ATELIER / WORKSHOP

THE SOUTH CAUCASIAN CHALK CIRCLE
Philology meets linguistics

SEPTEMBER 22 ➤ 24 2016

PHONETICS-PHONOLOGY / MORPHOSYNTAX / DOCUMENTATION VARIATION-CHANGE

Day 1 - 9:30
Tutorials
Formal models, Kartvelian research in Georgia
Poster Session
Phonetics and Phonology
Panel Meetings

Day 2 - 9:00
Tutorials
Experimental works, The issue of terminology
Poster Session
Morphosyntax
Panel Meetings

Day 3 - 9:00
Tutorials
Documentation, Language corpora
Poster Session
Documentation, variation, acquisition
Panel Meetings

UNIVERSITY OF CHICAGO CENTER IN PARIS
Phonetics / Phonology Panel

- Day 1 – Ioana Chitoran and Marika Butskhrikidze
- Day 2 – Gašper Beguš and Julia Sturm
- Day 3 – Jelena Borise

Goals

- Identifying research questions of interest for:
  - The phonetics and phonology *(henceforth PH)* of Kartvelian languages
  - Linguistics more generally:
    - Typological descriptions
    - Theoretical models
    - Phonological representations
    - Models of speech production, perception, processing
• Identify **new types of data** and ask **new questions**

• Ask **new questions about old data**, that have already received a lot of attention (e.g., *phonotactics*)
Specific to Kartvelian, *but* with broad implications:

- Syllable structure and phonotactics
- Consonant clusters: distribution, restrictions
  - The role of the syllable in phonology, in speech production, speech perception, and speech comprehension
  - The syllable as a unit of structure, a unit of information, a unit of processing
  - The nature of phonological representations – formalism
Panel organization and related posters

- **Day 1:** phonotactics (Chitoran, Butskhrikidze)
  - Posters: Akhvlediani & Gabunia; Lentz et al.
- **Day 2:** phonotactics (Beguš, Sturm, Butskhrikidze)
  - Posters: Beguš; Meier et al.; Sturm
- **Day 3:** prosody, stress (Borise, Butskhrikidze)
  - Posters: Borise
Stop-stop sequences in Georgian
The role of *timing lag* in phonological representation
What is timing lag?

- The delay between two consonantal constrictions $C_1C_2$

  - Example – in the sequence [pt]:

    - $C_1$ labial constriction
    - $C_2$ coronal constriction

Figures from Yip (2013)
Main articulatory events (gestures) for a stop consonant

- Constriction (closure)
- Release

How are these two events timed relative to each other?
Patterns of stability within widespread variation

- When is the C2 constriction *formed* relative to C1 constriction / release?
- When is the C2 constriction *released* relative to C1 constriction / release?
Relative timing of C1 and C2

Shorter timing lag, more overlap ...

... Longer lag, less (no) overlap
The question we want to ask:

- Do **timing differences** play a role in the phonology?
  - Is the relative timing of adjacent C1 and C2 controlled by speakers?

- **Working H**: phonological representations are dynamic. In their abstract form they encode info about relative timing of gestures.
  - Timing patterns are learned.
Timing pattern found in production

Variation in timing is not random

Order of place effect

- Longer lag in back-to-front sequences \((tp, kt)\) than front-to-back \((pt, tk)\)


- Relates to terms used in the Georgian literature: "accessive" and "decessive" (I. Melikhishvili)
- Front-to-back sequences include the harmonic clusters
An explanation initially proposed for the order of place effect:

The perceptual recoverability hypothesis

*Not supported, at least in its initial formulation*
Perceptual recoverability hypothesis

- Gestures in a stop-stop sequence (C1C2) have longer timing lag in contexts where information about C1 may be harder to recover.

- In production, speakers may control timing between C1 and C2 to increase C1 perceptibility in a stop-stop sequence.
  - They produce a longer lag, which would prevent C1 release from being hidden by C2 closure, and
  - a C1 vocalic release, which would provide clearer C1 formant transitions.
Is the C1C2 timing difference observed in production predicted by the perceptual recoverability hypothesis?
Lag asymmetries: Front-to-Back

- If C2 constriction is behind C1, some acoustic information will still be present at C1 release, even with substantial overlap.
  - In a **front-to-back** sequence [pt]:

  
  - C1 labial closure
  - C2 coronal closure
  - C1 labial release while holding C2 closure (audible)

Figures from Yip (2013)
If C2 constriction is ahead of C1, C1 release may be completely hidden acoustically unless the C2 constriction gesture is applied after C1 release.

- In a back-to-front sequence [gd]:

  - C1 dorsal closure
  - C2 coronal closure
  - C1 dorsal release while holding C2 closure (inaudible)

Figures from Yip (2013)
Sometimes vocalic releases are produced

In Georgian (Chitoran et al. 2002)

- More often in back-to-front order and in voiced context
- Inter-/intra-speaker variation (occurrence/duration)

example: /gdeba/
Is the occurrence of C1 vocalic release in production predicted by the perceptual recoverability hypothesis?

- C1 vocalic releases may provide formant transitions => richer information about C1 identity
- Typically seen as a consequence of C-C coordination with longer lag

(Gafos 2002; Hall 2003; Davidson & Roon 2008; Bradley 2007)
However...

- Production patterns are **NOT** always predicted by perceptual recoverability.
  - Chitoran and Goldstein (2006): Georgian stop & liquid combinations (e.g., *kl, lp*) show a place order effect although neither the stop nor the liquid is in danger of being obscured by a high degree of overlap.
  - Yip (2013): Greek C1C2 sequences show a place order effect at least for some speakers, even when one of the consonants is a fricative or a liquid.

- Perceptual recoverability has not yet been tested in perception (to our knowledge).
Testing perceptual recoverability in perception:

Do longer lags between C gestures and/or C1 vocalic releases help listeners recover C1 in a C1C2 sequence?

- **H1**: Longer timing lag between C1 and C2 facilitates recovery of C1 gestures
- **H2**: C1 vocalic release facilitates recovery of C1 gestures
Methodology: stimuli recording

- A male native speaker of Georgian produced Georgian words
- Acoustic and articulatory (EMA) data simultaneously recorded

<table>
<thead>
<tr>
<th>C1C2</th>
<th>front-to-back</th>
<th>back-to-front</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>target words</strong></td>
<td>bg <em>era</em></td>
<td>_phth <em>ila</em></td>
</tr>
<tr>
<td></td>
<td>ab <em>ga</em></td>
<td>_aphth <em>ari</em></td>
</tr>
<tr>
<td><strong>fillers</strong></td>
<td>t’k’ <em>ena</em></td>
<td>brazi</td>
</tr>
<tr>
<td></td>
<td>bat _k <em>ani</em></td>
<td>_albat _k <em>eri</em></td>
</tr>
<tr>
<td><strong>CVCV controls</strong></td>
<td>bile</td>
<td>t’ <em>ebi</em></td>
</tr>
</tbody>
</table>
Methodology: stimuli segmentation

- **C1C2V portion**
  - C1 closure midpoint to V midpoint
  - Segmentation based on the acoustic signal
Methodology: acoustic parameters

Three acoustic parameters

1. **Acoustic Lag**: $C_1$ release burst – $C_2$ release burst
2. **Presence/absence of vocalic release**
3. **Duration of vocalic release** (when present)

example: /gde/
Methodology: participants and procedures

- 29 native Georgian listeners living in Tbilisi, Georgia
- Two perception experiments

1. **Forced-choice identification test**
   Decide whether the stimulus begins with “cv” or “cc”.
   - 30% “cv”
   - 70% “cc”
   To disambiguate between V epenthesis and C deletion

2. **Transcription test**
   (a week later)
   Transcribe the stimulus in Georgian orthography.
C1 is correctly transcribed 66% of the time.

Does each of the four parameters contribute to correct identification of C1?

1. Timing lag: Acoustic Lag, Articulatory Lag
2. Vocalic release: Presence/absence, Duration
C1-C2 longer lag helps native listeners recover C1 in stop-stop sequences.

There is no evidence that the presence of a vocalic release helps C1 identification, even though it includes richer C1 formant transition information.

Long vocalic releases prevent listeners from correctly identifying C1.
Native listeners are sensitive to the timing lag differences, when making the phonological judgment of identifying C gestures in C1C2 sequences.

Supports the inclusion of timing lag in the grammar of Georgian

Two possible reasons for the place order effect observed in production

- perceptually motivated online computation
- phonologized coordination patterns
  - may have emerged for perceptual reasons
  - generalized and learned as part of phonological grammar
In Georgian, **timing lag** as phonologized coordination patterns is consistent with:

- The unpredicted place order effect in stop & liquid combinations (Chitoran & Goldstein 2006)
- Historical development of Georgian stop-stop sequences
  - Two historical sources (Gamkrelidze & Ivanov 1995):
    - Back-to-front C1C2 – developed through deletion of intervening V
    - Most front-to-back C1C2 – developed from velarized stops
      - e.g., [dˠ] broken into [dg]
Current results suggest that longer lags can be useful for the Georgian listeners.

But we do not find evidence that vocalic releases help them.

Patterns reported in production studies do not always seem to match what listeners use in perception.

Question: Do speakers control the timing lags and vocalic releases for the sake of listeners?


Thank you
გამოგონება