The importance of contrasts in bilingual language developments - Part I

International Summer School on Multilingualism - 2022

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Greetings!

- A little bit about **me**
- Now a little bit about all of you!
Overview & objectives

- We will take a closer look at bilingual language development from the perspective **contrasts**
- **Important point:** We will remain largely theory-neutral in our discussions
- Tentative schedule:
  - **Day 1:** Contrasts & phonology
  - **Day 2:** Morphology
General questions:

- **Q₁**: How are languages acquired? Through experience? By means of language-specific cognitive mechanisms? A combination of both?
- **Q₂**: How is the situation different for bi- & multilinguals?
The ability to search for systematic contrast in the linguistic input, by correlating differences at various levels, is the only mechanism required to account for the abstract building blocks that make up those mental structures: the formal features of grammatical systems (Cowper & Hall 2014:161)

- Dresher (2014) maintains a similar view and argues that UG further requires that features be organized into a hierarchical relationship that reflects language-specific contrasts and patterns of activity.
- Linguistic computations operate using these contrast-marking features (Dresher 2009, 2014; Hall 2020), i.e., the contrastivist hypothesis
Hall (2020:248) conceptualizes modular relationships an arch of abstract systems that mediate between FORMS and MEANINGS.

- Representations towards the top are more abstract and discrete than those at the bottom.
Q: What does this necessarily mean for bi/multilingual grammars?

- Bilinguals necessarily build representations based on PLD (= Principle Linguistic Data) from multiple languages.
- A variety of language-external factors influence how these structures take form, resulting in heterogeneous representations of meaningful contrasts:
  - age of acquisition (AoA)
  - social contexts for acquisition and use over the lifespan
- Representations are stored and shared in the bi/multilingual mind
Natvig (2021) discusses situations where individuals build phonologies from source languages with different laryngeal (voicing, aspiration, etc.) contrast.

**Phonetics & phonology:**
- **Phonetics** is typified by continuous, gradient properties, whereas **phonology** consists of discrete, distinctive categories.
- Each module deals in different representation types that reflect those properties.
- **Phonological** representations are language-specific collections of relative properties.
- **Phonological** representations *contain* potential articulatory and account realizations of speech sounds.
- **Phonetics** is ‘richer’ than phonology, meaning that multiple acoustic cues may correspond to a single, relevant distinction.
- **Phonology** is *underspecified* relative to measurable outputs in speech production data.
Modified Contrastive Specification (MCS)

Example Contrastive Hierarchy

\[
\begin{array}{c}
\{P_1, P_2, P_3, P_4\} \\
\emptyset & F_1 \\
\{P_1, P_2\} & \{P_3, P_4\} \\
F_2 & \emptyset & F_3 & \emptyset \\
/P_1/ & /P_2/ & /P_3/ & /P_4/ \\
\end{array}
\]
Presence (F) vs. Absence of a feature (Ø)

The relevant phonological properties (F₁, F₂, and F₃) divide the phonemic inventory (/P₁ P₂ P₃ P₄/) one feature at a time until each phoneme is uniquely specified

**Successive Division Algorithm (SDA)** (Dresher 2009:16)

**Important point:** F₂ and F₃ need not be different features, but each feature can only be applied once to any given set or subset of phonemes
Phonemes are collections of contrastive features (and are not pronounceable in and of themselves)

**Dimensions:**
- For aspiration, the dimension is *Glottal Width (GW)*
- *Glottal Tension (GT)* - *[stiff]* vs. *[slack]* (vocal chords)
Voicing and Aspirating laryngeal representations

a. VOICING
   /consonant/
   \{b d g p t k\}
   GT \ø
   \{b d g\} \{p t k\}

b. ASPIRATING
   /consonant/
   \{p t k p^h t^h k^h\}
   \ø
   GW
   \{p t k\} \{p^h t^h k^h\}
Organization of the sound system:

- Contrastive features (phonology)
- Articulatory gestures (phonetics-phonology interface)
- Speech signal (phonetics)
Asymmetric patterns from language contact may emerge as a result of different levels of representation within a multilingual grammar being relatively more or less differentiated.

Bi/multilingualism often results in gradient changes in the accounts of a given articulation.

**Enhancements:** When new non-contrastive gestures enter a bi/multilingual system.

### Table 2. American English laryngeal representations, completions, and enhancements.

<table>
<thead>
<tr>
<th></th>
<th>NAE</th>
<th>SAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHONOLOGY</td>
<td>⊘</td>
<td>GW</td>
</tr>
<tr>
<td>PHON-PHON</td>
<td>#spread#</td>
<td>+#slack#</td>
</tr>
<tr>
<td>PHONETICS</td>
<td>plain</td>
<td>voiced</td>
</tr>
<tr>
<td></td>
<td>aspirated</td>
<td>aspirated</td>
</tr>
</tbody>
</table>
Decades of psycholinguistic research has demonstrated simultaneous language activation among multilinguals.

Competing representations in a shared, integrated system.

The tree structure above represents an integrated Spanish-English bilingual system.
3 possibilities

3 hypothetical alignments of phonological contrasts for a S-E bilingual for the /p t k/ - /b d g/ distinction:

- Representations that match the Spanish Voicing contrast
- Enhanced aspiration (phonologically voiced and aspirated phonemes)
- Representations that match the English Aspiration contrast
Potential differentiations of structure for Voicing and Aspirating systems

a. /consonant/
   \{b\ d\ g\ p\ t\ k\ p^h\ t^h\ k^h\}

- The square represents a **contrastive subset**
b. /consonant/
\{b d g p t k p^h t^h k^h\}

\[
\begin{array}{c}
\text{GT} \\
\{b d g\}
\end{array}
\quad \emptyset 
\begin{array}{c}
\{p t k p^h t^h k^h\}
\end{array}
\]

\[
\begin{array}{c}
\emptyset \\
\{p t k\}
\end{array}
\quad \text{GW} 
\begin{array}{c}
\{p^h t^h k^h\}
\end{array}
\]
c. /consonant/
\{b d g p t k p^h t^h k^h\}

\[
\begin{array}{cc}
\text{GT} & \emptyset \\
\{b d g\} & \{p t k p^h t^h k^h\} \\
\emptyset & \text{GW} \\
\{p t k\} & \{p^h t^h k^h\}
\end{array}
\]
Potential integrated representations

Table 3. Potential integrated representations and their completions.

<table>
<thead>
<tr>
<th>PHONOLOGY PHON-PHN PHONETICS</th>
<th>(4a) Voicing</th>
<th>(4b) Hybrid</th>
<th>(4c) Aspirating</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT [slack] voiced</td>
<td>∅ (+[spread]) plain (aspirated)</td>
<td>GT [slack] voiced GW [spread] aspirated</td>
<td>∅ (+[slack]) plain (voiced) GW [spread] aspirated</td>
</tr>
</tbody>
</table>
At least 3 distinction levels of representation:

- **phonology** (represents contrasts)
- **phonetics-phonology** (builds articulations/gestures from abstract categories)
- **phonetics** (properties of the speech signal)

Multilingual sound systems consist of *all* contrastive representations, both shared and unique to each language, that comprise a speaker’s integrated grammatical knowledge.

These categories can undergo various completion and implementation procedures.
3 Case Studies

- West Frisian & English in Wisconsin (Voicing vs. Aspirating)
- Toronto Polish and Toronto English (final laryngeal neutralization)
- Asymmetric laryngeal patterns of Western Armenian (HL spoken in Lebanon and in the US) – Voicing (Arabic) vs. Aspirating (English)
Based on Bousquette & Ehresmann (2010) and Ehresmann & Bousquette (2021)

(West) Frisian - moribund HL spoken in Randolph, WI

They find fully voiced and aspirated stops in HL

Q: To what extent do voicing and aspiration correlate to the specified, contrasted dimensions in an integrated F-E phonology?

<table>
<thead>
<tr>
<th></th>
<th>(4a) Voicing</th>
<th>(4b) Hybrid</th>
<th>(4c) Aspirating</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHONOLOGY</td>
<td>GT (slack)</td>
<td>Ø</td>
<td>GT (slack)</td>
</tr>
<tr>
<td>PHON-PHON</td>
<td>voiced</td>
<td>[+spread]</td>
<td>voiced</td>
</tr>
<tr>
<td>PHONETICS</td>
<td>Active</td>
<td>Inert</td>
<td>Active</td>
</tr>
<tr>
<td>ACTIVITY</td>
<td>voiced</td>
<td>aspirated</td>
<td>Inert</td>
</tr>
</tbody>
</table>

Table 4. Potential Frisian-English representations, with completions and activity for Frisian.
Integrated Polish-English laryngeal representations

/consonant/

\[
\text{GT} \quad \emptyset \\
\{b \ d \ ʃ \ g\} \quad \{p \ t \ c \ k \ p^h \ t^h \ k^h\}
\]

\[
\emptyset \quad \text{GW} \\
\{p \ t \ c \ k\} \quad \{p^h \ t^h \ k^h\}
\]
Comparison of *devoicing* vs. *fortition*

For Polish, voiced obstruents undergo a neutralization process and devoice word finally.

This operation does not occur before voiced obstruents (regressive spreading of GT)

**Final devoicing** (or *final fortition*) in Aspirating languages like German consist of the introduction of a [spread] gesture on the unmarked series (/p t k/) (Iverson & Salmons 2011)

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**Table 5. Comparison of devoicing and fortition.**

<table>
<thead>
<tr>
<th></th>
<th>Devoicing</th>
<th>Fortition</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHONOLOGY</td>
<td>GT</td>
<td>GW</td>
</tr>
<tr>
<td>PHON-PHON</td>
<td>∅</td>
<td>[spread]</td>
</tr>
<tr>
<td>PHONETICS</td>
<td>voiceless</td>
<td>aspirated</td>
</tr>
</tbody>
</table>

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Lyskawa et al. (2016) compare two generations of Toronto Polish HS (Gen1, Gen2) with homeland Polish and Toronto English speakers. They examine the extent to which HSs devoice Polish word-final stops, and whether there is any interaction between the Polish and English laryngeal neutralization process.

**Results:**
- Toronto Polish speakers implemented the devoicing rule at a higher rate than the homeland group (Homeland: 66%, Gen1: 67%, Gen2: 74%), and
- Gen2 devoiced less before voiceless obstruents than G1 and homeland speakers.
Asymmetric outcomes across dyads: Western Armenian

Based on research by Kelly & Keshishian (2021)

HSs with (i) Arabic and (ii) English as the MajL

Key findings:
- Surface patterns that clearly align with the MajL phonological systems:
  - Voicing for Arabic
  - Aspirating for English

Table 6. Potential Western Armenian laryngeal representations and their completions.

<table>
<thead>
<tr>
<th></th>
<th>(2a) Voicing</th>
<th>(2b) Aspirating</th>
<th>(3) Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHONOLOGY</td>
<td>GT</td>
<td>∅</td>
<td>GW</td>
</tr>
<tr>
<td>PHON-PHON</td>
<td>slack</td>
<td>+[spread]</td>
<td>+[slack]</td>
</tr>
<tr>
<td>PHONETICS</td>
<td>voiced</td>
<td>aspirated</td>
<td>voiced</td>
</tr>
</tbody>
</table>
A (phonological) system in flux

- WA Voicing system (2a):
  - WA undergoes no PHONOLOGICAL change in contact with Arabic, but there is a loss of +[spread] enhancement (PHONETIC-PHONOLOGICAL change);
  - WA and English are integrated into a Voicing-Aspirating system, with variable implementation of the English contrast (i.e., plain stops) or PHONOLOGICAL change to Aspirating system, with variable +[slack] enhancement (a PHONOLOGICAL dimension changes to a PHONETIC-PHONOLOGICAL gesture);

- WA Aspirating system (2b):
  - Results show either an integrated WA-Arabic laryngeal system, with implementation of the GT-Ø subsystem in WA, or complete PHONOLOGICAL change to the Arabic Voicing system;
  - No PHONOLOGICAL change in contact with English; instead patterns show (variable) reduction of +[slack] enhancement (PHONETIC-PHONOLOGICAL change);

- WA Overmarked (integrated) system (3):
  - Patterns in neither dyad distinguish between abstract representations or potential structural change. Rather, they demonstrate settings in which the implementations of contrastive subsets are modulated by MajL: Type (4a) for Arabic and type (4b) and/or type (4c) for English.
Contextualizing these effects

- Transfer
- Attrition
- Divergent Attainment
Following Putnam & Sánchez (2013) and Polinsky & Scontras (2020), Natvig (2021) considers *divergent attainment* to pertain to the grammatical knowledge in the *phonology*, rather than the *phonetic* or *phonetic-phonological* procedures.
Cross-generational comparison

Table 7. Comparison of cross-generational laryngeal representations.

<table>
<thead>
<tr>
<th>PHONOLOGY PHON-PHON</th>
<th>GT [slack]</th>
<th>Ø</th>
<th>GT [slack]</th>
<th>Ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHONETICS ACTIVITY</td>
<td><em>voiced</em></td>
<td><em>voiceless</em></td>
<td><em>voiced</em></td>
<td><em>aspirated</em></td>
</tr>
<tr>
<td></td>
<td>Active</td>
<td>Inert</td>
<td>Active</td>
<td>Inert</td>
</tr>
</tbody>
</table>

(6a) GENX Voicing

<table>
<thead>
<tr>
<th>PHONOLOGY PHON-PHON</th>
<th>Ø</th>
<th>GW [spread]</th>
<th>Ø</th>
<th>GW [spread]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHONETICS ACTIVITY</td>
<td><em>voiceless</em></td>
<td><em>aspirated</em></td>
<td><em>voiced</em></td>
<td><em>aspirated</em></td>
</tr>
<tr>
<td></td>
<td>Inert</td>
<td>Active</td>
<td>Inert</td>
<td>Active</td>
</tr>
</tbody>
</table>

(6b) GENX+1 Aspirating
Grammars are multi-layered systems
Bi/multilingual grammars contain all representations and contrasts
The role of contrasts in storing and activating linguistic knowledge is key in (bi/multilingual) language acquisition and development
Big question that we’ll leave for tomorrow...

Q: Can this model be applied to morphological and morphosyntactic features and representations in bi/multilingual grammars?