ARE BILINGUAL LOGICAL REPRESENTATION SHARED?

Priming scopally ambiguous sentences in English, Estonian, and Dutch

Mieke Sarah Slim¹,² & Napoleon Katsos¹
¹University of Cambridge, United Kingdom; ²Ghent University, Belgium

mieke.slim@ugent.be
ARE BILINGUAL LOGICAL REPRESENTATION SHARED?

Primming scopally ambiguous sentences in English, Estonian, and Dutch

Mieke Sarah Slim\textsuperscript{1,2} & Napoleon Katsos\textsuperscript{1}

\textsuperscript{1}University of Cambridge, United Kingdom; \textsuperscript{2}Ghent University, Belgium

mieke.slim@ugent.be

This ‘poster’ is annotated. Text balloons like these pop up in some slides to give some additional info that will guide you through the poster.

Of course, we will be available for a live walkthrough and/or Q&A during the conference!
• Scope ambiguity: Interpretations mentally represented as logical representations

• Logical representations can be primed in language comprehension (Feiman & Snedeker, 2016; Raffray & Pickering, 2010)

• Are bilingual logical representations shared (between languages) or separate (per language)? (Slim, Lauwers & Hartsuiker, under review)
  - Between-language priming (e.g. Hartsuiker, Pickering & Veltkamp, 2004)
  - Observed for bilingual syntactic and lexico-semantic representations (e.g. Francis, 2005; Hartsuiker, Pickering & Veltkamp, 2004; for review, see Van Gompel & Arai, 2017)

• Cross-linguistic differences in scope ambiguity resolution.
  - Do cross-linguistic differences influence the organisation of bilingual logical representations?
    - Cross-linguistic transfer?
    - Logical representations sensitive to language-specific biases?
All the sheep are not in the squares
Kõik lambad ei ole kastides
Alle schapen zijn niet in de vierkanten

There are empty squares
Kõik sead ei ole kastides
Alle varkens zijn niet in de vierkanten

Method
Sentence-picture matching task

Universal-wide prime
Negation-wide prime
Visual prime (Negation-wide example; Experiment 5)
English: All the sheep are not in the squares
Estonian: Kõik lambad ei ole kastides
Dutch: Alle schapen zijn niet in de vierkanten

English: All the pigs are not in the squares
Estonian: Kõik sead ei ole kastides
Dutch: Alle varkens zijn niet in de vierkanten

English: There are empty squares
Universal-wide prime

English: All the sheep are not in the squares
Estonian: Kõik lambad ei ole kastides
Dutch: Alle schapen zijn niet in de vierkanten

Negation-wide prime

English: All the sheep are not in the squares
Estonian: Kõik lambad ei ole kastides
Dutch: Alle schapen zijn niet in de vierkanten

Visual prime (Negation-wide example; Experiment 5)

English: There are empty squares

These prime trials did not involve an all…not sentence
<table>
<thead>
<tr>
<th>Experiments</th>
<th>Overview and participants</th>
</tr>
</thead>
</table>
| 1. L1-L1 priming *(within-language)* | I. English native speakers  
II. Estonian native speakers  
III. Dutch native speakers |
| 2. L1-L2 priming *(between-language)* | I. Estonian-English bilinguals  
II. Dutch-English bilinguals |
| 3. L2-L1 priming *(between-language)* | I. Estonian-English bilinguals |
| 4. L2-L2 priming *(within-language)* | I. Estonian-English bilinguals |
| 5. Visual priming *(control experiment)* | I. English native speakers |
Experiments

Overview and participants

1. L1-L1 priming  (within-language)
   I. English native speakers
   II. Estonian native speakers
   III. Dutch native speakers

2. L1-L2 priming  (between-language)
   I. Estonian-English bilinguals
   II. Dutch-English bilinguals

3. L2-L1 priming  (between-language)
   I. Estonian-English bilinguals

4. L2-L2 priming  (within-language)
   I. Estonian-English bilinguals

5. Visual priming  (control experiment)
   I. English native speakers

The first language denotes the L1, the second language the L2 (so ‘Estonian-English bilinguals’ are L1 speakers of Estonian who speak English as an L2)
Results

Priming of logical representations (Experiments 1-4)

- ** Logit mixed-effect models
- Cross-experimental analysis: Effect of priming comparable

**Experiment 1: L1-L1**

- **
- *
- n.s.

**Experiment 2: L1-L2**

- ***
- n.s.

**Experiment 3: L2-L1**

- ***
- n.s.

**Experiment 4: L2-L2**

- ***
Results

Priming of logical representations (Experiments 1-4)

- **Experiment 1: L1-L1**
- **Experiment 2: L1-L2**
- **Experiment 3: L2-L1**
- **Experiment 4: L2-L2**

Logit mixed-effect models

Cross-experimental analysis: Effect of priming comparable

The y-axis represents the percentage of universal-wide target responses.
Results

Priming of logical representations (Experiments 1-4)

- **Logit mixed-effect models**
- **Cross-experimental analysis: Effect of priming comparable**

### Experiment 1: L1-L1
- n.s.

### Experiment 2: L1-L2
- ***
- n.s.

### Experiment 3: L2-L1
- ***

### Experiment 4: L2-L2
- ***

The x-axis denotes the two prime conditions (universal-wide and negation-wide).

---

**Note:** The diagrams illustrate the distribution of responses across prime conditions for each experiment, with significance levels indicated.
Experiment 1: L1-L1
Experiment 2: L1-L2
Experiment 3: L2-L1
Experiment 4: L2-L2

Results

Priming of logical representations (Experiments 1-4)

Logit mixed-effect models
Cross-experimental analysis: Effect of priming comparable

These labels here refer to the sub-experiments
• Logit mixed-effect models
• Cross-experimental analysis: Effect of priming comparable
**Results**

**Experiment 1: L1-L1**

- **n.s.**

**Experiment 2: L1-L2**

- ***

**Experiment 3: L2-L1**

- ***

**Experiment 4: L2-L2**

- ***

---

- Logit mixed-effect models
- Cross-experimental analysis: Effect of priming comparable

---

The dots represent the individual participants.
Results

Priming of logical representations (Experiments 1-4)

- Experiment 1: L1-L1
  - **
  - *
  - n.s.
- Experiment 2: L1-L2
  - ***
  - *
  - n.s.
- Experiment 3: L2-L1
  - ***
  - n.s.
- Experiment 4: L2-L2
  - ***

**Priming is characterised as a higher rate of universal-wide responses in the universal-wide condition than in the negation-wide condition.**

- Logit mixed-effect models
- Cross-experimental analysis: Effect of priming comparable
Results

Priming of logical representations (Experiments 1-4)

** Logit mixed-effect models
• Cross-experimental analysis: Effect of priming comparable
Results

Effect of visual priming? (Experiment 5)

n.s.

- No role of visual priming
- Cross-experimental comparisons: Priming of logical representations (Experiments 1-4) significantly stronger than visual priming
  - Except for the Experiment 1c and 2b (the ‘Dutch experiments’)
Results

Effect of visual priming? (Experiment 5)

- No role of visual priming
- Cross-experimental comparisons: Priming of logical representations (Experiments 1-4) significantly stronger than visual priming
  - Except for the Experiment 1c and 2b (the ‘Dutch experiments’)

Proportion of universal-wide responses is lower in the universal-wide prime condition than in the existential-wide condition: Clearly no effect of priming
Results

Cross-linguistic influence

English targets

Estonian targets

- Cross-linguistic influence
  - From the L1 onto the L2
  - From the L2 onto the L1
- Enhanced by prime trials in the non-selected language
Results

Cross-linguistic influence

- English targets
- Estonian targets

• Cross-linguistic influence
  - From the L1 onto the L2
  - From the L2 onto the L1

• Enhanced by prime trials in the non-selected language

Prime condition is ignored
**Results**

**Cross-linguistic influence**

- **English targets**
- **Estonian targets**

This left panel shows that native speakers of English assign the universal-wide interpretation more often to English all...not sentences than Estonian-English bilinguals.

- Cross-linguistic influence
  - From the L1 onto the L2
  - From the L2 onto the L1
- Enhanced by prime trials in the non-selected language
Results

Cross-linguistic influence

English targets

Estonian targets

• Cross-linguistic influence
  - From the L1 onto the L2
  - From the L2 onto the L1

• Enhanced by prime trials in the non-selected language

This trend is induced when prime trials are given in Estonian
**Cross-linguistic influence**

- From the L1 onto the L2
- From the L2 onto the L1
- Enhanced by prime trials in the non-selected language

When the target trials are given in Estonian, the presence of English prime trials influences the interpretation of these Estonian target sentences (so, also cross-linguistic transfer from the L2 onto the L1).
• Priming of logical representations persists between languages (L1-L1, L1-L2, L2-L1, L2-L2)
  • Bilinguals have **shared logical representations**
  • Results not due to effects of visual priming

• Cross-linguistic priming of *all*...*not* in Estonian-English bilingualism
  • (Short-term) priming of logical representations insensitive to language-specific biases

• Estonian-English bilinguals were not completely native-like in their interpretation of English *all*...*not* sentences
  • **Cross-linguistic transfer** at the level of logical representations
  • Implicit knowledge on language-specific biases and preferences also shared
    (e.g. Salamoura & Williams, 2006; Van Gompel & Arai, 2018).
  • Induced by prime trials in the non-target language (Experiments 2-3)

• Alternative explanation: Logical representations as **conceptual meaning representations**? (Fodor, 1982)
  • Locus of priming: Conceptual sentence meaning representation, rather than a linguistic logical representation

• Bilinguals form a very heterogeneous group!