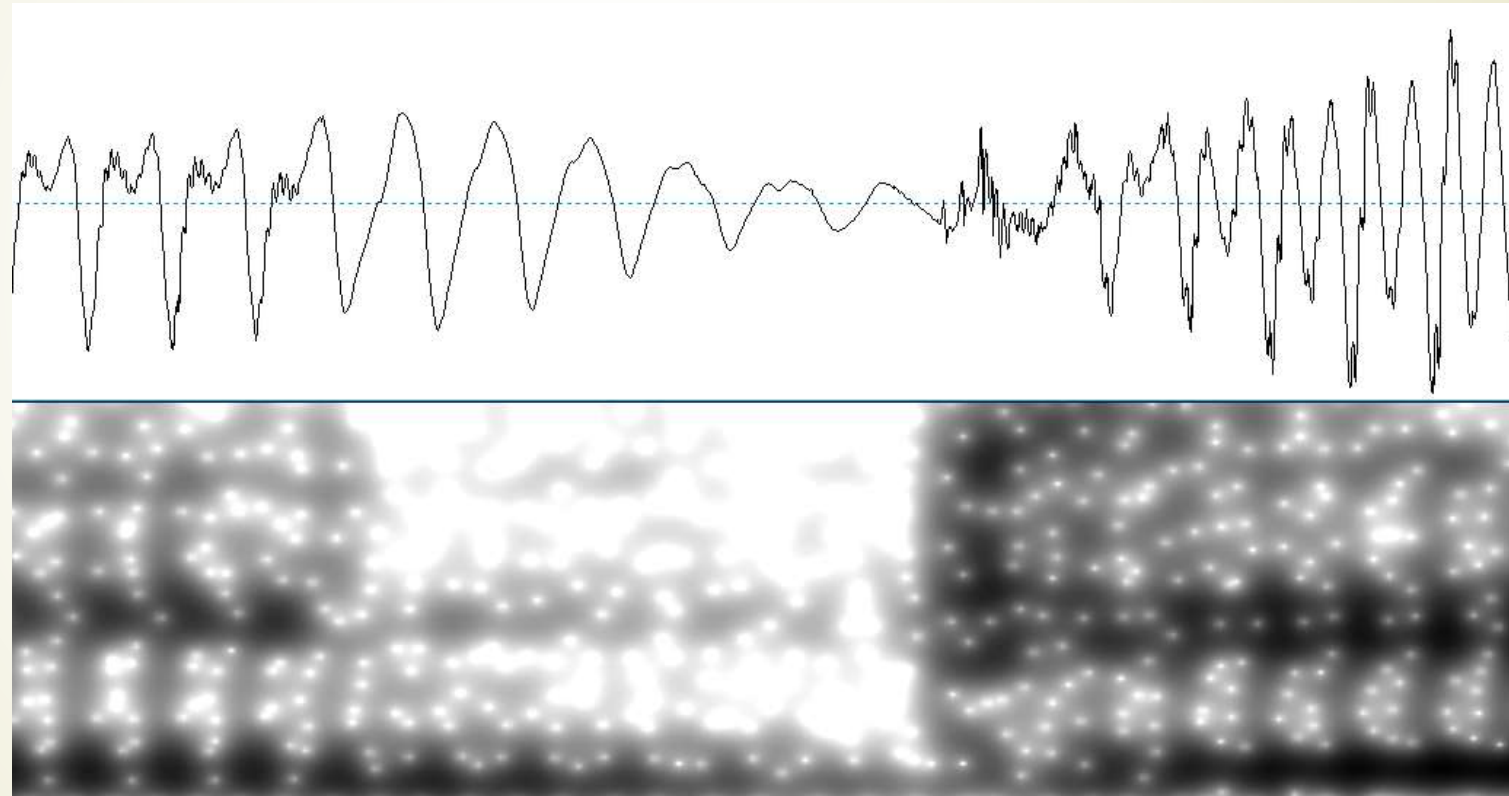
voiced plosive [b] (ဆီ 'great-great grandfather')



voiced approximant [β̥] (ပိဝိကွေး: 'something very small')



voiced tap [ɾ] (ဒကာ 'donor')





Laryngeal Settings

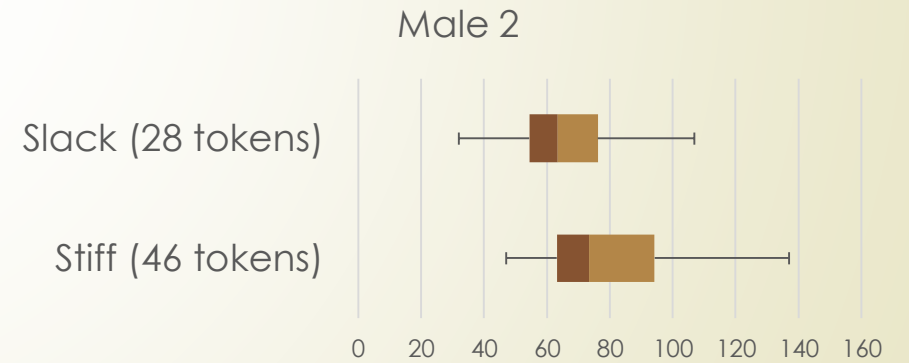
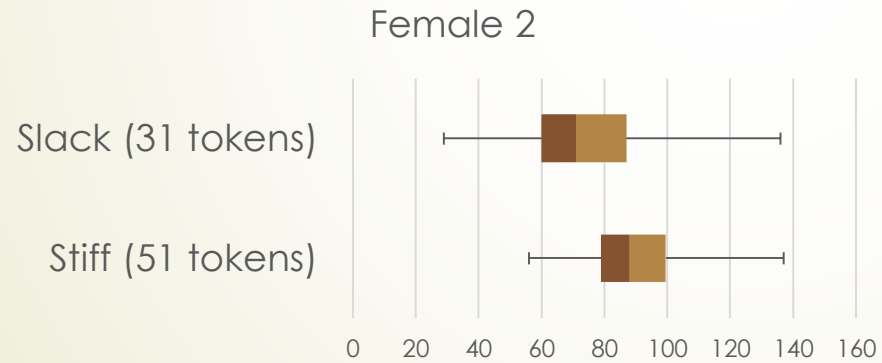
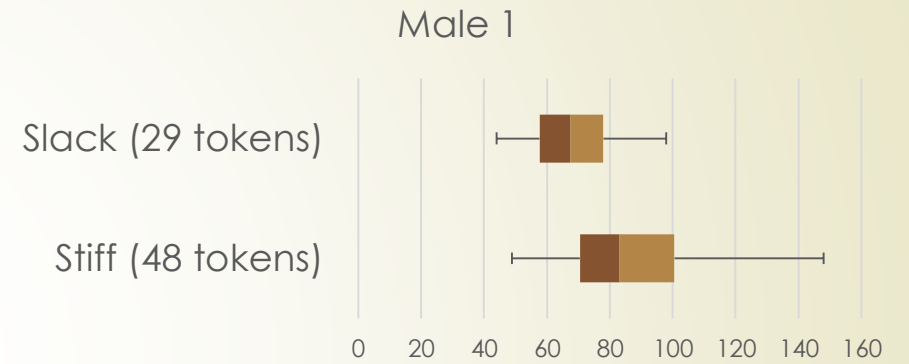
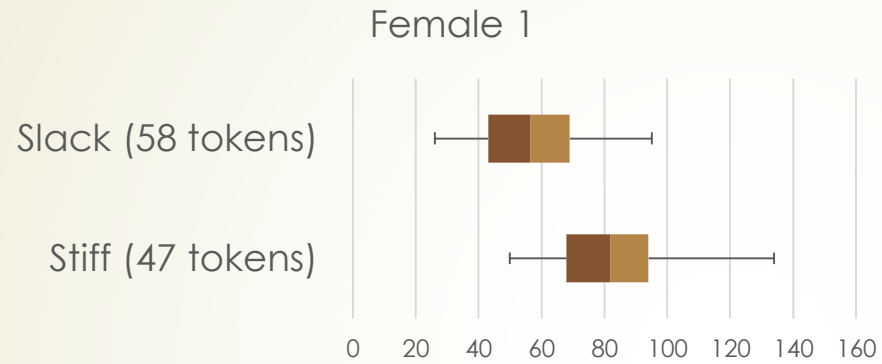
- ▶ Aspirated plosives are consistent, but the other series aren't.
- ▶ We suggest that the contrast is between **stiff** and **slack voice**.
- ▶ These are described in *Sounds of the World's Languages* (Ladefoged & Maddieson 1996).
- ▶ **Stiff voice**: “slight degree of laryngealization which may be associated with a **contraction of the vocalis muscles**” (p. 55).
- ▶ **Slack voice**: “These stops have a slightly increased glottal aperture beyond that which occurs in modal voice, and a **moderate increase in flow**” (p. 63).



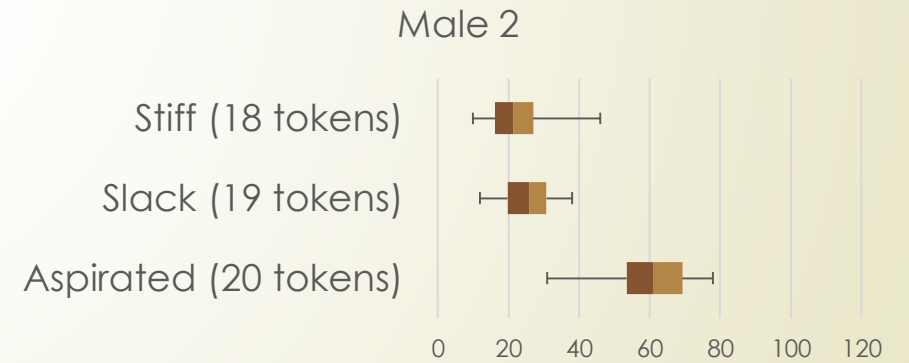
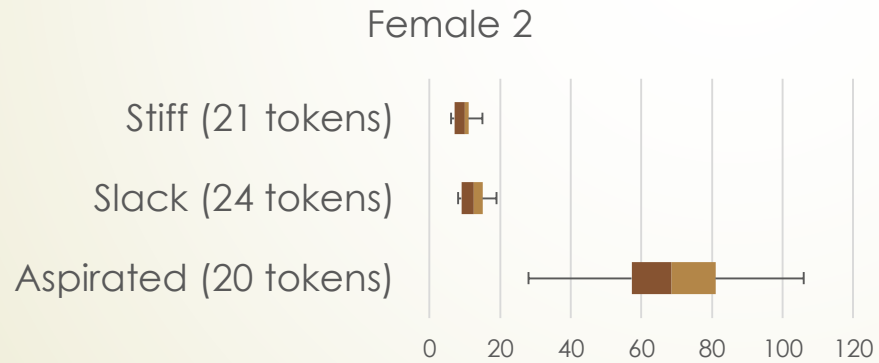
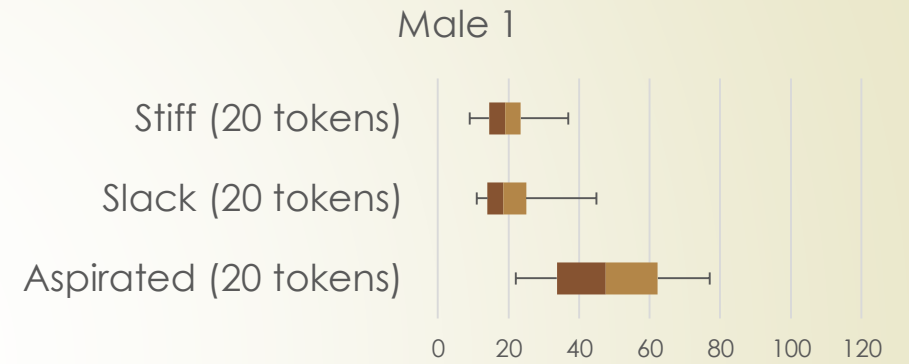
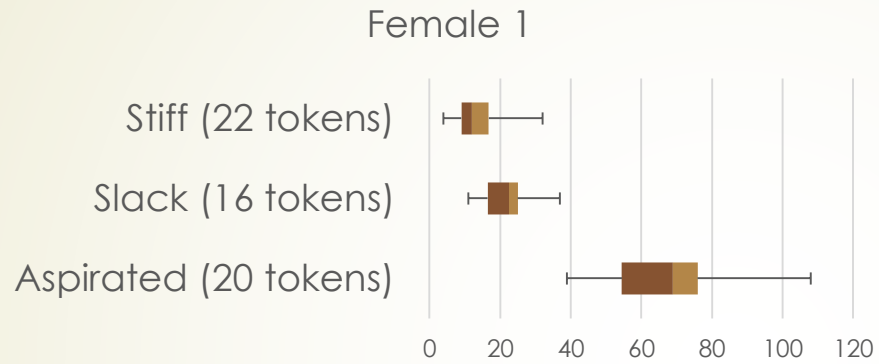
Acoustic Measurements

- ▶ We measured for this study:
 - ▶ Consonant Length
 - ▶ Release Noise (Stop Burst Length and Aspiration Length)
 - ▶ F_0 on the Vowel Onset
 - ▶ F1
 - ▶ Vowel Length
- ▶ We did not measure phonation on the vowel onset.
 - ▶ This may be important phonetic cue.

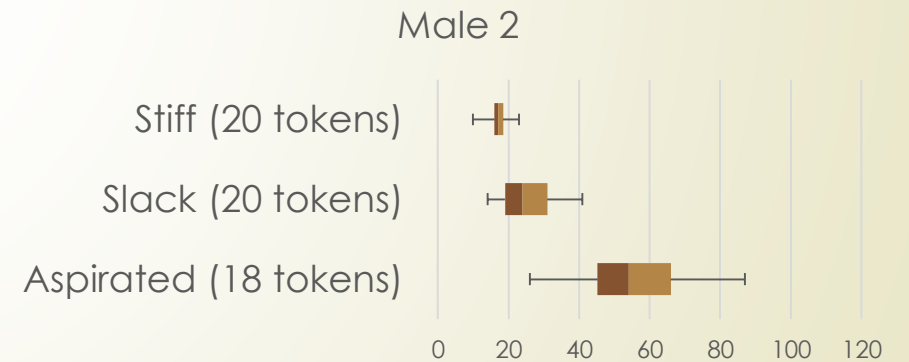
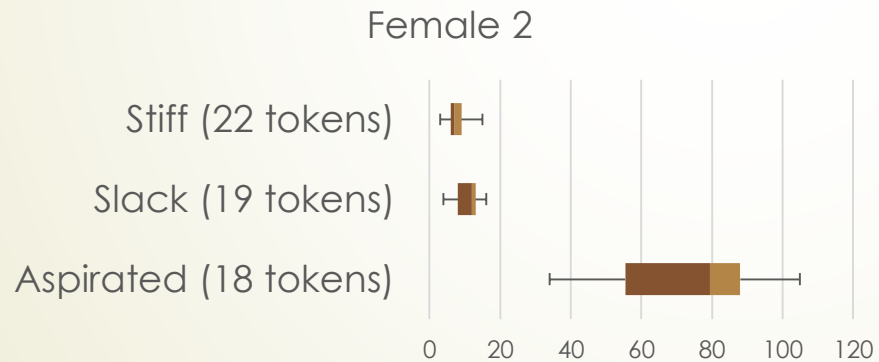
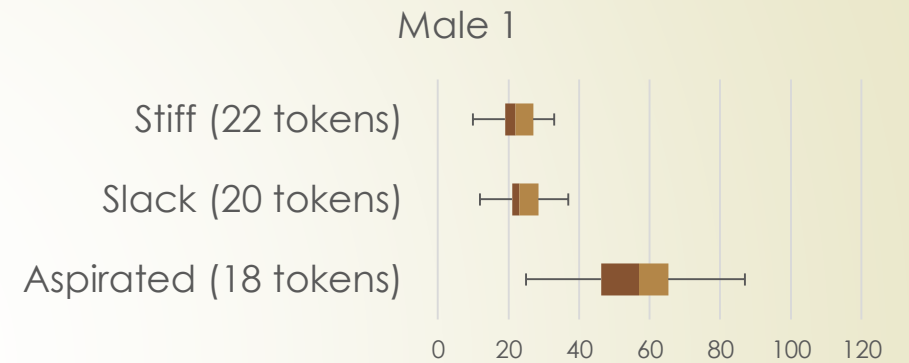
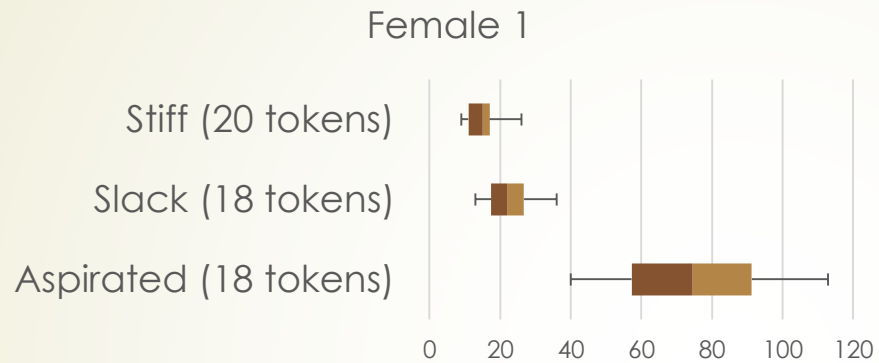
Consonant Length



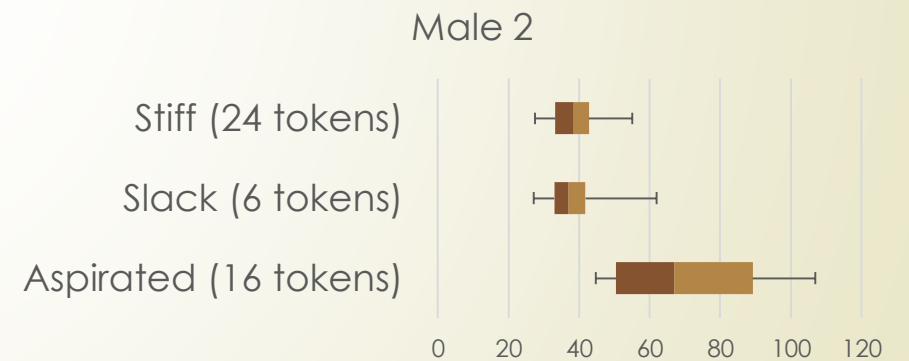
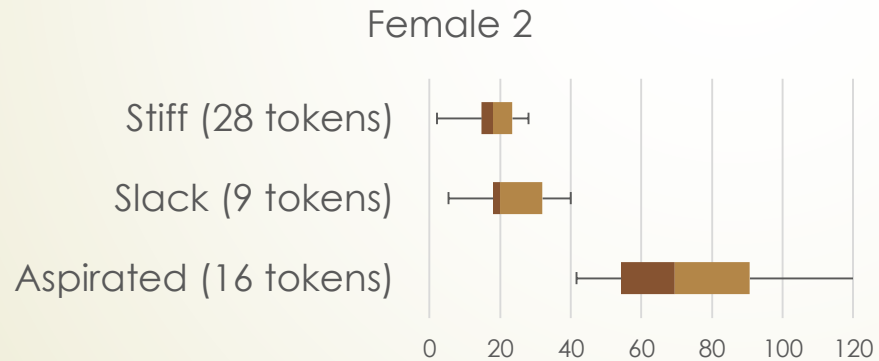
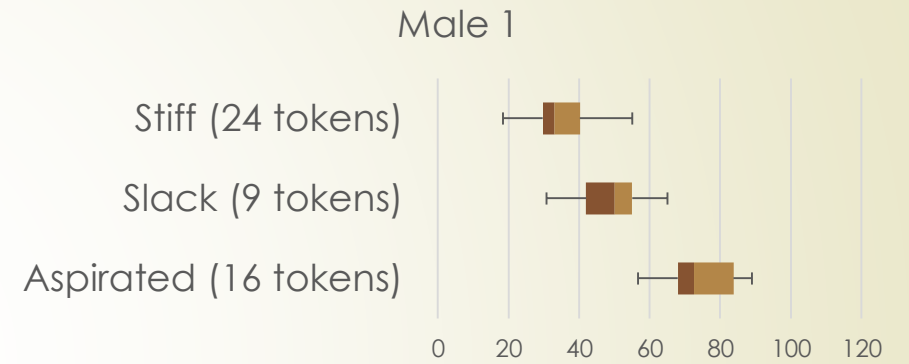
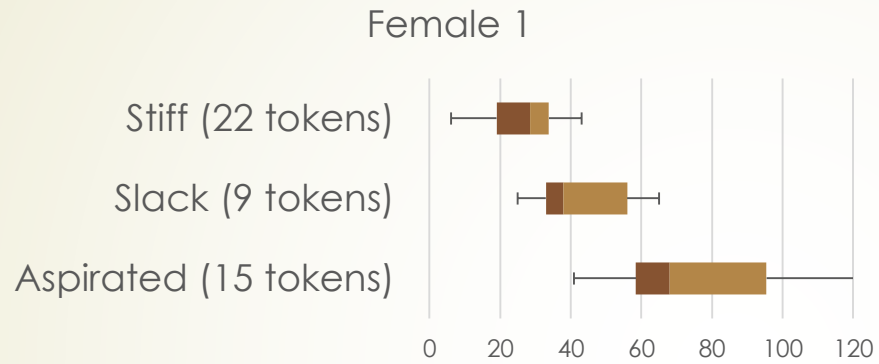
Release Noise (Bilabial)



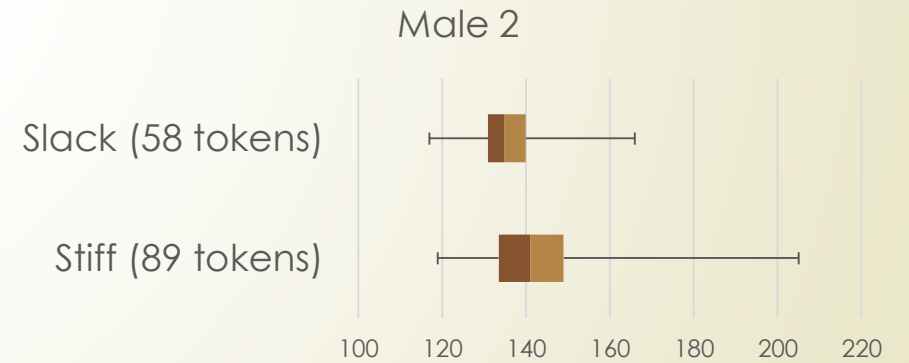
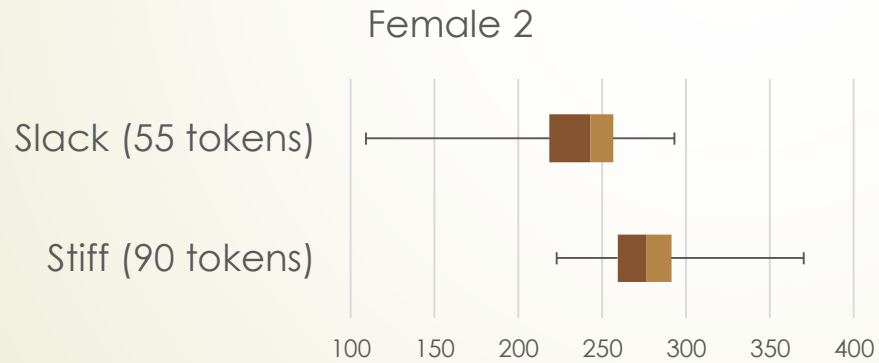
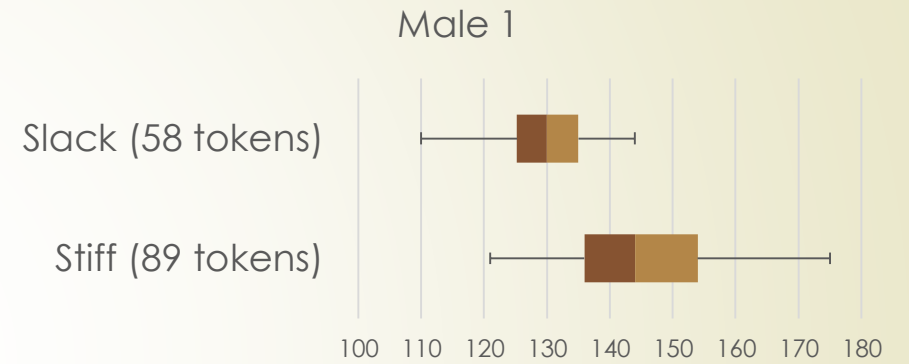
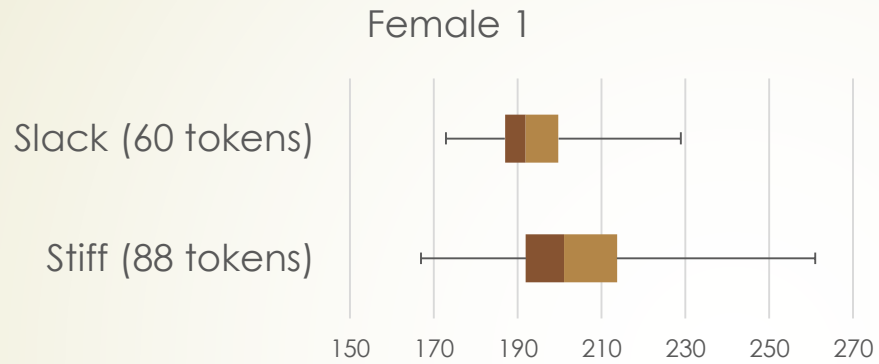
Release Noise (Alveolar)



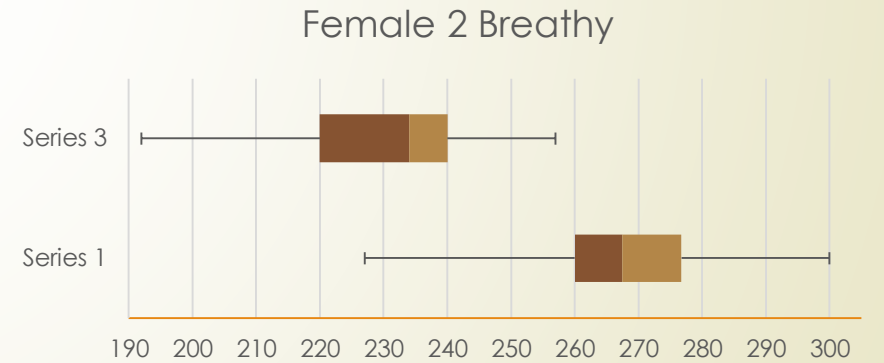
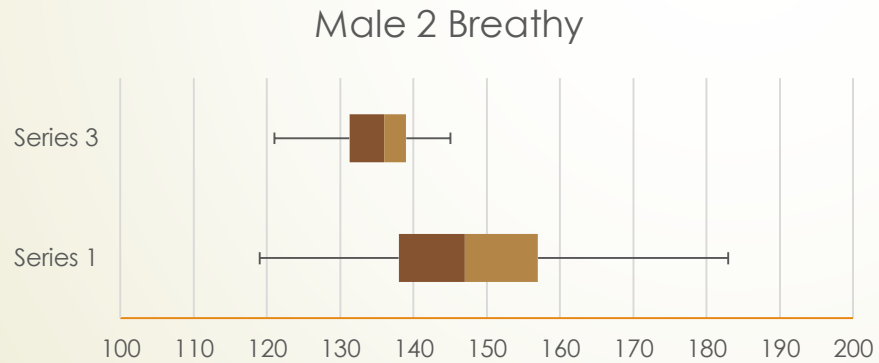
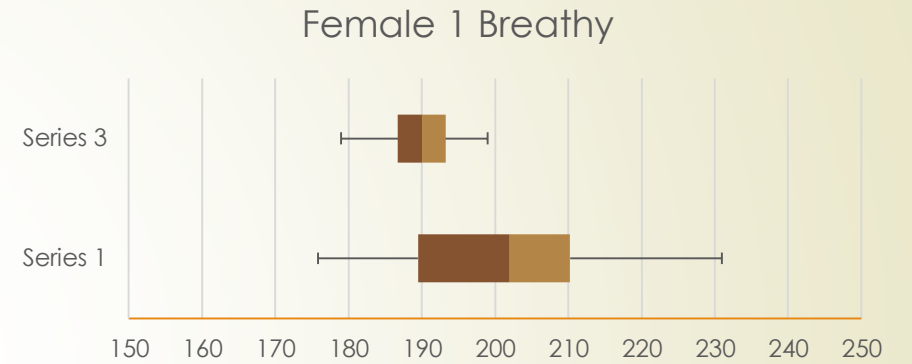
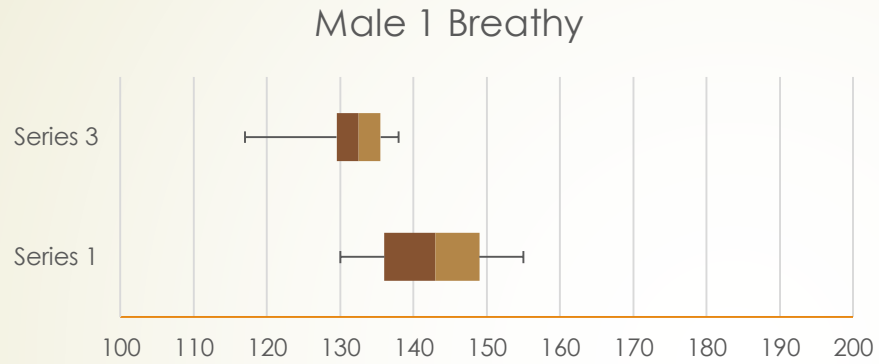
Release Noise (Velar)



F₀ of Vowel Onset

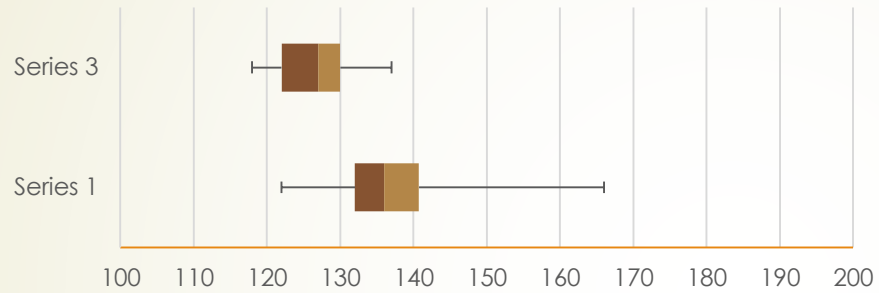


Breathy/High

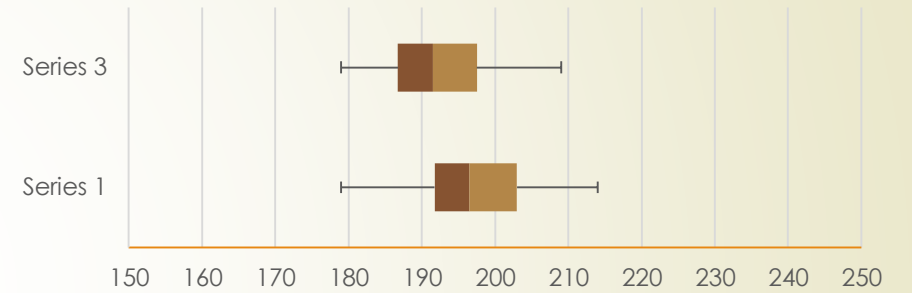


Modal/Low

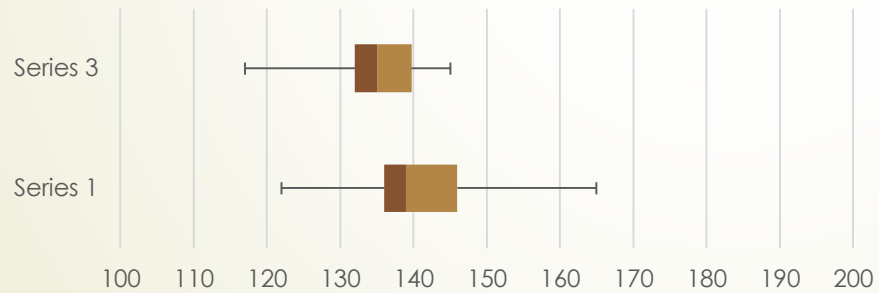
Male 1 Modal



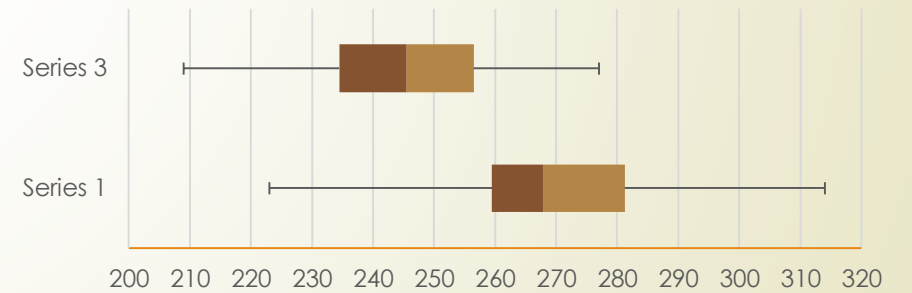
Female 1 Modal



Male 2 Modal

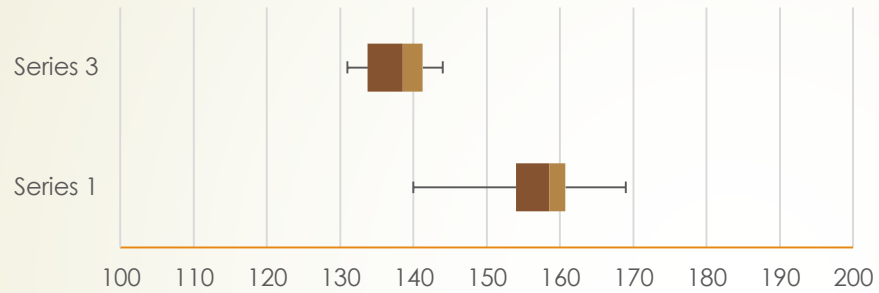


Female 2 Modal

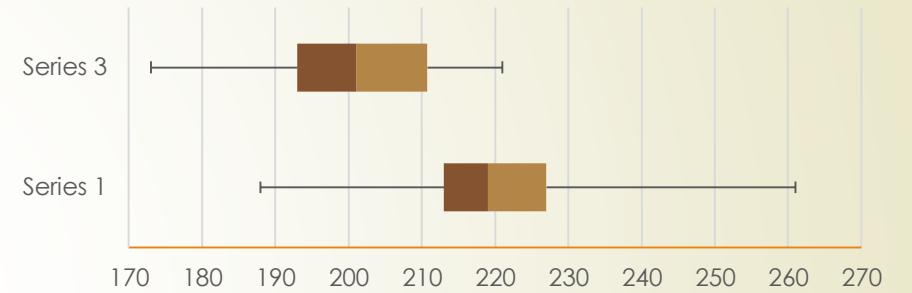


Creaky

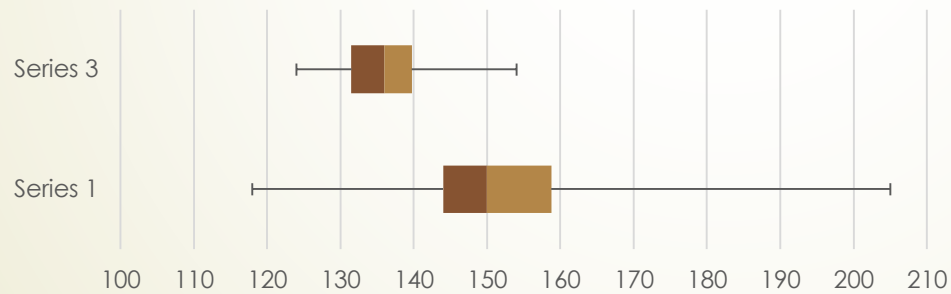
Male 1 Creaky



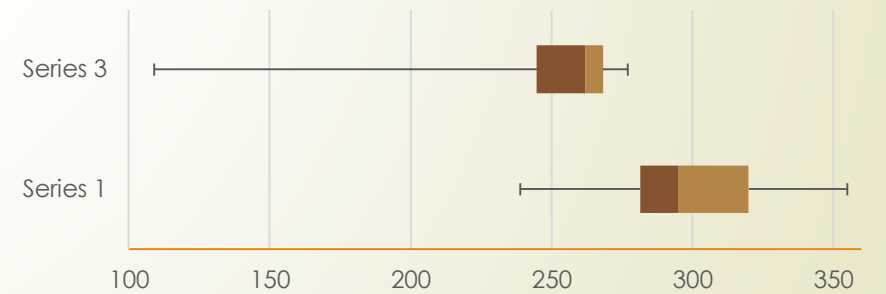
Female 1 Creaky



Male 2 Creaky

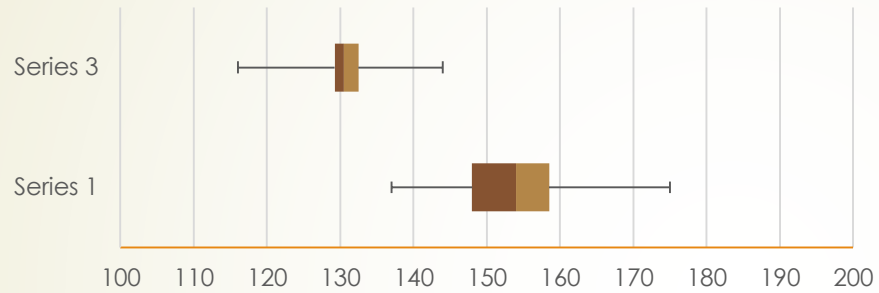


Female 2 Creaky

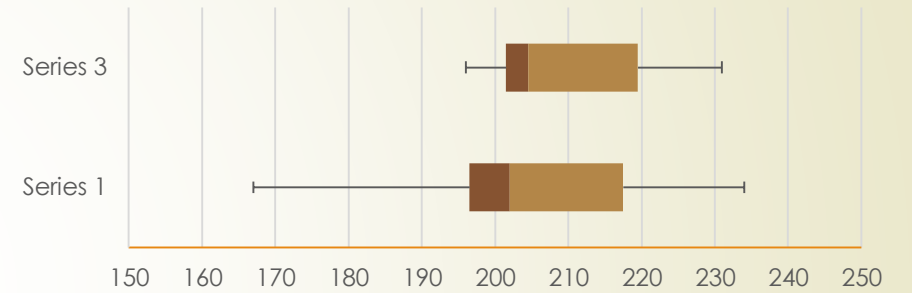


Stopped

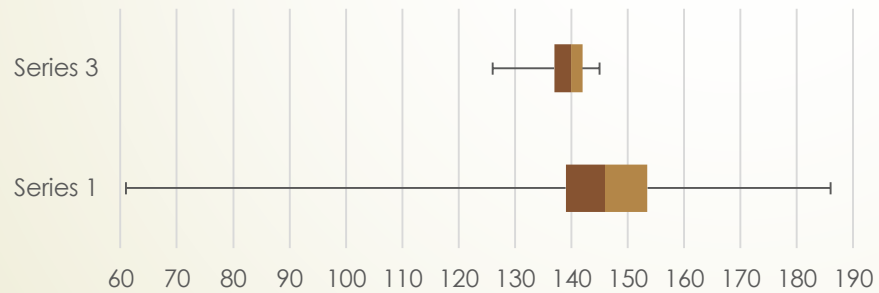
Male 1 Stopped



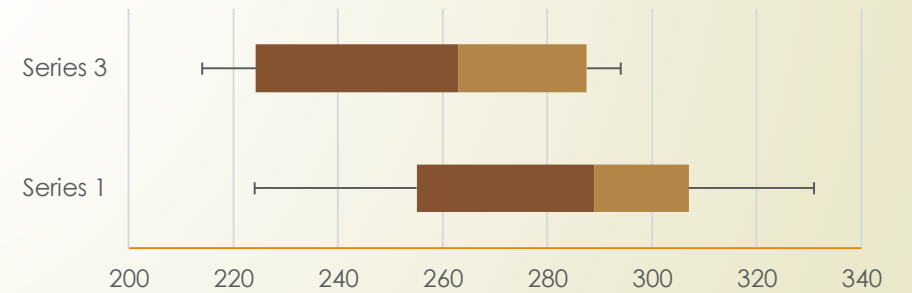
Female 1 Stopped



Male 2 Stopped

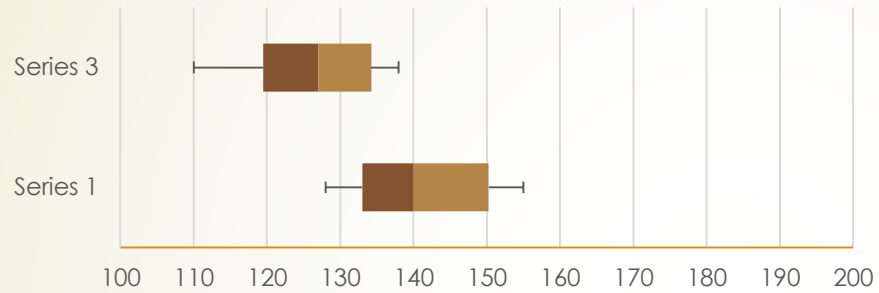


Female 2 Stopped

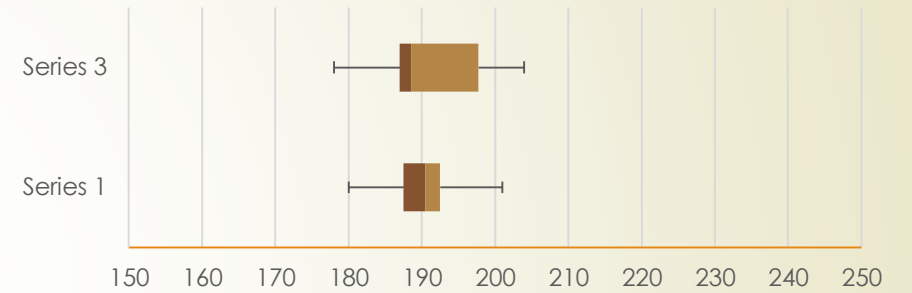


Unstressed/Reduced

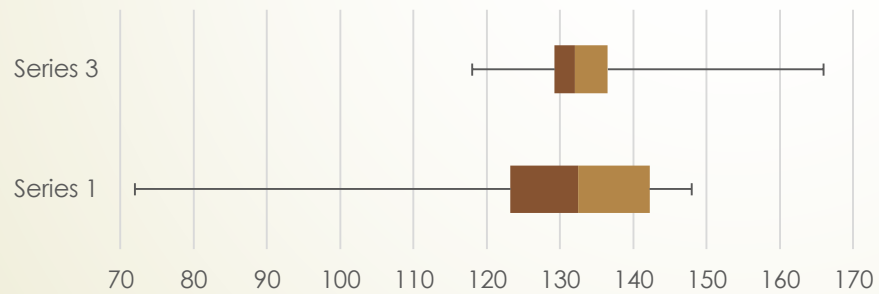
Male 1 Unstressed



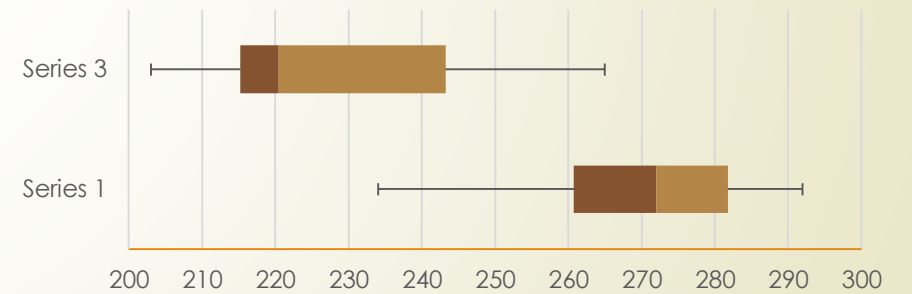
Female 1 Unstressed



Male 2 Unstressed



Female 2 Unstressed





F₁ and Vowel Length

- ▶ F₁ did not show a consistent pattern.
- ▶ Vowel Length also did not show a consistent pattern.



Phonetic Cues


Aspirated

- ▶ Release noise


Stiff and Slack


- ▶ Consonant Length
- ▶ F_0 on the Vowel Onset

Minimal Sets | ʔ: [p^ha] 'frog' | ɔ̃: [pã] 'cheek' | ɔ̃: [pã] 'bar' |

▶ Female 1 

▶ Male 1 

▶ Female 2 

▶ Male 2 



References

- ▶ Armstrong, Liliás E. & Pe Maung Tin. (1925). *A Burmese phonetic reader*. London: University of London Press.
- ▶ Ladefoged, Peter & Maddieson, Ian. (1996). *The Sounds of the World's Languages*. Blackwell, Malden, MA & Oxford.
- ▶ Shiwaruangrote, Nitasakorn. (2000). *A phonological study of Yangon Burmese*. Bangkok: Mahidol University.
- ▶ Son, M. Kim, S., Cho, T. (2012). 'Supralaryngeal articulatory signatures of three-way contrastive labial stops in Korean.' *Journal of Phonetics*, 40(1): 92-108.
- ▶ Watkins, Justin W. (2001). 'Illustrations of the IPA: Burmese.' *Journal of the International Phonetic Association* 31(2): 291-295.
- ▶ Wheatley Julian K. (2003). 'Burmese.' In Thurgood G & LaPolla R J (eds.) *The Sino-Tibetan languages*. London & New York: Routledge. 195–207.