Quantifier scope in heritage bilinguals: a comparative experimental study

Eszter Ronai
The University of Chicago – ronai@uchicago.edu

Objectives

Investigate the interaction of different scope systems in English-Hungarian heritage bilingual speakers:

- general transfer always in one direction?
- simplification across the board due to processing considerations?

Background

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.

Scope-rigid languages do not allow ambiguities, only surface readings are available.

Scontras et al. (2017) investigated English-dominant heritage speakers of Mandarin:

- their Mandarin grammar is like native Mandarin: scope-rigid
- their English grammar is also like native Mandarin: scope-rigid

This suggests that there is **no transfer from the dominant (L2) to the heritage (L1)** grammar in the domain of scope. Puzzle: why would the scope system of the weaker language not only be retained, but even transferred to the dominant language?

These results are compatible with two hypotheses. The population to tease them apart: heritage speakers of English who are dominant in a scope-rigid language.

Hypotheses

Hypothesis 1 The heritage grammar, by virtue of being acquired first, is preserved and transferred to the L2 even though the L2 is dominant.
Prediction: the scope ambiguity of their English is preserved.

Hypothesis 2 Regardless of temporal order of acquisition, the simpler (defined as not allowing ambiguities) grammar is preserved and carried over to the other language.
Prediction: their English becomes scope-rigid.

In Hungarian (a scope-rigid language), the surface reading of (1) is encoded by (3), the literal translation, and its inverse reading by (4) (i.a. É. Kiss, 2002).

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

(4) Egy cápá-t etet-ett meg minden kalóz.
a/one shark-ACC feed.3SG-PST PFV every shark-ACC

Predictions tested on the L1s of:

- Experiment 1: 77 native monolingual Hungarians
- Experiment 2: 15 English-dominant heritage speakers of Hungarian
- Experiment 3: 8 Hungarian-dominant heritage speakers of English

Experimental design

- Participants rated on a 7-point scale how accurately a doubly quantified sentence described a disambiguating (surface vs. inverse) picture.
- Two factors manipulated:
  - **Word Order** (Every - A vs. A - Every)
  - **Scope Interpretation** (Surface vs. Inverse)
- Under the Every - A condition, the inverse reading entails the surface reading. Therefore the **critical test case to demonstrate inverse scope is A - Every inverse**.

	Surface scope	Inverse scope
Every-A	 Minden kalóz megetetett egy cápát. Every pirate fed a shark.	 Minden kalóz megetetett egy cápát. Every pirate fed a shark.
A-Every	 Egy kalóz megetetett minden cápát. A pirate fed every shark.	 Egy kalóz megetetett minden cápát. A pirate fed every shark.

Results

Experiment 1: significant effect of Word Order ($p<.001$), Scope Interpretation ($p<.001$), their interaction ($p<.05$). Critical A - Every inverse condition received the lowest rating. → **empirical confirmation of scope-rigidity in Hungarian**

Experiment 2: significant main effect of Word Order ($p<.05$), Scope Interpretation ($p<.01$). The overall pattern was very similar to Experiment 1, even though the interaction was n. s. ($p=.4$). → **replicates Scontras et al.**

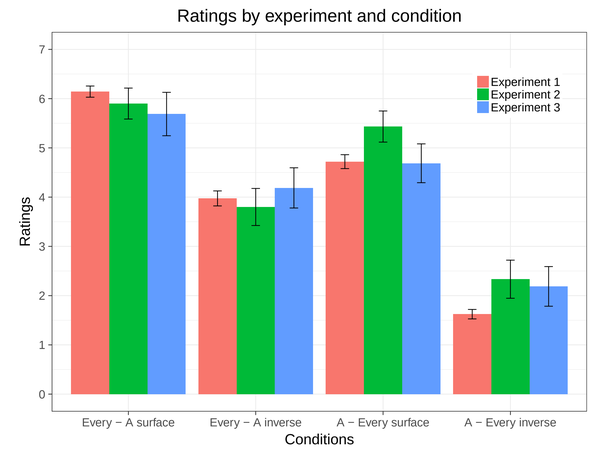
Experiment 3: significant main effect of Word Order ($p<.05$), Scope Interpretation ($p<.001$), their interaction ($p<.05$). → **supports Hypothesis 2**

- The slightly higher critical condition ratings in Experiments 2-3 are likely due to the yes-bias of heritage speakers (Benmamoun et al., 2013).
- Ratings in the crucial heritage English group are over 2 points below the monolingual English baseline (from Scontras et al., 2017).
- Data in general pattern similarly to monolingual Hungarian (from Experiment 3).

Word Order	Scope Interpretation	Heritage English	Native English	Native Hungarian
Every - A	surface	5.68	6.5	6.14
A - Every	surface	4.68	5.6	4.72
Every - A	inverse	4.18	5.5	3.97
A - Every	inverse	2.18	4.46	1.62

Table: Comparing heritage English to monolingual English/Hungarian

Results



Discussion

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

A processing-related explanation:

- Calculation of inverse scope is independently known to be costly, cf. e.g. the principle of Processing Scope Economy (Anderson, 2004).
- Heritage speakers have to employ a less dominant grammar → additional processing cost.
- A preference for simpler grammars is especially pronounced in their case, to the extent that they default to scope-rigidity across the board.

Conclusion

In the domain of scope, the interaction of a dominant and a heritage grammar results in simplification (i.e. loss of ambiguity) across the board.

Future research

Does a simpler scope-rigid grammar need to be available from L1/L2 to see these effects, or would heritage speakers default to it anyway?

- Test: speakers whose heritage and dominant languages both allow ambiguities.

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