Vowel Harmony as Agreement by Correspondence: The case of Khalkha Mongolian Rounding Harmony

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Goals

- Demonstrate that it is possible to account for vowel harmony as Agreement by Correspondence (ABC) (Hansson, 2001; Rose & Walker, 2004)
  - Offer a new analysis of rounding harmony in Khalkha Mongolian
  - Show that a wider variety blocking effects can be modeled with ABC than has previously been assumed

- Demonstrate the utility of accounting for vowel harmony as ABC
  - Introduce the typology of opaque and transparent segments that is highlighted by treating vowel harmony as ABC
Outline

1. Introduction to ABC
2. Blocking Effects and ABC
3. Data
4. Analysis
5. Discussion
6. Conclusion
Introduction to ABC

- Agreement between nonadjacent segments is regulated by two distinct families of constraints: Corr-SS and Ident-SS constraints.
- Corr-SS constraints compel segments within an output string to correspond.
- Ident-SS constraints require that corresponding segments within an output string agree for a particular feature.
  - For example, Ident-CC(nasal) requires that corresponding segments within an output string have the same value for the feature [nasal].
Introduction to ABC

- Corr-SS constraints compel sufficiently similar segments within an output string to correspond
- What constitutes sufficient similarity depends on the specific Corr-SS constraint
  - For example, Corr-DG only compels voiced stops to correspond, while Corr-TG compels all stops to correspond
- Corr-SS are in a fixed similarity-based hierarchy
  - Corr-SS constraints compelling more similar segments to correspond always outrank Corr-SS constraints that compel less similar segments to correspond
    - For example, Corr-DG outranks Corr-TG
- If less similar segments interact, then more similar segments are also predicted to interact
  - For example, if stops that do not agree in voicing interact, then stops that do agree in voicing are also predicted to interact
Introduction to ABC

- A short sample analysis?
Outline

1. Introduction to ABC
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Initially, it was assumed that blocking effects could not be modeled with ABC. For this reason, while ABC has been seen as an exciting new way to account for consonant harmony, it is generally believed to be inapplicable to vowel harmony. However, Hansson (2007) demonstrated that it actually is possible to model some blocking effects with ABC.
Blocking in ABC

- Explain (and possibly demonstrate briefly?) Hansson’s blocking
Blocking in ABC

- Hansson still maintains that there are cases of blocking that cannot be accounted for in ABC
- In particular, he says that under ABC “a segment carrying the agreement-triggering feature value cannot be opaque” (2007: 406, his emphasis)
- Therefore, he claims that Khalkha Mongolian rounding harmony cannot be analyzed as ABC
Outline

1. Introduction to ABC
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Data

- All data are taken from Svantesson, et al. (2005), unless otherwise noted
- Vowel Inventory:

<table>
<thead>
<tr>
<th></th>
<th>unrounded</th>
<th>rounded</th>
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</thead>
<tbody>
<tr>
<td>high</td>
<td></td>
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<tr>
<td>[+ATR]</td>
<td>i</td>
<td>u</td>
</tr>
<tr>
<td>[-ATR]</td>
<td></td>
<td>ui</td>
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<tr>
<td>non-high</td>
<td></td>
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<tr>
<td>[+ATR]</td>
<td>e</td>
<td>o</td>
</tr>
<tr>
<td>[-ATR]</td>
<td>a</td>
<td>c</td>
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<tr>
<td></td>
<td>ai</td>
<td></td>
</tr>
</tbody>
</table>
Data

- Non-high vowels are round following a non-high round vowel ([o] and [ɔ]) in initial syllable
- Harmony conditions suffix alternations, as seen with the direct past suffix in (1)

<table>
<thead>
<tr>
<th></th>
<th>'to see'</th>
<th>'to pleat'</th>
<th>'to decorate'</th>
<th>'to go'</th>
<th>'to be stunned'</th>
<th>'to cry'</th>
<th>'to brag'</th>
<th>'to give'</th>
<th>'to enter'</th>
<th>'to dart out'</th>
</tr>
</thead>
<tbody>
<tr>
<td>uc-ļe</td>
<td>xun-l-ļa</td>
<td>jaw-ļa</td>
<td>ukš-ļa</td>
<td>sairx-ļa</td>
<td>og-ļo</td>
<td>cr-ļo</td>
<td>ch'oiš-ļo</td>
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</tbody>
</table>
Data

- High round vowels ([u] and [ʊ]) block rounding harmony
- Compare the form of the direct past suffix when it follows the causative suffix to its form when it appears alone

(2) Causative Direct Past          Direct Past
    og-ul3-3e                      og-30          ‘to give’
    on-ul3-3a                      on-30          ‘to enter’
Data

- There is a vowel [e] that alternates with diphthongs and blocks rounding harmony
- Compare the vowel in the reflexive suffix when it appears following the comitative suffix to the vowel when it appears alone

(3) Comitative Reflexive  Reflexive
    teːlɛ-tʰe-ge       teːlɛ-e       ‘gown’
    poːr-tʰe-ge        poːr-ɔ        ‘kidney’
    cʰaːs-tʰai-ga      cʰaːs-ɑ        ‘paper’
    xɔːlɛ-tʰɔi-ɡo      xɔːlɛ-ɔ        ‘food’
Data

- There is a vowel [e] that alternates with diphthongs and blocks rounding harmony
- Compare the vowel in the reflexive suffix when it appears following the comitative suffix to the vowel when it appears alone

(3)  | Comitative | Reflexive |
-----|------------|-----------|
      | teː̠ɬ-tʰe-ge | teː̠ɬ-e    |
      | poːr-tʰe-ge  | poːr-o     |
      | cʰaːs-tʰai-ga | cʰaːs-a     |
      | xoːɬ-tʰi-go  | xoːɬ-ə      |

‘gown’  ‘kidney’  ‘paper’  ‘food’
Data

- There is a vowel [e] that alternates with diphthongs and blocks rounding harmony.
- Compare the vowel in the reflexive suffix when it appears following the comitative suffix to the vowel when it appears alone.

(3) Comitative Reflexive | Reflexive
---|---
te:lɔ-tʰe-ge | te:lɔ-e | ‘gown’
po:r-tʰe-ge | po:r-o | ‘kidney’
cʰa:s-tʰai-ga | cʰa:s-a | ‘paper’
xɔ:lɔ-tʰɔi-ga | xɔ:lɔ-o | ‘food’
Data

High unrounded vowel /i/ is transparent to rounding harmony

(4) Accusative Reflexive  Reflexive
    po:r-ig-o        po:r-o        ‘kidney’
    xɔ:lʒ-ig-ɔ        xɔ:lʒ-ɔ        ‘food’
Outline

1. Introduction to ABC
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Analysis: Preliminaries

- I assume both Corr-VV and Ident-VV constraints are evaluated “locally”
  - Corr-VV constraints only violated when the nearest potentially corresponding vowels fail to correspond
    - For example, Corr-OE is violated only once for \textit{po:rt\textsuperscript{h}e\textsubscript{i}ge\textsubscript{i}}
  - Ident-VV constraints only violated when the nearest corresponding vowels fail to agree
    - For example, Ident-VV is violated only once for \textit{po:i\textsuperscript{t}r\textsuperscript{h}e\textsubscript{i}ge\textsubscript{i}}

- There is some precedent for these assumptions
  - Hansson showed that at least one of the two constraint families must be evaluated “locally”, if blocking effects are to be modeled with ABC (He chose Ident-VV constraints)
Analysis: Preliminaries

- I assume that alternating segments are underspecified for the alternating feature
  - Underspecified segments will be written with capital letters
- I assume that the feature [round] is bivalent
- Neither of these assumptions is crucial
Analysis: Basic Harmony

The Constraints

- Corr-OE – Let S be an output string of segments and let X and Y be segments that agree for the features [-cons, +son, -hi]. X and Y correspond if X, Y \in S.
  - Non-high vowels must correspond
- Ident-VV(rd) – Let X be a segment in the output and let Y be a correspondent of X in the output. If X is [\alpha \text{ round}], then Y is [\alpha \text{ round}].
  - Corresponding output segments must agree for the feature [round]
- Ident-OI(rd) – Let X be a segment in the input and let Y be any correspondent of X in the output. If Y is [\alpha \text{ round}], then X is [\alpha \text{ round}].
  - Input segments must agree with their output correspondent for the feature [round]
- *o – No [-high, +round] vowels

The Constraint Ranking

Ident-OI(rd), Ident-VV(rd) >> Corr-OE >> *o
### Analysis: Basic Harmony

**Representative Tableaux**

(5)

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>a. ʧɪtʃe</td>
<td>*</td>
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<td></td>
<td></td>
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<tr>
<td>b. itʃo</td>
<td>*</td>
<td></td>
<td></td>
<td>*₁</td>
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</tbody>
</table>

(6)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>a. ʧɪoʃoᵢ</td>
<td>*</td>
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<td>**</td>
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<tr>
<td>b. ogʃe</td>
<td>*</td>
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<tr>
<td>c. ogʃeᵢ</td>
<td>*</td>
<td>*₁</td>
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<tr>
<td>d. eᵣgʃeᵢ</td>
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</tbody>
</table>
Analysis: High Vowels

The Constraints

- Corr-OU – Let S be an output string of segments and let X and Y be segments that agree for the features [-cons, +son, +round]. X and Y correspond if \( X, Y \in S \).
  - Round vowels must correspond
- Ident-VV(hi) – Let X be a segment in the output and let Y be a correspondent of X in the output. If X is [\( \alpha \) high], then Y is [\( \alpha \) high].
  - Corresponding output segments must agree for the feature [high]

The Updated Constraint Ranking
Ident-OI(rd), Ident-VV(rd), Corr-OU >> Ident-VV(hi) >> Corr-OE >> *o
## Analysis: High Vowels

### Representative Tableaux

(7)

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<tr>
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<tbody>
<tr>
<td>a. œoᵲuguᵲslugge</td>
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<td>*</td>
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<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b. oᵲuguᵲsluggοᵲi</td>
<td>*</td>
<td>*</td>
<td>**!</td>
<td>*</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>c. oᵲuguᵲsluggοᵲi</td>
<td>*</td>
<td><em>!</em></td>
<td>*</td>
<td>*</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>d. oᵲsluggοᵲi</td>
<td>**!</td>
<td>*</td>
<td>*</td>
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<tr>
<td>e. eᵲuguᵲsluggeᵲi</td>
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**Analysis: High Vowels**

- **Representative Tableaux (Continued)**

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<tbody>
<tr>
<td>a. $\text{\textcircled{E}} o_i \text{go}<em>{i,j} \text{gui}</em>{j}$</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<tr>
<td>b. o$_i$g$_i$e$_i$gui$_i$</td>
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<tr>
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<td>*</td>
<td>*!</td>
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<tr>
<td>d. o$_i$g$_i$o$_i$gi</td>
<td>**!</td>
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<tr>
<td>e. e$_i$ge$_i$gui</td>
<td>**!</td>
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## Analysis: High Vowels

### Representative Tableaux (Continued)

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<tbody>
<tr>
<td>a. ᵣ poːrigoᵣ</td>
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<td>b. poːrige</td>
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<tr>
<td>c. poːri₉geᵣ</td>
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<tr>
<td>d. poːrigeᵣ</td>
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<td>*!</td>
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<td>*</td>
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<tr>
<td>e. poːru₉ge</td>
<td>**!</td>
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<td>*</td>
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</tbody>
</table>
Analysis: Opaque e

The Constraint

- CorrProm-OE – Let S and P be output strings of segments and let X and Y be segments that agree for the features [-cons, +son, -hi]. X and Y correspond if:
  (a) P is a syllable and P is prominent;
  (b) P ∈ S and X ∈ P; and
  (c) P, Y ∈ S
- If there is a non-high vowel in the initial syllable then all other non-high vowels must correspond with it

The Updated Constraint Ranking

Ident-OI(rd), Ident-VV(rd), Corr-OU >> Ident-VV(hi) >> Corr-OE >> Corr_{Prom-OE} >> *o
### Analysis: Opaque e

#### Representative Tableaux

(10)

<table>
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<tbody>
<tr>
<td>a. ʃ poːrtʰe_i ge_i</td>
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<td>*</td>
<td>**</td>
<td>*</td>
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<tr>
<td>b. poːrtʰego_i</td>
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<td>e. peːr-tʰe_i ge_i</td>
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## Analysis: Opaque e

### Representative Tableaux (Continued)

(11)

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</thead>
<tbody>
<tr>
<td>a. ꝧo̕i̕go̕r̕e</td>
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<td></td>
<td></td>
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<td>*</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>b. oge_{i}r_{i}</td>
<td>**</td>
<td></td>
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<td>**!</td>
<td>*</td>
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<tr>
<td>c. o_{i}ge_{i}r_{i}</td>
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<tr>
<td>c. e_{i}ge_{i}r_{i}</td>
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</tbody>
</table>
Outline

1. Introduction to ABC
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Discussion

- Analyzing vowel harmony as ABC highlights the fact that neither opaque nor transparent segments are uniform categories
  - Transparent Segments
    - Segments that would alternate with a segment that is missing from the inventory of the language
      - Finnish \(i, e\)
    - Segments that are not sufficiently similar to those segments that harmonize
      - Khalkha \(i\)
  - Opaque Segments
    - Segments that are not sufficiently similar to fully participate in harmony
      - Khalkha \(u, \dot{u}\)
    - Segments that cannot fully participate in harmony because of markedness
      - Khalkha \(e\)
- In ABC, each of these segments gets a distinct analysis
# Discussion

- ABC analysis of transparent and opaque segments

<table>
<thead>
<tr>
<th>Segment Type</th>
<th>ABC Analysis</th>
<th>Markedness</th>
<th>Lack of Similarity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opaque</td>
<td></td>
<td>Khalkha ( e )</td>
<td>Khalkha ( u, \ u )</td>
</tr>
<tr>
<td>Transparent</td>
<td></td>
<td>Finnish ( i, e )</td>
<td>Khalkha ( i )</td>
</tr>
</tbody>
</table>
Discussion

- ABC has the potential to offer a unified analysis of consonant and vowel harmonies
- Remaining issues in accounting for vowel harmony with ABC
  - Directionality
    - In the present analysis, directionality is the result of special faithfulness (to pre-specified segments) and correspondence (to a prominent syllable)
    - Hansson (2001) makes use of targeted constraints to generate directionality
  - Gap-driven transparency without prominence
    - Finnish transparent vowels
  - Determining what constitutes more and less similar for vowels
    - For example, is the ranking Corr-OU >> Corr-OE universal?
Hansson (2001) argues that consonant and vowel harmonies are distinct and, therefore, should have distinct formal treatments

- Blocking effects are extremely rare, if not entirely absent, in consonant harmony
  - As Hansson (2007) and the current analysis demonstrate, blocking effects can be modeled with ABC

- Consonant harmony is left-to-right by default
  - Left-to-right default is not inherent to ABC; it must be built in

- Sensitivity to prosody
  - There is nothing in ABC that prevents or aids in incorporating sensitivity to prosodic structure
Thank You

**Acknowledgements:**

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Marc Ettlinger
UC Berkeley Linguistics
And Especially, Sharon Inkelas