

# Phonetics of Yoruba vowel deletion: durational evidence for hidden structure



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## Introduction

Yoruba contains a reported vowel deletion process where the vowel of a CV verb is deleted before a V-initial direct object:

- /se olú/ → [solú] “cook mushrooms”
- /je edé/ → [jedé] “eat shrimp” (Ola Orié and Pulleyblank 2002)
- /ta ata/ → [tata] “sell pepper”

This pilot study compares the duration of the vowel remaining after deletion (the **remnant vowel**) with the duration of a short vowel in underived environments (a **simple vowel**):

- /tata/ → [tata] “grasshopper”

## Findings

The duration of the remnant vowel is **slightly but significantly longer** than that of the simple vowel.

This suggests the process is **not true phonological deletion**: following theories of containment and mora-sharing, the remnant vowel is not a short vowel but instead **projects two moras**, one of which is shared with **an unpronounced vowel**.

## Methodology

### Subject:

- 30 years old, female
- Speaks Yoruba daily, and also English
- From Kwara State, speaks Igbomina dialect
- Linguistics background, but naive to purpose of study

### Materials:

- Target vowel is [a] to control for inherent duration between vowels
- Vowel always appears between voiceless stops to control for effect of manner and voicing on vowel duration

### Frame sentence:

mo ta \_\_\_\_ lana “I sold \_\_\_\_ yesterday”  
(5 repetitions per target word)

**Recordings** were made in a sound-attenuated booth in the Phonology and Field Research Laboratory at Rutgers University. The subject wore a head-mounted AKG C420 microphone connected through a digital pre-amp, and was recorded in Goldwave at 44.1kHz. The file was saved as a WAV file and segmented in Praat.

**Segmentation** is based on the first and last zero crossing of the regular periodic signal (Francis, Ciocca, and Yu 2003; Ladefoged 2003)

## Results

### Remnant

n = 33      àkàrà    bean cake  
 Mean = 108 ms    aká      cripple  
 Std Dev = 12 ms    akpá     hand  
                          àtíkè    make-up powder  
                          ata      pepper  
                          àkèkè    scorpion  
                          àkpótí   stool

### Simple

n = 15      kpáká field  
 Mean = 96 ms    tata     grasshopper  
 Std Dev = 8 ms    kpákó wood

**Significant: p < 0.001**  
(R t.test)

- The difference in duration is significantly different between remnant and simple vowels.

- There is one minimal pair:

/ta ata/    [tata]    “sell pepper”  
 /tata/    [tata]    “grasshopper”

- This difference is near significance: p = 0.055. A larger sample size should show a more robust difference.

### Minimal pair

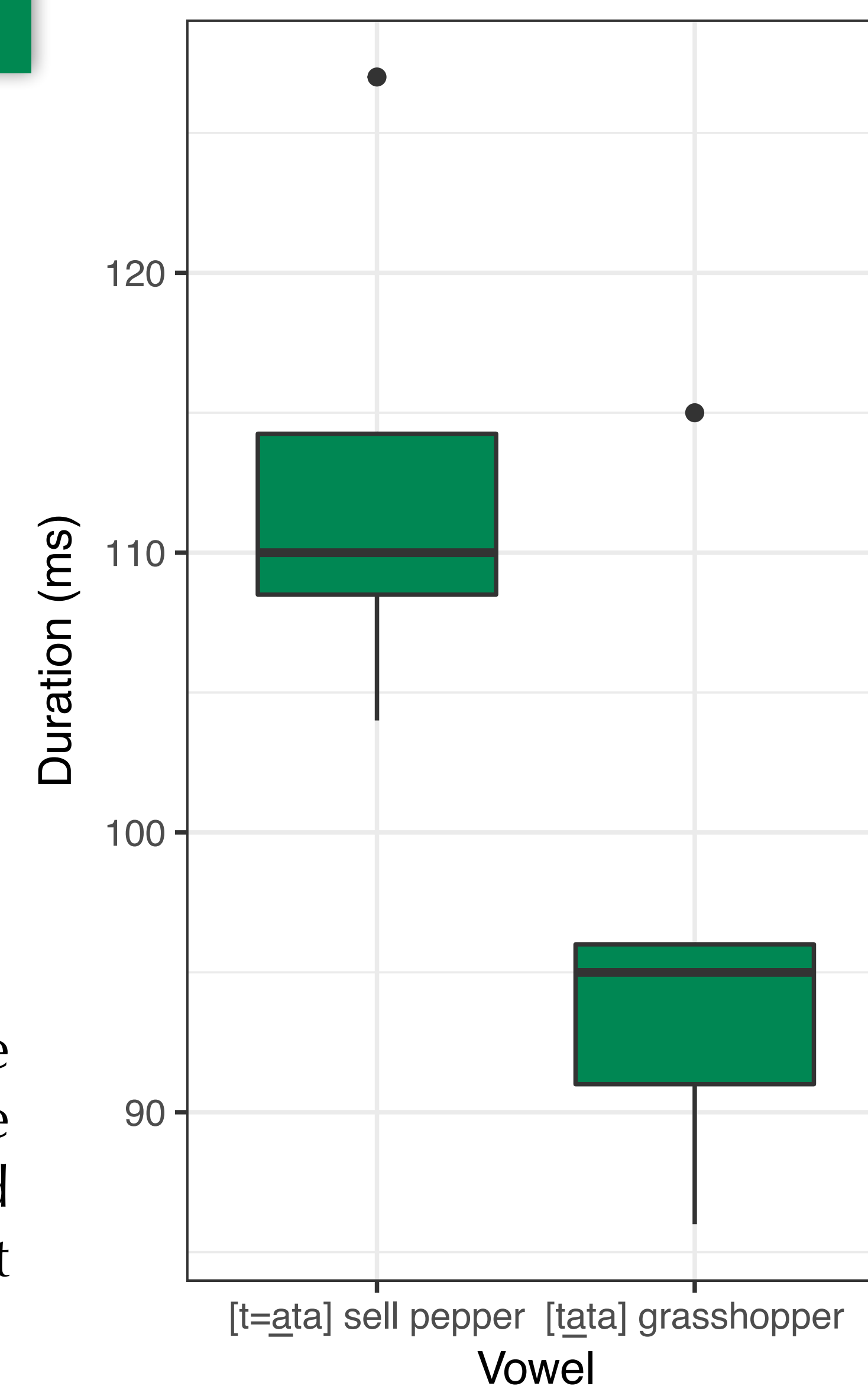


Fig. 2

### Full dataset

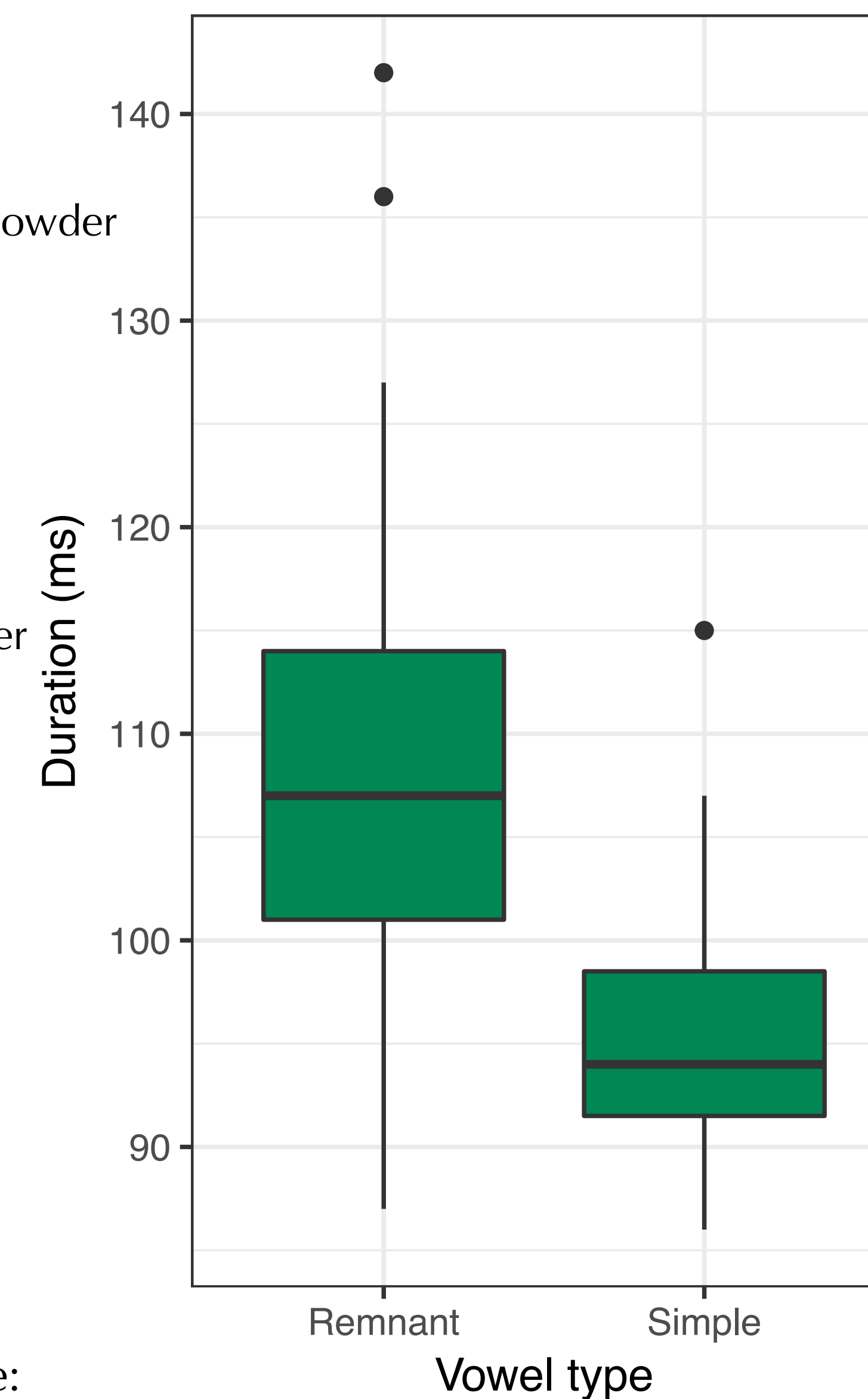


Fig. 1

## Discussion

- The remnant vowels are only about **1.125** times longer than the simple vowels.
  - Cross-linguistically, phonologically long vowels are usually between **1.5-2.5** times longer than phonologically short vowels (Broselow, Chen and Huffman 1997, Hubbard 1995).
- The difference is **at or just below estimates of the Just Noticeable Difference (JND)**: 12ms or 12.5% is the difference here, while Klatt (1976) finds cases where 10ms to 20ms differences are perceptual.

## Enriched prosodic structure

If the remnant vowel is not a true long vowel, what is it?

- Long vowels that share a mora are longer than short vowels, but not as long as true long vowels (e.g. V: > V:C > V) (Broselow, Chen, and Huffman 1997)
- Turbidity theory (Goldrick 2000): vowel “deletion” is the presence of an **unpronounced** vowel in the output structure
- **Claim: Yoruba remnant vowels share a mora with an unpronounced vowel (Fig. 3, cf. Goldrick 2000:(3)).**
- While originally intended to capture opacity effects, Turbidity theory can account for differences in phonetic implementation between short and remnant vowels in Yoruba.

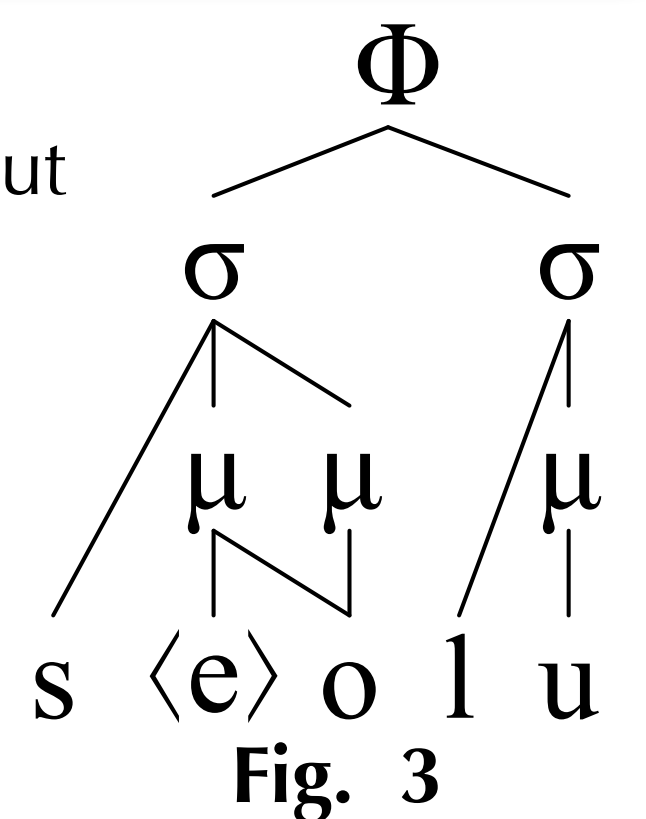


Fig. 3

- By assumption, the phonetic module would spell out Fig 3 as longer than a simple short vowel.
- Compare this with the “full deletion” structure given in OO&P (2002: 119) for the phrase “cook mushrooms” (Fig. 4)
- In this structure, there is nothing to differentiate short vowels from remnant vowels in the phonetic module. This would make it a case of incomplete neutralization (Braver 2013).

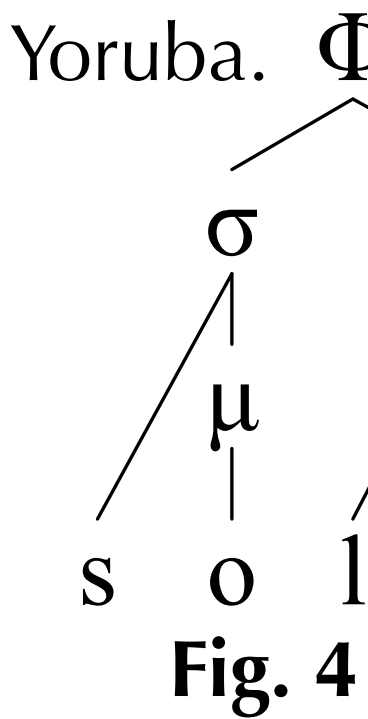


Fig. 4

## Interaction with Syntax?

- Why would the grammar prefer to keep unpronounced segmental material, instead of fully deleting it?
- The results of this study are parallel to the results of a separate study: **L-raising between verb and DO results in a mid tone that is slightly but significantly lower in f0** than an underived or within an NP (Ajíbóyè et al. 2011).

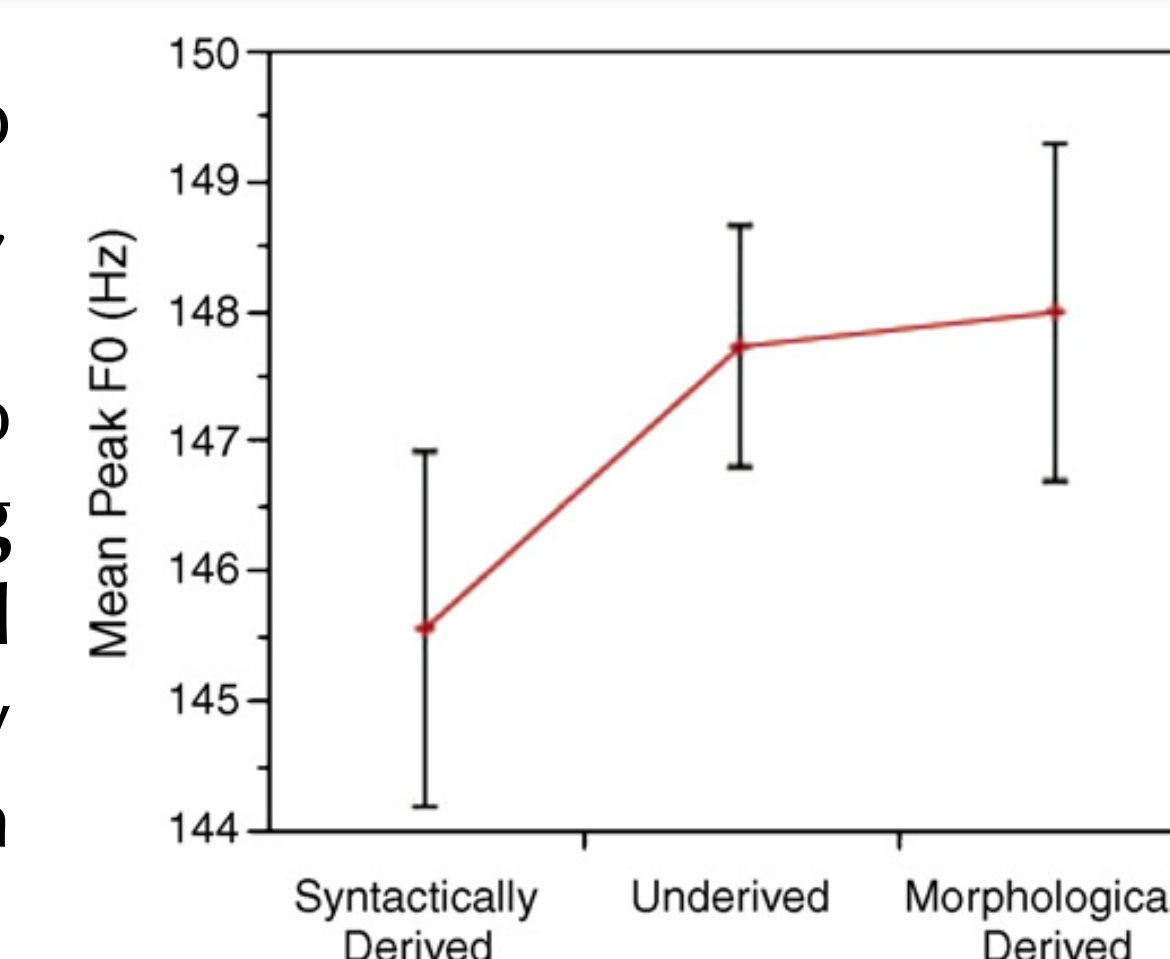


Fig. 5 (Ajíbóyè et al. 2011:1640)

- Ajíbóyè et al. 2011 state that due to the *inclusiveness condition* in syntactic derivations, “after lexical items enter a numeration – when they are active in a derivation – phonological processes may **only insert** unmarked features.” (p. 1641)
- In other words, that this occurs as part of a larger syntactic derivation, **the phonology cannot delete, only insert.**

Is the preservation of the unpronounced vowel due to this same condition that Ajíbóyè et al. 2011 argue for tones? Vowel deletion also occurs in the same morphological environments as the completely neutralized M tones:

### Deletion within an NP:

/owó kí owó/ → owókwó “any money at all/bad money”  
 /omo kí omo/ → omokómo “any child at all/bad child”  
 (OO&P 2002: 102)

Is the duration of these vowels more like the simple vowels, or more like the remnant vowels? A future experiment can test.

## References and Acknowledgements

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