A cross-linguistic look at vocoid transparency

Phonetics and Phonology Workshop
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1 Preliminaries

I am reporting on the results of a survey of vowel harmony systems with special focus on vowel and glide transparency.

1.1 Previous surveys

- General overviews
  - Aoki (1968) discusses various parameters relevant for categorizing vowel harmony systems.
  - Archangeli & Pulleyblank (2007) present a general introductory-style survey of harmony, including vowel harmony.

- Particular types of harmony

No previous surveys have focused on transparency. This is a gap that ought to be filled, given the relevance of transparency to issues like strict locality (Gafos 1996; Choisáin & Padgett 1997; Walker 1998) and the role of similarity in phonology (Frisch 1996; Frisch et al. 2004; Hansson 2001; Zuraw 2002; Rose & Walker 2004).
### 1.2 Research Questions

While conducting the survey, I was guided by the following questions:

- **Vowel questions**
  1. The main generalization one finds about transparent vowels is that they do not lexically contrast in the harmonic feature. Is this always true?
  2. Does one find transparent behavior equally distributed over palatal, labial, ATR, and height harmony systems?

- **Glide questions**
  3. Glides (and the high segments of diphthongs) are typically, or at least often, transparent to vowel harmony. To what extent do these vocoids participate in harmony?
  4. Does one find non-transparent behavior of glides equally distributed over palatal, labial, ATR, and height harmony systems?

- **General question**
  5. Does any other property (e.g. stress, syllable position) correlate with whether a vocoid participates in vowel harmony?

The survey supplies a definitive answer to (1), tentative answers to (3) and (5), and very tentative answers to (2) and (4). I will return to these questions in §2.

### 1.3 Quick Overview

- **51 languages**
  - 13 language families
  - Appendix A contains the full list of languages with language family, location spoken, and source information

- **74 harmony systems**
  - 12 height
  - 21 tongue root
  - 12 palatal
  - 14 labial
  - 15 other

- 12 systems include at least one transparent vowel

- 10 systems include a glide that is not transparent

2
1.4 Methodology

1.4.1 Language Reports

For each language in the survey, I created a language report including the following:

- Information about the language
  - Language name
  - Language family and also often genus
  - Location(s) where the languages is spoken
  - ISO 639-3 code
  - Source(s) used to create the report

- Information about the phonology of the language
  - Monophthong, Diphthong, and Glide inventories
  - Whether diphthongs are derived or underlying
  - Whether the glide(s) behave(s) like a vowel or a consonant
  - Stress
  - Syllable structure
  - Basic morphological information

- Information about each harmony system in the language:
  - The type of harmony: *height, palatal, labial, tongue root, other*
    * I am using Tongue Root Harmony as a cover term for harmonies that have been described as [ATR], [RTR], [tense], and [constricted pharynx] harmonies
    * I classified languages as *other* if the nature of the harmony did not obviously fit into one of the other four categories.
  - Dependent feature (i.e. any feature that harmony is parasitic on)
  - Transparent vowels
  - Opaque vowels
  - The behavior of diphthongs in the system
  - The behavior of glides in the system
  - A short description of the harmony system with basic facts and anything notable that was not captured in the other fields

Appendix C contains a sample language report for Khalkha.
1.4.2 Important Decisions

- What counts as harmony?
  - “[A] harmony system requires that two or more non-necessarily-adjacent segments must be similar in some way.” (Archangeli & Pulleyblank 2007)
  - In practice this generally meant that anything another author dubbed harmony was eligible for inclusion in the survey.
  - Although non-iterative harmonies are not excluded, I made sure to include a large number of iterative harmonies. This was important because transparent vowels can only be identified with iterative agreement.

- What counts as a glide?
  - I followed the categorization of the linguist whose work I used as a source.

- How do you determine if a glide is transparent?
  - I took an author’s failure to mention anything as the first piece of evidence that glides were transparent in that language
  - I then went through as much data as possible looking for confirmation that indeed glides were transparent
  - Although I did not always find the crucial data that showed the non-participation of glides, I never came across data that indicated that glides participated when it was not explicitly mentioned by the author.

2 Findings

2.1 Vowel Transparency and Contrast

“Vowel transparency emerges (but not necessarily) where a potentially harmonic vowel has no alter- nant, because the particular vowel which would surface in this case is not allowed in the respective language.” Krämer (2003:104)

Although it is true that transparent vowels often do not contrast for the harmonic feature, this is not always the case.
Counter examples

- Khalkha labial harmony (Svantesson et al. 2005)
  - [i] is transparent
  - [u] is in the vowel inventory
  - [e] alternates with [o], so [i] would be expected to alternate with [u]

- Buriat labial harmony (Poppe 1960)
  - [i] is transparent
  - [y] is in the vowel inventory

- Menominee ATR harmony (Bloomfield 1962; Walker 2009)
  - [a] is transparent
  - [o] is in the vowel inventory

Transparent [i] in Khalkha

a. Vowel inventory

\begin{tabular}{ccc}
  +ATR & -ATR \\
  i & u & o \\
  e & o & a & o
\end{tabular}

b. Reflexive suffix (-e/-a/-o/-ø)

i. poor-o  ‘kidney’
   mour-a  ‘eat’
   tees-e  ‘gown’

ii. poor-ig-o  ‘kidney’ (com. refl.)

In each of these systems, the transparent vowels lack the feature that harmony is parasitic on.

- Khalkha and Buriat
  - Harmony only applies to non-high vowels
  - Transparent vowel is high

- Menominee
  - Harmony only applies to high vowels
  - Transparent vowel is non-high

Transparent vowels of this type are quite rare. These systems constitute only 1/4 of the harmony systems that contain at least one transparent vowel in the current survey.
2.2 Vowel Transparency and Harmony Type

Vowel transparency appears to be slightly more likely with tongue root harmony than with other types of harmony.

- **Total**
  - 47 harmony systems in the survey could have included a transparent vowel
  - Only 12 systems did include a transparent vowel (about 26%)
- **Tongue Root Harmonies**
  - 18 eligible systems
  - 6 systems include a transparent vowel (about 33%)
    - Menominee, Khalkha, Oroch, Oroqen, Pasiego Montañes Spanish, Wolof
  - Account for 50% of the systems that do include a transparent vowel, but only 38% of the systems that could include a transparent vowel
- **Palatal Harmonies**
  - 11 eligible systems
  - 3 systems include a transparent vowel (about 27%)
    - Finnish, Hungarian, Buriat
  - Account for 25% of the systems that do include a transparent and about 23% of the systems that could
- **Labial Harmonies**
  - 9 eligible systems
  - 2 systems include a transparent vowel (about 22%)
    - Khalkha, Buriat
  - Account for about 17% of the systems that do include a transparent vowel and about 19% of the systems that could
- **Height Harmonies**
  - 6 eligible systems
  - 1 system includes a transparent vowel (about 17%)
    - Pasiego Montañes Spanish
  - Account for only about 8% of the systems that do include a transparent vowel, while constituting about 13% of the systems that could

It’s important to be very careful when drawing conclusions based on the above data.
• The numbers are small, so the percentages are not stable

• Aside from the tongue root harmony systems, there is a considerable lack of diversity among the languages with harmonies that could and do include a transparent vowel.
  – 4 of the 5 height harmony systems that could, but do not, include a transparent vowel are found in Bantu languages.
  – 6 of the 8 palatal harmony systems that could, but do not, include a transparent vowel are found in Turkic languages.
  – Both of the labial harmony systems that include a transparent vowel are found in Eastern Mongolic languages

2.3 Participating Glides

In contrast to vowels, where transparency is the exception rather than the rule, glides tend strongly to be transparent to vowel harmony.

• Total
  – 58 harmony systems in the survey include at least one glide that could potentially participate
  – 11 of those harmony systems include a glide that does participate (about 19%)

• Participating glides fall into three categories
  – Patterning with consonants
  – Not intervocalic
  – Can be intervocalic

2.3.1 Participating glides patterning with consonants

Suffix-initial consonants block ATR harmony in Lango, this includes glides.

(8) a. njím-ó ‘my forehead’
    b. wéló-wá ‘our visitor’ *wélówó
    c. wéló-gí ‘their visitor’ *wélógí

Other examples:
• In Warlpiri, [w] blocks progressive harmony (full/fronting), but so does [p]
• In Dhaasanac, [j] blocks harmony (full), but so do all other palatal consonants
• In Arapaho, [j] blocks harmony, but so do all other non-velar, non-glottal consonants

2.3.2 Participating glides do not appear intervocally

In Pasiego Montañes Spanish, glides trigger raising when they appear in the stressed syllable (9), but only when they appear between a preceding consonant and a following vowel (Kaisse & Levi 2004). Notice that the glides in (10) are all transparent.

(9)  molér ‘to grind’ muljénda ‘grinding’
     bebër ‘to drink’ bibjéndu ‘drinking’
(10) a. krejér₁ *krijér ‘to believe’
     b. koxájs *kuxájs ‘take 2p pl subj’

Other examples:

• In Ekegusii, [w] blocks height harmony (Cammenga 2002).

2.3.3 Participating glides can appear intervocally

In Karachay, high vowels are usually only rounded following other rounded vowels Seegmiller (1996), as shown in (11a). [w] also triggers rounding on a following vowel (11b).

(11) 1SG Possesive suffix (-im/üm/-ïm/-um)
     a. tilm ‘my tongue’
        butum ‘my leg’
     b. tawum ‘my *taw-ǐm
        moun-
tain’
        injiwsüz ‘well-
to-do’ *injiwsiz
Other examples in the survey:

- In Bashkir, where labial harmony only affects mid vowels, [w] is opaque (Poppe 1964).
- In Nawuri, [w] triggers rounding (Casali 1995b).

These sorts of affects are not confined to just labial harmony. In Turkana, a language not included in the survey, vowels are [ATR] preceding glides (van der Hulst & van de Weijer 1995 citing Dimmendaal 1983).

### 2.3.4 Distribution of participating glides

Setting aside those glides that participate along with consonants, here is the distribution of participating glides in the current survey:

- In height and ATR harmonies, both palatal and labial glides have been found to participate.
- In labial harmonies, labial glides have been found to participate.
- In palatal harmonies, no glides have been found to participate.

### 2.4 Relevance of Syllable Position

Syllable position or whether a vocoid surfaces as a vowel or a glide can affect vocoid behavior. Maasai [ATR] harmony offers a particularly clear example of this (Cole & Trigo 1989). Harmony is [+ATR] dominant harmony can be triggered by a nuclear vowel (13a) or by the first element of the diphthongs [ja] and [wa] (13c). When triggered by a nuclear vowel, harmony is only blocked by [a] (13b). When triggered by a diphthong, harmony is also blocked by mid vowels (13d). Notice that the first elements of the diphthongs are derived from vowels (in some cases [-ATR] vowels).

(12) +ATR -ATR
    High: i u i u
    Mid: e o e o
    Low: a

(13) a. e-dot-u → e-dot-u  3-pull-MT
    b. i-guran-u → i-guran-u  II-play-MT
    c. i-tu-pumu-t-w-a → i-tu-pumu-t-w-a  2-Past-come-Pl-MA-Past
    d. i-mariq-a → i-mariq-a  look up to-Past
        k-i-nori-u-t-w-a → k-i-nori-u-t-w-a  1p-lllook-Pl-MT-Past
Other relevant examples:

- In Pasiego Montañes Spanish, the behavior of glides depends on their position in the syllable, as discussed above. They do not trigger height harmony unless they appear between a consonant and a vowel.

- In Ekegusii, [w] is derived from rounded vowels. Although non-high rounded vowels do not block height harmony in nuclear position, [w] derived from a non-high round vowel can block harmony.

3 New Research Questions

- As seen above, glide transparency is much more common than vowel transparency. Given the phonetic similarity between glides and vowels, why should this be?

- What implications does this high rate of glide transparency have for a theory of strict locality in phonology?

- Related to that, why should syllable position affect a vocoid segment’s behavior with respect to vowel harmony if harmony processes are the result of local spreading?

- There are extremely few instances of intervocalic glides blocking or triggering harmony. Do those intervocalic glides that do exceptionally participate in vowel harmony have anything else in common? If so, can that common property account for their exceptional behavior?

- What is the full range of glide behavior in vowel harmony systems?
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## B Languages with Neutral Vowels

<table>
<thead>
<tr>
<th>Language</th>
<th>Type of Harmony</th>
<th>Transparent</th>
<th>Opaque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish (Pasiego Montañes)</td>
<td>Height</td>
<td>a, æ</td>
<td>none</td>
</tr>
<tr>
<td>Chichewa</td>
<td>Height</td>
<td>none</td>
<td>a</td>
</tr>
<tr>
<td>Ciya</td>
<td>Height</td>
<td>none</td>
<td>a</td>
</tr>
<tr>
<td>Ekegusii</td>
<td>Height</td>
<td>none</td>
<td>i, u, a</td>
</tr>
<tr>
<td>Kimatuumbi</td>
<td>Height</td>
<td>none</td>
<td>a</td>
</tr>
<tr>
<td>Kham</td>
<td>Height</td>
<td>none</td>
<td>a</td>
</tr>
<tr>
<td>Ikalanga</td>
<td>Height</td>
<td>none</td>
<td>a</td>
</tr>
<tr>
<td>Warlpiri</td>
<td>Other</td>
<td>none</td>
<td>a</td>
</tr>
<tr>
<td>Dhaasanac</td>
<td>Other</td>
<td>none</td>
<td>high vowels</td>
</tr>
<tr>
<td>Djingili (a.k.a. Jingulu)</td>
<td>Other</td>
<td>none</td>
<td>i, u</td>
</tr>
<tr>
<td>Armenian (Agulis)</td>
<td>Palatal</td>
<td>none</td>
<td>i, e</td>
</tr>
<tr>
<td>Armenian (Karchevian)</td>
<td>Palatal</td>
<td>none</td>
<td>i, e, æ</td>
</tr>
<tr>
<td>Buriat</td>
<td>Palatal</td>
<td>i, i:</td>
<td>none</td>
</tr>
<tr>
<td>Finnish</td>
<td>Palatal</td>
<td>i, e</td>
<td>none</td>
</tr>
<tr>
<td>Hungarian</td>
<td>Palatal</td>
<td>i, i: æ, (e)</td>
<td>none</td>
</tr>
<tr>
<td>Buriat</td>
<td>Rounding</td>
<td>i, i, e, (y)</td>
<td>y: u: e: [æ], [i]: [u]: (u)</td>
</tr>
<tr>
<td>Khalkha</td>
<td>Rounding</td>
<td>i</td>
<td>u, ø(underlying Ei [e:])</td>
</tr>
<tr>
<td>Oroch</td>
<td>Rounding</td>
<td>none</td>
<td>i, æ, u</td>
</tr>
<tr>
<td>Azari, Iranian (South Azari)</td>
<td>Rounding</td>
<td>none</td>
<td>low vowels</td>
</tr>
<tr>
<td>Bashkir</td>
<td>Rounding</td>
<td>none</td>
<td>low vowels</td>
</tr>
<tr>
<td>Oroqen</td>
<td>Rounding</td>
<td>none</td>
<td>i, u, ø</td>
</tr>
<tr>
<td>Tangale</td>
<td>TRH</td>
<td>none</td>
<td>a</td>
</tr>
<tr>
<td>Menominee</td>
<td>TRH</td>
<td>a</td>
<td>ø</td>
</tr>
<tr>
<td>Khalkha</td>
<td>TRH</td>
<td>i</td>
<td>none</td>
</tr>
<tr>
<td>Oroch</td>
<td>TRH</td>
<td>i, æ</td>
<td>none</td>
</tr>
<tr>
<td>Assamese</td>
<td>TRH</td>
<td>none</td>
<td>a</td>
</tr>
<tr>
<td>Spanish (Pasiego Montañes)</td>
<td>TRH</td>
<td>e</td>
<td>none</td>
</tr>
<tr>
<td>Akan</td>
<td>TRH</td>
<td>none</td>
<td>a</td>
</tr>
<tr>
<td>Nawuri</td>
<td>TRH</td>
<td>none</td>
<td>a</td>
</tr>
<tr>
<td>Wolof</td>
<td>TRH</td>
<td>i, i:, u:</td>
<td>a:</td>
</tr>
<tr>
<td>Maasai</td>
<td>TRH</td>
<td>none</td>
<td>a</td>
</tr>
<tr>
<td>Maasai (diphthong induced)</td>
<td>TRH</td>
<td>none</td>
<td>a, e, o</td>
</tr>
<tr>
<td>Oroqen</td>
<td>TRH</td>
<td>i</td>
<td>none</td>
</tr>
</tbody>
</table>
C Sample Language Report

Language: Khalkha
Family: Altaic (Mongolic)
Locations: Mongolia
Langcode: khk


Monophthong Inventory: i,e,a,u,o,ө
Diphthong Inventory: ai,ui,oi,өi
Diphthongs derived or underlying: Underlying
Glide Inventory: j,w
Glide portion behaving as vowel or consonant: Consonant (See Svantesson, et al. 2005 Ch 2.5 re:[w] and Ch 6.5 re:[j])
Stress: None
Syllable structure: (C)V(V)(C)(C)(C)
Vowel length: Long vowels occur only in the first syllable (e in initial syllables is always long)
Morphological facts: Suffixing, Reduplication

Harmony Type: ATR
Dependent feature: None
Transparent Vowels: i
Opaque Vowels: None
Behavior of Diphthongs: The non-high portion of diphthongs behave just like their monophthong equivalents. The high portion is transparent.
Behavior of Glides: Transparent
Domain of harmony: Non-compound word
Directionality: Left-to-right

Description: All harmonic vowels in a word are + or - ATR.

Harmonic vowels:
+ATR vowels: e,u,o
-ATR vowels: a,u,ө

[i], which has no -ATR counterpart, is transparent (can occur between -ATR vowels). If [i] is the first vowel of the word, all subsequent vowels are +ATR.

Both glides can occur in + or - ATR words.

Harmony Type: Rounding
Dependent feature: Height
Transparent Vowels: i
Opaque Vowels: u,o (e: that alternates with diphthongs)
Behavior of Diphthongs: The non-high portion of diphthongs behave just like their monophthong equivalents. The high portion is transparent.
Behavior of Glides: Transparent
Domain of harmony: Non-compound word
Directionality: Left-to-right

Description: A non-high vowel is rounded iff the preceding vowel is another non-high rounded vowel.

[i] is transparent (can occur between two non-high rounded vowels). In the spoken language, [i] is sometimes opaque (though more often in +ATR words).

High rounded vowels block harmony (as monophthongs or as the first quality of a diphthong).

Both glides can occur between non-high rounded vowels.
References


KAISSE, ELLEN M., & SUSANNAH V. LEVI, 2004. Vowel harmony: nucleus to nucleus or vocalic node to vocalic node? Talk presented at the 78th annual meeting of the Linguistics Society of America, Boston, MA.


