Backing vacillating stems
Hungarian vowel harmony in fast speech

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Variation in Hungarian Vowel Harmony

Hungarian [±back] vowel harmony:

*asztal* [ɒstɒl]  ‘table’ + Dative –nAk = *asztalnak*.
*függöny* [fygːøɲ]  ‘curtain’ + Dative –nAk = *függönynek*.
*fotel* [fotɛl]  ‘armchair’ + Dative –nAk = *fotelnek* ∼ *fotelnek*.

- Both considered grammatical by native speakers.
- Both amply attested in corpora.

Inter-speaker or intra-speaker variation? Both:
- Self-report, etc.
- Experiment below.
Variation in Hungarian Vowel Harmony

Most *vacillating* stems: back vowel followed by front vowel. Phonological *et al.* factors determine if / to what degree a stem vacillates.

For a **specific stem**, variation (= probability of back suffix) modulated by further factors:

- Dialect of the speaker (Blaho and Szeredi 2013).
- Suffix/case.
- Syntactic context (*ennek a X-nAk* ‘to this X’ vs. *annak a X-nAk* ‘to that X’).
- Priming by earlier decisions (Biró and Füredi on Saturday).
- Style (formal and causal), topic, etc.? — to be researched.

- Speech rate? — goal of this study.
Overview

1. Speech rate influencing variation
2. Our experiments: Design
3. Our experiments: Results
4. Discussion
Overview

1. Speech rate influencing variation

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Speech rate influencing variation (1)

Vacillation (probably) due to conflicting constraints: \(fo.te\ell -nAk\)

<table>
<thead>
<tr>
<th>(/fotel+nAk/)</th>
<th>(\text{LOCALHARMONY}[F])</th>
<th>(\text{DISTANTHARMONY}[B])</th>
</tr>
</thead>
<tbody>
<tr>
<td>([fotel.nak])</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>([fotel.nek])</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

1. Only local harmony is phonetically motivated,
→ local \(F\)-harmony stronger in fast speech,
→ prediction: \(fotelnak\) more frequent in fast than in normal speech.

2. Distant \(B\)-harmony ‘less distant’ in fast speech (as measured in msec),
→ distant harmony stronger in fast speech,
→ prediction: \(fotelnak\) more frequent in fast than in normal speech.
Speech rate influencing variation (2)

Smolensky and Legendre (2006); Biró (2006):

- Mental grammar modelled by (e.g.) OT introduces globally optimal forms.
- Mental computation modelled by (e.g.) simulated annealing (imperfect search) produces locally optimal forms.

As computation speeds up, frequency of globally optimal forms (usually) drops, and the frequency of other local optima increases. Hence, if fotelnek less frequent in fast speech than in normal speech, then argument for fotelnek.
Speech rate influencing variation

Our experiments: Design

Our experiments: Results

Discussion
Eliciting fast speech data in a quiz-like situation


Part 1: Say to the microphone

Part 2: Type in the field

Q: *What has armrests?* (lit.: ‘To what are armrests?’)
A. Table. B. Curtain. C. Armchair.
- Q presented visually and auditorily.
- Answers presented only visually.

Response using dative or inessive case (‘to armchair’), to be figured out by subject.
Presentation orders of items and answers:
- randomized across subjects,
- same in two modalities for given subject.
Details

- Software written by author in Java (TB).
- Experiment 1: 26 Hungarian native speaker subjects (11 male, 15 female, age: 20–57, median: 25). 10 target words.
- Experiment 2: still being evaluated (# of subjects and # of target words doubled).
- Target words: vacillating stem, with one back stem and one front stem as alternative answers (comparable semantic field, phonological and morphological complexity, frequency).
- Fillers: equal # as targets, of which half back and half front. Answers required various cases (including dative and inessive).
- Experiment starts with three fillers. Then back and front fillers alternate. E.g., B F B T F T T B T F T B T T F T B T F T.
- Evaluation: done by software for written part; done by authors for oral part (inter-rater agreement > 98%, Cohen’s kappa index = 97%).
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## Experiment 1: non-real vacillating stems

Words that could vacillate in theory, but do not, or do ‘differently’:

<table>
<thead>
<tr>
<th>Word</th>
<th>Allophone</th>
<th>Affix</th>
<th>Corpus (*)</th>
<th>fast</th>
<th>normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>hamburger</td>
<td>'hamburger'</td>
<td>.INESS</td>
<td>1 11</td>
<td>1 24</td>
<td>0 25</td>
</tr>
<tr>
<td>sláger</td>
<td>'hit'</td>
<td>.DAT</td>
<td>1 127</td>
<td>0 21</td>
<td>1 24</td>
</tr>
<tr>
<td>dzsungel</td>
<td>'jungle'</td>
<td>.INESS</td>
<td>30 569</td>
<td>0 25</td>
<td>1 25</td>
</tr>
<tr>
<td>férfi</td>
<td>'[male] man'</td>
<td>.DAT</td>
<td>3908 928</td>
<td>12 2</td>
<td>16 7</td>
</tr>
<tr>
<td>Athén</td>
<td>'Athens'</td>
<td>.INESS</td>
<td>2717 359</td>
<td>22 4</td>
<td>23 2</td>
</tr>
<tr>
<td>balhé</td>
<td>'roughhouse'</td>
<td>.INESS</td>
<td>24 0</td>
<td>24 0</td>
<td>26 0</td>
</tr>
</tbody>
</table>

(*) Hungarian National Corpus (http://mnsz.ny whole.hu).
Experiment 1: real vacillating stems

For really vacillating stems, when moving from fast/oral modality to normal/written modality, frequency of F suffix increased!

<table>
<thead>
<tr>
<th>allomorph chosen:</th>
<th>Corpus (*)</th>
<th>fast</th>
<th>normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>hotel ‘hotel’ .INESS</td>
<td>236 1419</td>
<td>6 19</td>
<td>1 24</td>
</tr>
<tr>
<td>farmer ‘jeans’ .DAT</td>
<td>4 4</td>
<td>7 17</td>
<td>5 17</td>
</tr>
<tr>
<td>farmer ‘farmer’ .DAT</td>
<td>13 30</td>
<td>10 15</td>
<td>6 17</td>
</tr>
<tr>
<td>fotel ‘armchair’ .DAT</td>
<td>12 3</td>
<td>6 19</td>
<td>4 21</td>
</tr>
</tbody>
</table>

(*) Hungarian National Corpus (http://mnsz.nyted.hu).
Experiment 1: real vacillating stems

Matched-pair design:

<table>
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<tr>
<th>allomorph chosen:</th>
<th>Corpus (*)</th>
<th>(fast, normal) pairs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>F</td>
</tr>
<tr>
<td>hotel ‘hotel’ .INESS</td>
<td>236</td>
<td>1419</td>
</tr>
<tr>
<td>farmer ‘jeans’ .DAT</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>farmer ‘farmer’ .DAT</td>
<td>13</td>
<td>30</td>
</tr>
<tr>
<td>fotel ‘armchair’ .DAT</td>
<td>12</td>
<td>3</td>
</tr>
</tbody>
</table>

Probability of front suffix is increased in normal/written condition! McNemar’s Chi-squared test with continuity correction:

\[ \chi^2 = 5.8824, \text{ df} = 1, p = 0.0153. \]

(*) Hungarian National Corpus (http://mnsz.nytud.hu).
61 Hungarian native speaker subjects.
20 target words: new ones, and old ones (old or new case).
Tendency again: fast speech more frequently [+back].
Some speakers unnaturally stressing suffix: reversed effect. Hyper-correctness in part 1?
One group of speakers with strong preference for F suffix and much less cross-modality differences.
Those with a preference for B suffix in normal/written modality, will typically yield more cross-modality variances.
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Speech rate does influence variation!
Frequency of B suffix increased in fast speech

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</tr>
<tr>
<td>✽ [fotel.nek]</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

- ∼ B-suffix produced, and produced more often in fast speech:
  1. by imperfect mental computation (prone to errors), as local optimum?
  2. DISTANTHARMONY[B] ‘less distant’ in fast speech, slightly promoted?
  3. noise (stoch. OT), stronger in fast speech (‘increased randomness’, reviewer 5)?
Thank you for your attention!

Tamás Biró:


Thank you to Katalin Mády for discussion and help in preparing the material.