Using root shape to choose among prefixes in Xhosa

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Introduction

• Bantu languages are famous their complex noun class systems

• Q: How do speakers learn noun class membership?

• Q: How do speakers choose among noun class prefix allomorphs?

Xhosa [||ʰɔsə]

• Bantu (Nguni)

• South Africa’s Eastern Cape and surroundings

• Approximately 8.2 million speakers

Noun classes in Xhosa

<table>
<thead>
<tr>
<th>Singular</th>
<th>Plural</th>
<th>Class</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>um-nt'u</td>
<td>a6o-nt'u</td>
<td>1/2</td>
<td>person</td>
</tr>
<tr>
<td>u-mama</td>
<td>ooa-mama</td>
<td>1a/2a</td>
<td>mama</td>
</tr>
<tr>
<td>um-lambo</td>
<td>imi-lambo</td>
<td>3/4</td>
<td>river</td>
</tr>
<tr>
<td>i-gama</td>
<td>ama-gama</td>
<td>5/6</td>
<td>name</td>
</tr>
<tr>
<td>isi-ca</td>
<td>izi-ca</td>
<td>7/8</td>
<td>dish</td>
</tr>
<tr>
<td>i-ŋk’omo</td>
<td>i-ŋk’omo</td>
<td>9/10</td>
<td>cow</td>
</tr>
<tr>
<td>uulu-su</td>
<td></td>
<td>11</td>
<td>stomach</td>
</tr>
</tbody>
</table>
Noun class membership and root phonotactics in Xhosa

<table>
<thead>
<tr>
<th>Class 5</th>
<th>Class 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>ili-fu</td>
<td>ama-fu</td>
</tr>
<tr>
<td>ili-ce</td>
<td>ama-ce</td>
</tr>
<tr>
<td>i-ndźa</td>
<td>izi-ndźa</td>
</tr>
<tr>
<td>i-n’o</td>
<td>izi-n’o</td>
</tr>
</tbody>
</table>

Homophonic prefixes

- With long (2+ syllable) nouns, classes 5 and 9 can both be [i-]:
  - ikʰaya ama-ikʰaya 5/6 'home'
  - igama ama-gama 5/6 'name'
  - i-moto ili-moto 9/10 'car'
  - i-t khômo ili-t khômo 9/10 'cow'

Disambiguating classes 5 and 9

- Short (1 syllable) nouns:
  - ili-fu ama-fu 5/6 'cloud'
  - ili-ce ama-ce 5/6 'stone'
  - i-ndźa izi-ndźa 9/10 'dog'
  - i-n’o izi-n’o 9/10 'thing'

The history of classes 5 and 9

- Class 5: *li > i(li)
- Class 9: *ni > i(n)

(Doke 1954)

- Class 9 nouns often retain the nasal:
  - i-ndźa ‘dog’, i-t khômo ‘cow’, etc
  - But not all words have the nasal in the prefix:
    - i-moto ‘car’
    - i-cuwa ‘salt’
    - i-nilika ‘traditional honey beer’
Post-nasal alternations

• When the class 9 adjectival prefix (en-) is added to roots:
  – de-aspiration (-kʰulu 'big' > en-k’ulu 'cl.9-big')
  – hardening (-t’e ‘good’ > en-t’l’e ‘cl.9-good’)

• This doesn’t happen with class 5
  – ∴ unaspirated and ‘hard’ initial Cs may signal class 9

Historical change leads to synchronic phonotactics

If –kʰaja takes the class 9 prefix with a nasal, deaspiration occurs and the modern version surfaces as –kaja.

If –kʰaja takes the class 5 prefix with no nasal, deaspiration doesn’t occur and the modern version surfaces as –kʰaja

• Class 9 nouns historically lost initial aspirated and non-hardened Cs

• Class 5 nouns didn’t go through this process and so may surface with aspirated and non-hardened Cs
The prediction

• Ambiguous i-$C_1$VC$_2$V nouns:
  – If $C_1$ is a sound that would result from a post-nasal consonant change (i.e. unaspirated or hard), it’s likely to be class 9
  – If $C_1$ is a sound that would undergo a post-nasal consonant change (i.e. aspirated or non-hard), it’s likely to be class 5

Testing the prediction

• Wug task
  – Nonce items don’t have any semantic clues to noun class

Stimuli

• 20 nonce nouns
  – 10 with shape i-CV (short)
  – 10 with shape i-CVCV (long)

• First C is either:
  – An undergoer of post-nasal changes, or
  – A result of post-nasal changes
  – Five of each, for each noun shape (=20 total)
Method: on each trial...

**Singular** (isinye) **Plural** (isinini)

ikhelu → ____

- Shown a singular nonce noun
- Speakers read the singular form, then produced a plural form

Method: expectations

- If C1 is a post-nasal change *undergoer* (fricative, aspirate, implosive, /l/), speakers should treat the word as class 5/6 and give plural forms with ama-

- If C1 is the *result* of a post-nasal change (voiced, unaspirated, nasal), speakers should treat the word as class 9 and give plural forms with ii(N)- or izi(N)-

Method

- Stimuli presented on a laptop in random order
- Participants saw 3 real-noun sg/pl examples in the instructions, then did 14 practice items

Participants

- 10 native speakers of isiXhosa
  - 5 male, 5 female
  - Age
    - Range: 21–42
    - Mean: 26
  - Other languages
    - English (≈all)
    - Afrikaans (2)
    - Zulu (2)
    - Sotho (2)
Results

- Speakers choose class 5/6 (ama) when initial C is an 
undergoer, and 9/10 (ii) when C is a 
result
Summary

- Speakers have intuitions about nonce words’ noun class membership

- The status of initial consonants as results or undergoers of post-nasal changes influences speakers’ decisions
  - Undergoers are likely to be class 5/6, while results are likely to be class 9/10

Discussion

- Synchronic phonotactics can come from historical patterns

- Speakers make use of phonotactic clues in determining noun class

- Noun classes aren’t simply semantic or arbitrary—phonology plays a role

Background

- Xhosa noun class prefixes alternate based on the length of the following root

- Are these alternations synchronically productive, or just the vestiges of historical change?

- We argue that these alternations are part of speakers’ synchronic grammars
Length-based allomorphy in class 10

- Class 10:
  - izi(N)- before 1-syllable roots
  - ii(N)- elsewhere

<table>
<thead>
<tr>
<th>Singular (9)</th>
<th>Plural (10)</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>in- têm</td>
<td>izin- têm</td>
<td>‘thing(s)’</td>
</tr>
<tr>
<td>in-dlsu</td>
<td>izin-dlsu</td>
<td>‘house(s)’</td>
</tr>
<tr>
<td>in-dkela</td>
<td>lin-dkela</td>
<td>‘road(s)’</td>
</tr>
</tbody>
</table>

Length-based allomorphy in class 5

- Class 5:
  - ili- before 1-syllable roots
  - i- elsewhere

<table>
<thead>
<tr>
<th>Singular (5)</th>
<th>Plural (6)</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>ili-fu</td>
<td>ama-fu</td>
<td>‘cloud(s)’</td>
</tr>
<tr>
<td>ili-ce</td>
<td>ama-ce</td>
<td>‘stone(s)’</td>
</tr>
<tr>
<td>i-epʰe</td>
<td>ama-epʰe</td>
<td>‘spoon(s)’</td>
</tr>
</tbody>
</table>

Length-based allomorphy in class 11

- Class 11:
  - ulu- before 1-syllable roots
  - u- elsewhere

<table>
<thead>
<tr>
<th>Singular (11)</th>
<th>Plural</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>ulu-vo</td>
<td>izim-vo</td>
<td>‘opinion(s)’</td>
</tr>
<tr>
<td>ulu-su</td>
<td>izin-tsʰu</td>
<td>‘skin(s)’</td>
</tr>
<tr>
<td>u-pʰondo</td>
<td>iim-pʰondo</td>
<td>‘horn(s)’</td>
</tr>
</tbody>
</table>

Possible representations

a. Remnant of a historical process; only in the lexicon (learned for each word)

b. Synchronic phonological pattern; active in the grammar (learned as a rule)
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a. Remnant of a historical process; only in the lexicon (learned for each word)
   - Speakers shouldn’t apply the pattern to novel words or nonce items

b. Synchronic phonological pattern; active in the grammar (learned as a rule)
   - Speakers should apply the pattern to novel words or nonce items

Experiment design

• Wug task
  - Nonce items aren’t stored lexically, so any alternation must be a synchronic pattern
  - Singular ↔ Plural

• Block 1: ii(n) ~ ízí(n) (class 10 plurals)
• Block 2: i- ~ íli- (class 5 singulars)

Experiment 2

Block 1 (class 9/sg. → 10/pl.): Stimuli

• Singular class 9 → plural class 10
  - 10 monosyllabic roots
  - 10 disyllabic roots

  - 20 filler/distractor items (part of a separate experiment)
    • 10 monosyllabic, 10 disyllabic
Block 1: Task

- Block 1 (9/sg. → 10/pl.)
  - On each trial, speakers see a singular nonce noun with the class 9 prefix i(N)-
  - Speakers produce the plural of that nonce noun, with one of the two class 10 allomorphs, izi(N)- or ii(N)-

Block 1 (9/sg. → 10/pl.): Examples

- into → izint’o or iint’o
- indlu → izindłu or iindłu
- indlela → izindłela or iindłela
- intombi → izint’ombi or iint’ombi

Block 2 (class 6/pl. → 5/sg.): Stimuli

- Plural class 6 → singular class 5
  - 10 monosyllabic roots
  - 10 disyllabic roots
  - distinct from block 1
  - 20 filler/distractor items (part of a separate experiment)
    - 10 monosyllabic, 10 disyllabic
    - distinct from block 1

Block 2: Task

- Block 2 (6/pl. → 5/sg.)
  - On each trial, speakers see a plural nonce noun with the class 6 prefix ama-
  - Speakers produce the singular of that nonce noun, with one of the two class 5 allomorphs, ili- or i-
Block 2 (6/pl. → 5/sg.): Examples

- amafu → ififu or ifu
- amace → ilice or ice
- amacephe → ili|eph e or i|eph e
- amadada → ilidada or idada

Participants

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Data capture

- Stimuli presented on a laptop in random order
- Participants saw 3 real-noun sg/pl examples in the instructions, then did 14 practice items
- Audio recorded, responses coded for class prefix added

Results

- In both blocks, speakers’ knowledge of length-based prefix alternations extends to novel words
Results: Block 1 (9/sg. → 10/pl.)

- Speakers were more likely to use izi(N)- with short roots and ii(N) with long roots

The “other” category

- Real class prefixes, but not izi(n)- or ii(n)-
- Most common: ama- (class 6 pl.)
- Two likely reasons for ama- responses
  - i-CVCV forms may be ambiguous between class 5 i(li)- and class 9 i(n)-
  - Some common nouns in class 9 have class 6 plurals (a 9/sg.-6/pl. paradigm exists)
    ex: in-doda → ama-doda ‘man’ / ‘men’

Results: Block 2 (6/pl. → 5/sg.)

- Speakers were more likely to use ili- with short roots and i- with long roots

um-

- “Other”: responses other than i- and ili-
- Most common responses:
  - um- (class 1 or 3)
  - u- (class 1a or 11)
- A likely explanation for um-s:
  - Most clan names and other ethnonyms follow an irregular 1/sg. → 6/pl. paradigm
  - ex: um-Xhosa → ama-Xhosa ‘Xhosa person/people’
Summary

• Xhosa speakers use root length to decide between class prefix allomorphs

• This alternation is represented in speakers’ synchronic grammars

Summary

• Length-based alternations are not just a historical vestige
  – Speakers have some linguistic awareness of length as the basis for the allomorphy
  – They can extend that knowledge to the treatment of novel words; it’s not lexicalized

• Consistent with other phonological evidence for bisyllabic minimal stem

Conclusion
Conclusion

• Speakers demonstrate multiple levels of awareness of phonotactic patterns across root-prefix combinations
  – Segmental co-occurrence patterns: nasality, aspiration
  – Metrical structure: length, minimalinity
• Laboratory phonology methods reveal new insights in unders