Incremental processing of grammatical gender in bilingual children

Jasmijn Bosch & Francesca Foppolo

University of Milano - Bicocca

Contact: jasmijn.bosch@unimib.it

Introduction

Grammatical gender: morphosyntactic cue to predict upcoming information during sentence processing

- Young monolingual children make rapid use of the gender of the article when comprehending subsequent nouns (Lew-Williams & Fernald, 2007)
- Adult L2 speakers show less efficient processing of gender than native speakers (e.g., Lew-Williams & Fernald, 2010)
- Transfer effects due to gender incongruency during online processing in bilingual adults (e.g., Morales et al., 2016; see Sá-Leite et al., 2019)
- Gender incongruency effect was found for successive but not for simultaneous bilingual children (Lemmerth & Hopp, 2019)

Research questions

1. **Do Italian-German bilingual children make linguistic anticipations on the basis of grammatical gender?**
2. **Is there cross-linguistic influence when two languages have the opposite gender?**
3. **What is the effect of language dominance?**

Visual world eye-tracking experiment

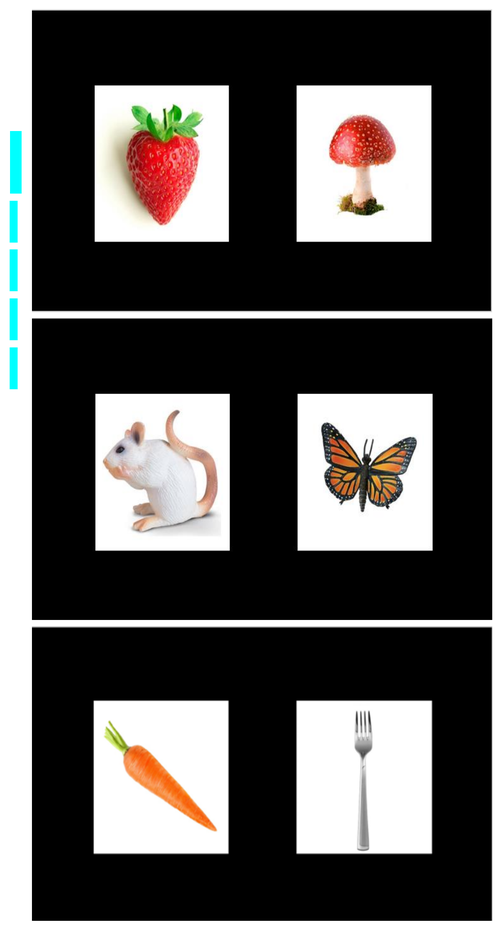


Figure 1.

Prediction – Congruent

$la_{[+Fem]}$ fragola vs $il_{[+Masc]}$ fungo
$die_{[+Fem]}$ Erdbeere vs $der_{[+Masc]}$ Pilz

➔ anticipation + no interference

Figure 2.

Prediction – Incongruent

$il_{[+Masc]}$ topo vs $la_{[+Fem]}$ farfalla
$die_{[+Fem]}$ Maus vsder $_{[+Masc]}$ Schmetterling

➔ anticipation + interference

Figure 3.

No prediction (congruent gender)

$la_{[+Fem]}$ carota vs $la_{[+Fem]}$ forchetta
die $_{[+Fem]}$ Möhre vs die $_{[+Fem]}$ Gabel

➔ no anticipation

Hypotheses and predictions

1. **Bilingual children process speech incrementally**
   - ➢ Increase of looks to target at during the article in predictable conditions
2. **Gender incongruency leads to cross-linguistic influence**
   - ➢ less anticipation in Italian when German translation equivalents have opposite gender
3. **Language dominance influences anticipation and interference**
   - ➢ stronger anticipation patterns for Italian-dominant children
   - ➢ language incongruency effect more likely for German-dominant children

Methods

Participants

- 65 Italian-German bilingual children (40 resident in Italy, 25 in Germany)
- *M* age = 8;02, SD = 0;10 (range = 6-10)
- All attending bilingual schools

Vocabulary test (PPVT) in German and Italian → *mostly Italian-dominant*

- *M* standard score Italian PPVT: 99.5 (*SD* = 19.7)
- *M* standard score German PPVT: 91.4 (*SD* = 21.8)
- Balance score = Italian PPVT – German PPVT
- Children in Italy were significantly better in Italian (p <.001), and children in Germany were significantly better in German (p <.001)

Eye movements recordings: Tobii Pro X3-120 (sampling rate: 120 Hz.)

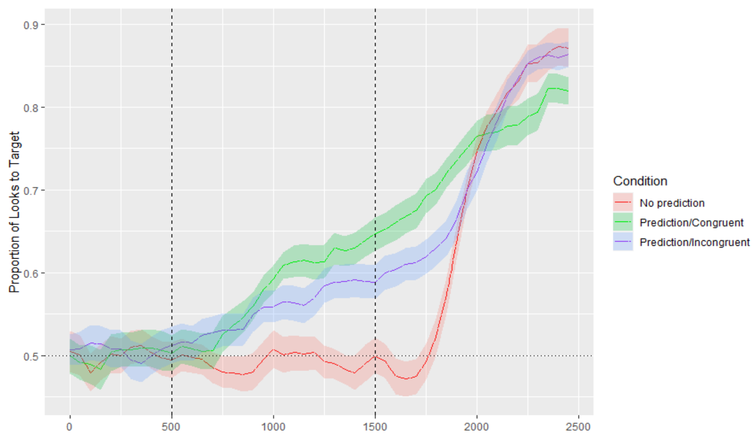
- All children participated in an experiment in Italian
- Children in Germany also participated in an experiment in German

Generalized linear mixed effects models

- Interaction between Time Region (Intro vs Determiner) and Condition (Prediction Congruent/Incongruent vs No Prediction) → *Prediction*
- Interaction between Time Region (Intro vs Determiner) and Condition (Prediction Congruent vs Prediction Incongruent → *Cross-linguistic influence*
- Three way interactions with Balance scores → *Effects of language dominance*

Results

Figure 4. Time course of eye-movements in Italian task



Dov'è	*$la_{[+FEM]}$*	*fragola?*
Where's	the	strawberry?

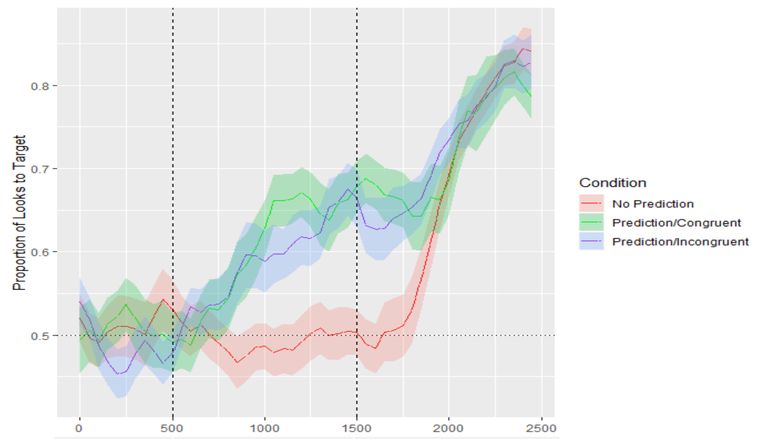
Italian experiment

- Significant prediction (p <.001)
- Significant interference from German (p < .001)
- Both effect modulated by language dominance: Italian-dominant children showed more prediction (p < .001) and less cross-linguistic influence (p < .001)

→ Gender congruency effect confirmed when focusing on simultaneous bilinguals only (*N* = 23)

German experiment

- Significant prediction (p <.001)
- No gender congruency effect (p = .115)
- Prediction effect modulated by language dominance: German-dominant children showed more prediction (p < .001)



Wo ist	*$die_{[+FEM]}$*	*Erdbeere?*
Where's	the	strawberry?

Discussion and conclusions

- **Anticipation of nouns on the basis of grammatical gender of articles in both Italian and German** → Like monolingual children and adults, bilingual children make use of predictive processing
- **Gender congruency effect in an Italian task but not in a German task**
  - Because participants in the German task were German-dominant, while there was more variation in the Italian task?
  - In contrast to previous research, the gender congruency effect in Italian was also present in simultaneous bilingual children
- **Language dominance matters**: stronger prediction and smaller likelihood of cross-linguistic influence for children who were tested in their dominant language (in terms of vocabulary knowledge)

Acknowledgements

We thank Maren Eikerling, Mathilde Chailleux, Giulia Mornati, Chiara Saponaro and Riccardo Zanaboni. Technical support from Carlo Toneatto.

This project has received funding from the European Union's Horizon2020 research and innovation programme under the Marie Skłodowska Curie grant agreement No 765556.