ACAL 56: UNIVERSITY OF MINNESOTA

CLICK PERCEPT!ON

IN NGUNI: NEW EXPERIMENTAL EVIDENCE

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A BIT OF A CONUNDRUM

- Why are clicks…?
  - Hand 1: super salient (the only Cs consistently louder than Vs, e.g.)
  - Hand 2: rare, restricted, limited in distribution qua consonants
- There are contradictory intuitions afoot
  - Clicks are very easy to recognize…as different from nonclicks
  - Click vs click distinctions don't seem nearly so easy to discern

P-MAPPING CLICKS

- Steriade (2001/2008) P-map: confusability of a given contrast…
  - is different in different contexts
  - projects relative ranking of faithfulness constraints (less distinct ~> less important to distinguish)
- This sets up oddball expectations for clicks:
  - faithfulness for "clickiness" is supreme (predicts clicks are hard to get rid of)
  - faithfulness among clicks less crucial (because less salient)
  - unfaithful click-to-click mappings should exist (but they don't)

a.

Obstruent voicing	V_V	C_V	V_R	V_]	V_T	C_T
p/ b	p/b	p/b	p/b	p/b	p/b	p/b
t/ d	t/d	t/d	t/d	t/d	t/d	t/d
k/ g	k/g	k/g	k/g	k/g	k/g	k/g
s/z	s/z	s/z	s/z	s/z	s/z	s/z

CLICKS SHOULD BE EASY TO PERCEIVE

- Ladefoged & Traill (1994:45), !Xóõ
  - "clicks are probably the most salient consonants"
  - clicks easier to ID than non-clicks
- masking level test: confounds loudness and spectral distribution
- only looked at plain [ʘ | ! ǁ ǂ] vs. pulmonic consonants (doesn't establish any click~click baseline)

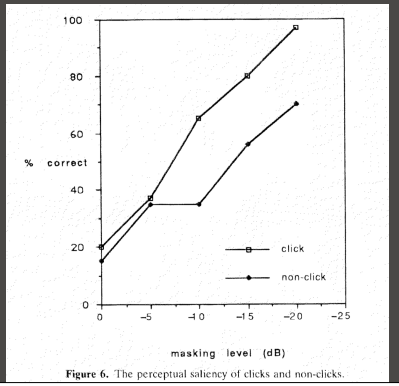

Figure 6. The perceptual saliency of clicks and non-clicks.

CLICKS SHOULD BE EASY TO PERCEIVE

- Most previous studies of click perception focus on non-native listeners (Best et al. 1988, 1999, 2003, 2008, 2020, among others)
  - American click-naïve listeners do not perceive clicks as speech sounds
  - Click-naïve listeners still extremely good at AXB discrimination (worst participant still 81% correct, cf. Zulu listener avg. 87%)
- Best et al. (2003) compare Sesotho & Zulu listeners, but both groups listened only to fricated clicks from !Xóõ, which are an obviously non-native category for them
- Point: none of these establish clear baseline expectations for the perceptibility of, e.g., different Zulu click contrasts by Zulu-speaking listeners

CLICKS ARE PERCEIVED TO BE DIFFICULT

- Anecdotal evidence abounds that people regard clicks as complex and difficult to master
  - probably not *just* an artifact of eurocentrism in descriptions ("*exotic!*")
  - Articulatory complexity seems obviously higher than non-clicks
  - RU undergraduates describe clicks as hard - even L1 Xhosa speakers
- Try it and see
  - click contrast test 1
  - click contrast test 2

FAILED ATTEMPTS AT REPLICATING PREVIOUS FINDINGS

- Pilot 1: ABX task, attempting to probe type vs accompaniment contrasts, using v!v intervals excised from real words, both Xhosa and click-experienced English speakers (Miller 2020)
  - all participants at chance (top performer ~54%) 😵
- Pilot 2: AXB task, new stimuli recordings of nonce a!a sequences
  - all participants still at chance; they can't discriminate
  - very much at odds with Best's findings; even L1 listeners failed to recover the contrasts from this set of stimuli

TODAY'S EXPERIMENT: DESIGN

- AXB paradigm, audio presentation, all CVCV nonce sequences
- Bipartite structure, stimuli recorded by Khethani Yende
- Side A: click type contrasts (c ~ q ~ x) (dental ~ alveolar ~ lateral)
  - intended to probe for differences based on dialect/accent
  - is c ~ q variation rooted in perceptual difference? (Yende 2023, in prep)
- Side B: two tranches
  - "Count" (!ada vs !a!a) (cf. Gallagher 2010)
  - "Site" (!ada vs da!a)
- Each side served as distractors from the other

PARTICIPANTS

- Batch 1 (2023): 12 L1 speakers of Zulu recruited by Khethani Yende using word of mouth + snowball sampling
- Targeted recruitment to probe for regional/dialect variation
  - one group of speakers from Gauteng (=urban Zulu, "Sowetan" Zulu)
  - one group of speakers from KZN ("proper" Zulu, "deep" Zulu)
- Batch 2 (2025): 33 more Zulu speakers recruited on campus at Rhodes University; some from Gauteng, some KZN, some Eastern Cape
- All could also speak multiple languages (English, etc.)

PERCEPTIBILITY VARIATION BY PLACE

c ~ q	😩
c ~ x	😶
x ~ q	😶

- "Click type": synonymous with front closure place of articulation distinctions
  [IPA key: c = | x = ǁ q = !]
- c ~ q: attested as free variation (Gunnink 2014)
  ~> Yende's hypothesis: speakers with free variation struggle to perceive contrast
- c ~ x: predictions unclear
- x ~ q: predictions unclear

PERCEPTIBILITY VARIATION BY CLICK CONTEXT

da!a	😠
!ada	🙂
!a!a	🤷‍♂️

- Some contradictory intuitions here
  - !ada > da!a would make sense bc initial prominence
  - But: da!a > !ada makes sense if the preceding vowel carries some of the acoustic cues of !
- Cross-interaction likely; different contrasts are made with different cues (burst vs VOT, e.g.)
- Also, count is a thing we looked at (!ada vs !a!a)

PERCEPTIBILITY VARIATION BY CLICK CONTEXT

"Site"

da!a	😠
!ada	🙂
!a!a	🤷‍♂️

- Some contradictory intuitions here
  - !ada > da!a would make sense bc initial prominence
  - But: da!a > !ada makes sense if the preceding vowel carries some of the acoustic cues of !
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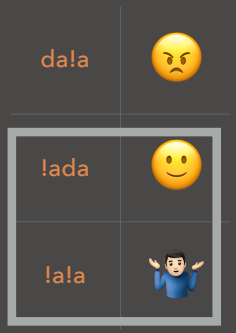

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RESULTS

ANALYSIS

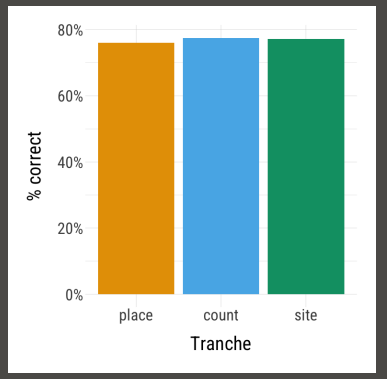
- Logistic mixed effects model (via `glmer`)
  - Fixed effects: tranche, batch, place, correct answer, province
  - Random effects: intercepts for item and participant
- Marginal means computed and pairwise tests (via `marginaleffects`)

BIRD'S EYE VIEW

- Correct perception is similar in each tranche:

Tranche	% correct
place	76.08%
count	77.53%
site	77.15%

- More in line with Best's prior work



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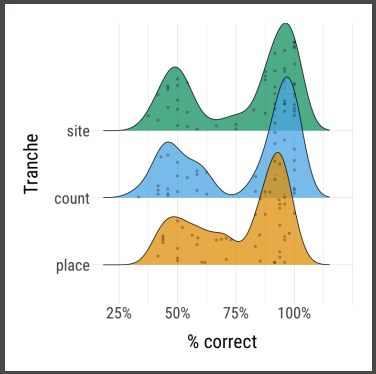
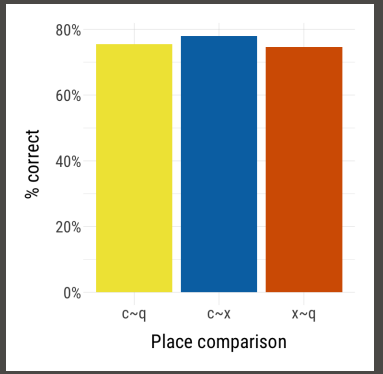


PLACE COMPARISONS

Places	% correct
c ~ q dental ~ alveolar	75.51%
c ~ x dental ~ lateral	78.04%
x ~ q lateral ~ alveolar	74.69%



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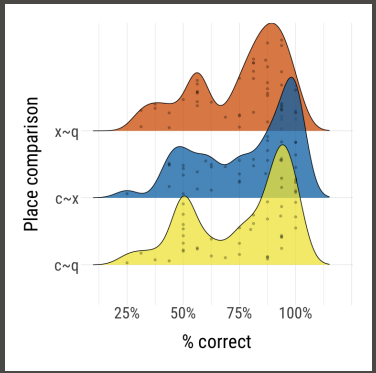
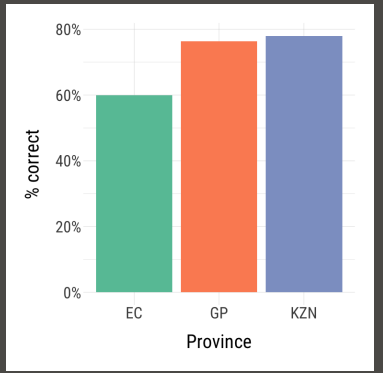


PLACE TRIALS BY PROVINCE

Province	% corr.
Eastern Cape (EC)	59.90%
Gauteng (GP)	76.41%
KwaZulu-Natal (KZN)	78.01%



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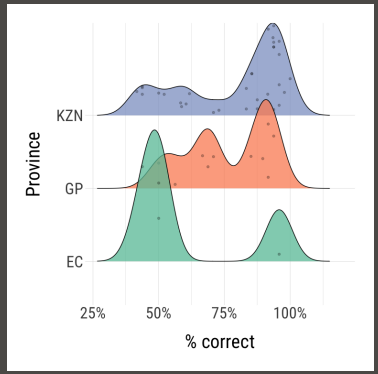

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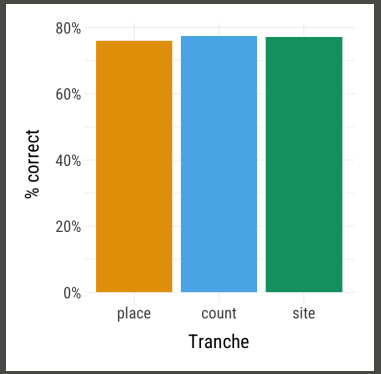
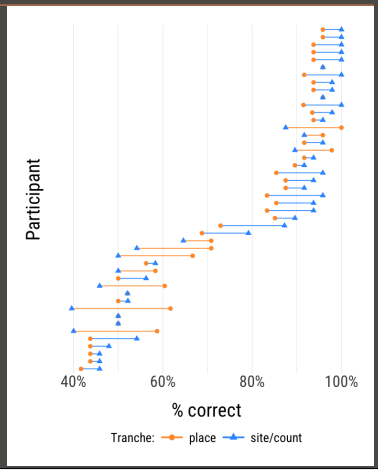


BY INDIVIDUAL

- Most individuals: site/count > place– but not all



CONCLUSION

- We have established now that the procedure we used in expt 3 is a good way to get some functional baselines
- Bimodality: why?
  - Intrinsic variation in population? Attention to task? Both?
- Similarity across tranches
  - Click vs. non-click should be easy
  - Click vs. click might be harder
  - Participants equally good/bad at both types

NEXT STEPS

- Further task effects remain to be studied
  - CV vs. VCV vs. CVCV stimuli
  - ABX vs AXB vs. oddball
- Individual-level patterns remain to be examined further
  - Are there good perceivers and bad perceivers?
- Place (c ~ q ~ x) vs. accompaniment (q ~ nq ~ ngq ~ gq); interaction?
- Click-naive vs. click-experienced listeners (SA vs. US English L1s)
- Cue weighting within each accompaniment (e.g. pitch effects)

THANKS!

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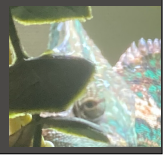

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