Quantifier scope in heritage bilinguals: a comparative experimental study

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Proposal: In the domain of scope, the interaction of a dominant and a heritage grammar results in simplification across the board.

1 Background
   - Quantification
   - Heritage speakers
   - Previous work: a puzzle

2 Experiments
   - Monolingual Hungarian
   - Heritage Hungarian
   - Heritage English

3 Discussion
Doubly quantified sentences exhibit scope ambiguities:

(1) Every pirate fed a shark. (Every – A)
   a. Surface scope ($\forall > \exists$): For every pirate, there is a shark that he fed.
   b. Inverse scope ($\exists > \forall$): There is a shark such that every pirate fed it.

(2) A pirate fed every shark. (A – Every)
   a. Surface scope ($\exists > \forall$): There is a pirate such that he fed every shark.
   b. Inverse scope ($\forall > \exists$): For every shark, there is a pirate that fed it.

- Every – A sentences: inverse entails surface
- A - Every sentence: good test case
Background

Quantification across languages

Different scope interpretations: generated via Quantifier Raising (QR) (May, 1977).

Inverse interpretations: available but dispreferred.

- grammaticality judgements
- reaction times
Scope-rigid languages: no scope ambiguities, only surface reading.

Hungarian: different readings of (1) encoded by different sentences.

(3) Minden kalóz meg-étet-ett egy cápá-t.
every pirate PFV-feed.3SG-PST a/one shark-ACC

(4) Egy cápá-t étet-ett meg minden kalóz.
a/one shark-ACC feed.3SG-PST PFV every pirate
Background
Heritage speakers

- Simultaneous/sequential bilinguals, native language (L1) is less dominant.
- Majority language (L2) only supplants L1 around school age (Benmamoun, et al., 2013a; b).
- Helpful in distinguishing areas of grammar susceptible to attrition from those that are not.
Scope calculations bring together syntactic, semantic and pragmatic levels of representation → difficult, fragile.

Heritage speakers have to employ a less dominant grammar → processing difficulty.

Scope is worthy of investigation especially in heritage speakers.
Previous experimental work
Scontras, et al. (2017)

- English-dominant heritage speakers of Mandarin.
- Both their Mandarin and English grammar like native Mandarin: scope-rigid.
- **Puzzle:** scope system of weaker language retained + even transferred?

**Hypothesis 1**
The L1, by virtue of being acquired first, is preserved and transferred to the L2.

**Hypothesis 2**
The simpler (no ambiguities, no QR) of the two grammars is preserved and transferred.
The present study

- A population to tease these apart: heritage speakers of English who are dominant in a scope-rigid language.

**Hypothesis 1**

The L1, by virtue of being acquired first, is preserved and transferred to the L2.

**Prediction:** the scope ambiguity of their English is preserved.

**Hypothesis 2**

The simpler (no ambiguities, no QR) of the two grammars is preserved and transferred.

**Prediction:** their English becomes scope-rigid.
The present study

- Predictions tested on (the heritage languages of):
  - Experiment 1: monolingual Hungarian speakers
  - Experiment 2: English-dominant heritage speakers of Hungarian
  - Experiment 3: Hungarian-dominant heritage speakers of English

Hypothesis 2

The simpler (no ambiguities, no QR) of the two grammars is preserved and transferred.

**Prediction:** their English becomes scope-rigid.
Experimental design

- Participants presented with a doubly quantified sentence and a disambiguating (surface vs. inverse) picture.
- Rated on a 7-point scale how accurately the sentence described the picture.
  - 1 = completely inappropriate and 7 = completely appropriate
- Two factors manipulated:
  - Word Order: the linear configuration of quantifiers (Every - A vs. A - Every)
  - Scope Interpretation: the intended reading (Surface vs. Inverse)
## Experimental design

<table>
<thead>
<tr>
<th></th>
<th>Surface scope</th>
<th>Inverse scope</th>
</tr>
</thead>
</table>
| **Every – A**  | ![Picture of Every A]  
Minden kalóz meg-etet-ett egy cápá-t. 
Every pirate fed a/one shark. | ![Picture of Every A]  
Minden kalóz meg-etet-ett egy cápá-t. 
Every pirate fed a/one shark. |
| **A – Every**  | ![Picture of A Every]  
Egy kalóz meg-etet-ett minden cápá-t. 
A/One pirate fed every shark. | ![Picture of A Every]  
Egy kalóz meg-etet-ett minden cápá-t. 
A/One pirate fed every shark. |
Experiment 1
Participants and predictions

- 77 native monolingual Hungarians.
- Prediction: if the theoretical assumption (i.a. É. Kiss, 2002) is correct, then Hungarian is scope-rigid:
  - Critical A - Every inverse condition: low ratings.
Experiment 1: Results

significant effects:
- Word Order ($p<.001$)
- Scope Interpretation ($p<.001$)
- interaction ($p<.05$)

A – Every inverse: 1.62

confirms scope-rigidity of Hungarian
15 English-dominant heritage speakers of Hungarian.

A priori:
- Scope-rigidity immune to transfer $\rightarrow$ low ratings for the critical condition.
- Scope calculation susceptible to transfer $\rightarrow$ higher ratings.

Based on Scontras, et al. (2017): L1 immune to transfer from L2.
Experiment 2: Results

significant effects:
- Word Order (p<.05)
- Scope Interpretation (p<.01)

interaction n. s. (p=.4)

A – Every inverse: 2.33

replicates Scontras, et al.
Heritage speakers less comfortable with their L1 heritage grammar → accept ungrammatical constructions to a greater extent (i.a. Benmamoun et al., 2013b).

Scontras, et al.’s comparable heritage Mandarin rating: 2.79.
Experiment 3
Participants and predictions

- 8 Hungarian-dominant heritage speakers of English
- Materials in English, but otherwise identical to Experiments 1-2.

**Hypothesis 1**
The L1, by virtue of being acquired first, is preserved and transferred to the L2.
**Prediction:** the scope ambiguity of their English is preserved, i.e. higher A - Every inverse ratings.

**Hypothesis 2**
The simpler (no ambiguities, no QR) of the two grammars is preserved and transferred.
**Prediction:** their English becomes scope-rigid, i.e. low A - Every inverse ratings.
Experiment 3: results

significant effects:
- Word Order ($p < .05$)
- Scope Interpretation ($p < .001$)
- interaction ($p < .05$)

A – Every inverse: 2.18

supports Hypothesis 2
Materials identical to Scontras, et al. → comparison with their native English results.
Rating for the critical condition: over 2 points below native English baseline.
Data pattern similarly to native Hungarian.

<table>
<thead>
<tr>
<th>Word Order</th>
<th>Scope Interpretation</th>
<th>Heritage English</th>
<th>Native English</th>
<th>Native Hungarian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every - A</td>
<td>surface</td>
<td>5.68</td>
<td>6.5</td>
<td>6.14</td>
</tr>
<tr>
<td>A - Every</td>
<td>surface</td>
<td>4.68</td>
<td>5.6</td>
<td>4.72</td>
</tr>
<tr>
<td>Every - A</td>
<td>inverse</td>
<td>4.18</td>
<td>5.5</td>
<td>3.97</td>
</tr>
<tr>
<td>A - Every</td>
<td>inverse</td>
<td>2.18</td>
<td>4.46</td>
<td>1.62</td>
</tr>
</tbody>
</table>
Overall results

Ratings by experiment and condition

Conditions

Ratings

Experiment 1
Experiment 2
Experiment 3

Ratings by experiment and condition

Every − A surface
Every − A inverse
A − Every surface
A − Every inverse

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Results and discussion

- A – Every inverse ratings: low across all three experiments.
- None of the three grammars (native and heritage Hungarian, heritage English) allow inverse scope.

Hypothesis 2

The simpler (no ambiguities, no QR) of the two grammars is preserved and transferred.
Results and discussion

- Observed preference for isomorphism can be given a processing-related explanation.
- Calculation of inverse scope is independently known to be costly:

  **Processing Scope Economy:** The human sentence processing mechanism prefers to compute a scope configuration with the simplest syntactic representation (or derivation). Computing a more complex configuration is possible but incurs a processing cost.

  Anderson (2004, p. 48)
Results and discussion

- Heritage speakers have to employ a less dominant grammar → additional processing cost.
- Not surprising that a preference for simpler grammars is especially pronounced.
- They default to scope rigidity, regardless of whether it comes from L1 or L2.

**Conclusion:** In the domain of scope, the interaction of a dominant and a heritage grammar results in simplification across the board.
Thank you!
References


