Myanmar (Burmese) Plosives

Three-way voiceless contrast?
Orthographic Contrasts

<table>
<thead>
<tr>
<th>Series</th>
<th>Bilabial</th>
<th>Dental</th>
<th>Alveolar</th>
<th>Velar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series 1</td>
<td>ပ</td>
<td>သ</td>
<td>တ</td>
<td>က</td>
</tr>
<tr>
<td>Series 2</td>
<td>ဖ</td>
<td>ထ</td>
<td>ခ</td>
<td></td>
</tr>
<tr>
<td>Series 3</td>
<td>ဘ</td>
<td>ဗ</td>
<td>သ (allophone)</td>
<td>ဒ</td>
</tr>
</tbody>
</table>

- 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”
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 (ရန်ကုန်).
- 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

- 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.

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<th>Dental</th>
<th>Alveolar</th>
<th>Velar</th>
</tr>
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<tbody>
<tr>
<td>Series 1</td>
<td>&quot;voiceless&quot;</td>
<td>၀</td>
<td>ဝ</td>
<td>ဝ</td>
</tr>
<tr>
<td>Series 2</td>
<td>&quot;aspirated&quot;</td>
<td>၀</td>
<td>ဝ</td>
<td>ဝ</td>
</tr>
<tr>
<td>Series 3</td>
<td>&quot;voiced&quot;</td>
<td>ဝ ၀</td>
<td>ဝ (allophone)</td>
<td>ဝ ဝ</td>
</tr>
</tbody>
</table>
Voicing in Isolation

Series 1 ("voiceless")
- Total: 181
  - Voiceless plosive: 1
  - Devoiced plosive: 1

Series 3 ("voiced")
- Total: 114
  - Voiceless plosive: 1
  - Devoiced plosive: 1
Voicing in Frame

Series 1 ("voiceless")
- voiceless plosive: 1
- voiceless approximant: 8
- devoiced plosive: 4
- devoiced tap: 22
- voiced plosive: 2
- voiced approximant: 140

Series 3 ("voiced")
- voiceless plosive: 2
- voiceless approximant: 20
- devoiced plosive: 15
- devoiced approximant: 17
- voiced plosive: 4
- voiced approximant: 56
voiceless plosive [p]

(ပီယဆေး: ‘charm’)
voiceless approximant [x] (ကီးမား 'kind of snack')
devoiced plosive [d̥] (တီဆကာင် ‘earthworm’)
devoiced approximant [β] (ไหว ‘life’)

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voiced plosive [b] (缈 ‘great-great grandfather’)

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voiced approximant $[\beta]$ (ပိစိဆကေး: ‘something very small’)

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voiced tap [ɾ] (‘donor’)

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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
  - $F_1$
  - Vowel Length
- We did not measure phonation on the vowel onset.
  - This may be important phonetic cue.
Consonant Length

Female 1

Slack (58 tokens)

Stiff (47 tokens)

Male 1

Slack (29 tokens)

Stiff (48 tokens)

Female 2

Slack (31 tokens)

Stiff (51 tokens)

Male 2

Slack (28 tokens)

Stiff (46 tokens)

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Release Noise (Bilabial)

Female 1
- Stiff (22 tokens)
- Slack (16 tokens)
- Aspirated (20 tokens)

Male 1
- Stiff (20 tokens)
- Slack (20 tokens)
- Aspirated (20 tokens)

Female 2
- Stiff (21 tokens)
- Slack (24 tokens)
- Aspirated (20 tokens)

Male 2
- Stiff (18 tokens)
- Slack (19 tokens)
- Aspirated (20 tokens)
Release Noise (Alveolar)

Female 1
- Stiff (20 tokens)
- Slack (18 tokens)
- Aspirated (18 tokens)

Female 2
- Stiff (22 tokens)
- Slack (19 tokens)
- Aspirated (18 tokens)

Male 1
- Stiff (22 tokens)
- Slack (20 tokens)
- Aspirated (18 tokens)

Male 2
- Stiff (20 tokens)
- Slack (20 tokens)
- Aspirated (18 tokens)
Release Noise (Velar)

Female 1
- Stiff (22 tokens)
- Slack (9 tokens)
- Aspirated (15 tokens)

Male 1
- Stiff (24 tokens)
- Slack (9 tokens)
- Aspirated (16 tokens)

Female 2
- Stiff (28 tokens)
- Slack (9 tokens)
- Aspirated (16 tokens)

Male 2
- Stiff (24 tokens)
- Slack (6 tokens)
- Aspirated (16 tokens)
Breathy/High

Male 1 Breathy

Female 1 Breathy

Male 2 Breathy

Female 2 Breathy
Modal/Low

**Male 1 Modal**

- Series 3
- Series 1

**Female 1 Modal**

- Series 3
- Series 1

**Male 2 Modal**

- Series 3
- Series 1

**Female 2 Modal**

- Series 3
- Series 1

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Creaky

Male 1 Creaky

Series 3
Series 1

100 110 120 130 140 150 160 170 180 190 200

Male 2 Creaky

Series 3
Series 1

100 110 120 130 140 150 160 170 180 190 210

Female 1 Creaky

Series 3
Series 1

100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270

Female 2 Creaky

Series 3
Series 1

100 150 200 250 300 350

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Stopped

Male 1 Stopped

Series 3
Series 1

100 110 120 130 140 150 160 170 180 190 200

Male 2 Stopped

Series 3
Series 1

60 70 80 90 100 110 120 130 140 150 160 170 180 190

Female 1 Stopped

Series 3
Series 1

150 160 170 180 190 200 210 220 230 240 250

Female 2 Stopped

Series 3
Series 1

200 220 240 260 280 300 320 340

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Unstressed/Reduced

Male 1 Unstressed

Series 3

Series 1

100 110 120 130 140 150 160 170 180 190 200

Male 2 Unstressed

Series 3

Series 1

70 80 90 100 110 120 130 140 150 160 170

Female 1 Unstressed

Series 3

Series 1

150 160 170 180 190 200 210 220 230 240 250

Female 2 Unstressed

Series 3

Series 1

200 210 220 230 240 250 260 270 280 290 300
F₃ and Vowel Length

- F₃ 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

- Female 1
- Male 1
- Female 2
- Male 2
References