

(Bound) Pronouns in Competition: Ambiguity Avoidance in Romanian Anaphora Production

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Today's Talk

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We provide psycholinguistic evidence from production which supports the hypothesis that **ambiguity avoidance** strategies steer pronominal usage in cases of **local coreference**, and, surprisingly to the BT literature, also for **bound variable dependencies**.

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Romanian is one such language.

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The pronoun *el* is compatible with either interpretation.

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- c. **Lockhart** a vorbit despre **el însuși**. EMPHATIC
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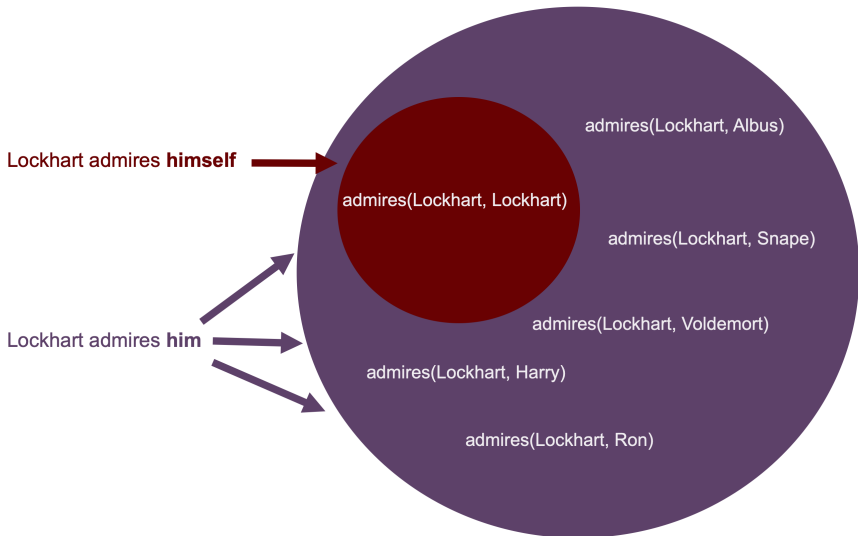
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This reasoning also led to a number of accounts which constrain the competition between pronouns and reflexives in terms of **ECONOMY** considerations. (Safir 2004, 2014; Rooryck & vanden Wyngaerd, 2011; a.o.)

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And, in fact, the competition between pronouns and reflexives is couched in an important larger question ...

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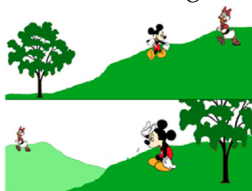
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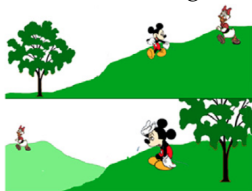
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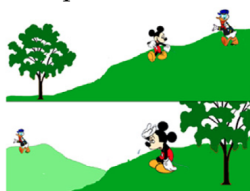
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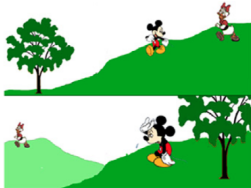


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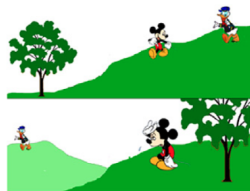
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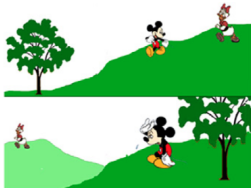
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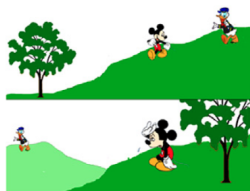
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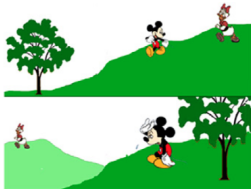
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Sample possible continuations:
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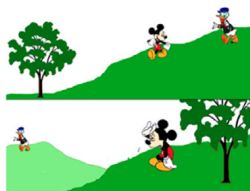
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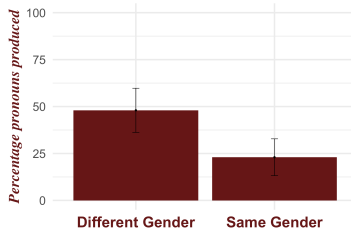
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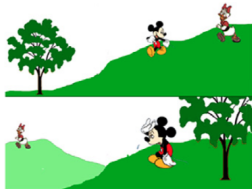


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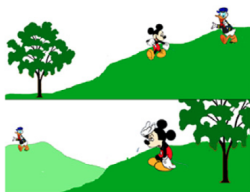
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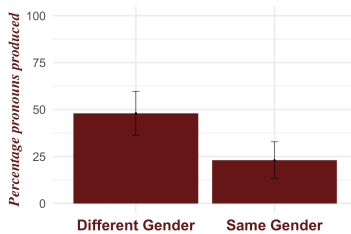
Speakers use **less pronouns** in
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While there is evidence in favor of ambiguity avoidance cross-sententially, it is not obvious that the same pressures should hold for intrasentential contexts.

Hypothesis

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When choosing between two alternative sentences, S and S', speak S' iff:

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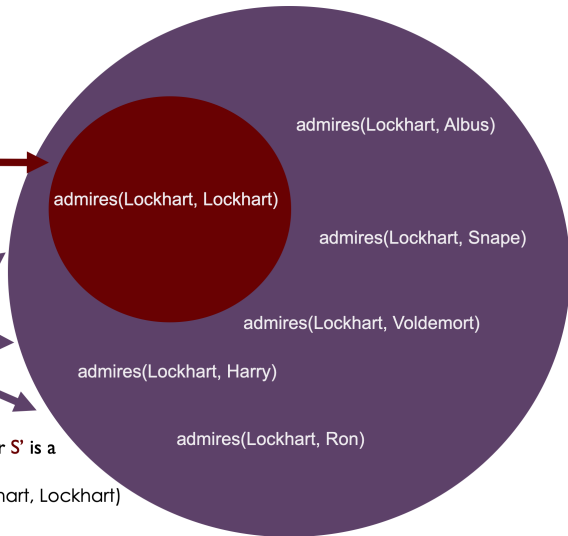
Lockhart admires someone else.

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S': Lockhart **se** admiră
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The set of possible interpretations for **S'** is a proper subset of those for **S**.
S' must be spoken for `admires(Lockhart, Lockhart)`



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These constraints stipulate preference for bound variables over coreference. A similar consequence is obtained by syntactic-based competition accounts (Safir 2004, 2014; Rooryck & vanden Wyngaerd 2011; a.o.).

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Experimental Question:

Is the rate of production of pronouns affected by context ambiguity in disjoint reference, local coreference and bound variable contexts?

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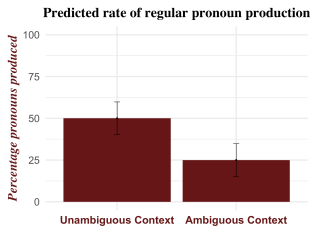
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Referential Subjects & Quantified Subjects

Main Questions:

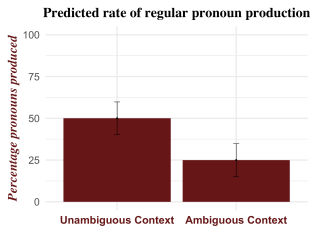
- 1 Is the rate of pronoun production affected by ambiguity in the case of **coreference** / **variables bound** by the local subject?
- 2 Is the rate of pronoun production affected by context ambiguity in the case of **disjoint reference** with the local subject?

Hypothesis:

BE CLEAR! affects coreferent, disjoint and locally bound variables.

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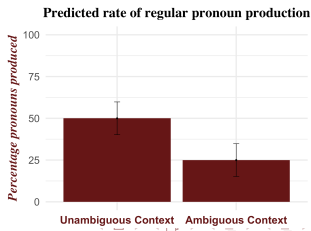
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Experiment 1: Referential Subjects

DESIGN

- picture description task
- 2 x 2 design: PICTURE TYPE x AMBIGUITY
Local Coreferent/Local Disjoint x Character Gender Match/Mismatch

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- only 2 referents in the context per item
- 20 fillers

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Local Coreferent/Local Disjoint x Character Gender Match/Mismatch
- 16 items (distributed in 4 Latin Squared lists)
- only 2 referents in the context per item
- 20 fillers

PARTICIPANTS

- 68 participants (62 female), University of Bucharest students
- The age range was between 18 and 30, with an average age of 20.4
- reimbursed 30 RON (\approx 8 USD) for participation

MATERIALS

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 - No transitive verbs were used to avoid clitic doubling.

At Monica's picnic, Daniel laughed at ...

SAMPLE ITEM

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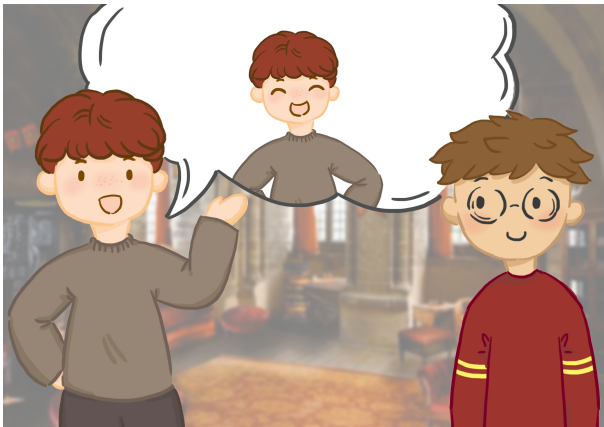


This is Andrei.



This is Mihai.

LOCAL COREFERENT, CHARACTER GENDER MATCH



At Mihai's house, Andrei talked about ...

Sample Item Pictures & Target Sentences by Condition



	<div> <div>COREFERENT MISMATCH</div> </div> <div> <div>DISJOINT MISMATCH</div> </div>
MISMATCH SENTENCE	<p>Acasă la Irina, Andrei a vorbit despre ... home at Irina, Andrei has talked about ... ‘At Irina’s house, Andrei talked about ...’</p>
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Be Clear! Prediction

*lower rate of
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<p><i>Be Clear! Prediction</i></p> <p><i>lower rate of regular pronouns than in MISMATCH</i></p>	<p>COREFERENT MATCH</p> 	<p>DISJOINT MATCH</p> 
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Non Target Responses

- pronouns/names targeting wrong referent
- possessive constructions: *her emotional states, his friend, his glasses*, etc.
- random NPs: *love, magical powers, girls*
- full sentences: *how he feels, what happened last night, how they met at a restaurant 10 years ago*, etc.

Data Exclusion

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- excluded non-target responses
- excluded data from 2 participants due to a low rate of target responses (<30%)
- lost 15 responses due to a PsychoPy error
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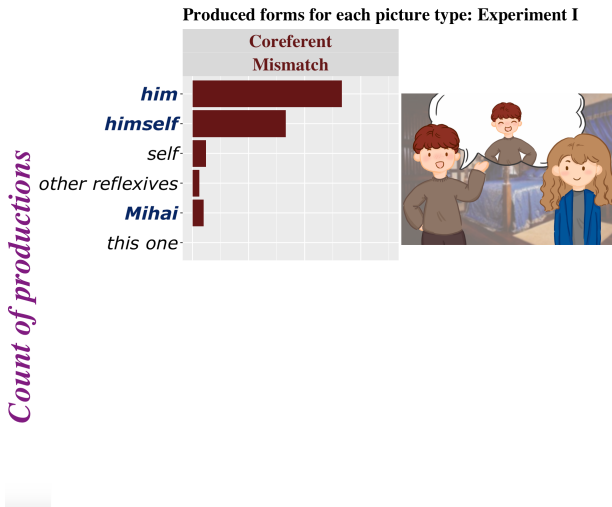
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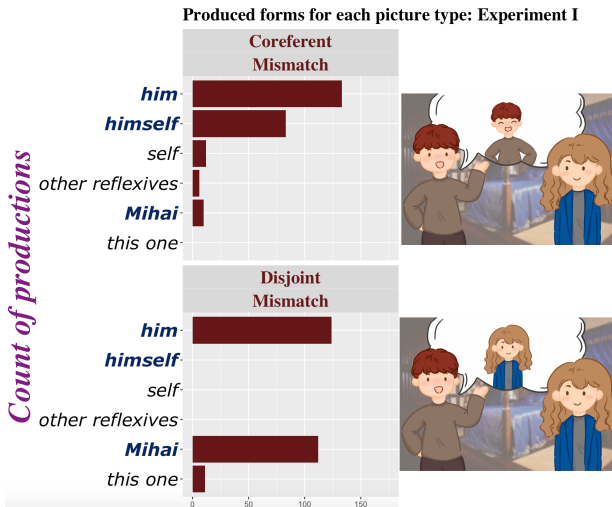
- the effect of **AMBIGUITY** (*Character Gender Mismatch/Match*)
- the effect of **PICTURE TYPE** (*Local Coreferent/Local Disjoint*)

A second nested model was fitted to estimate size of **AMBIGUITY** within each picture type.

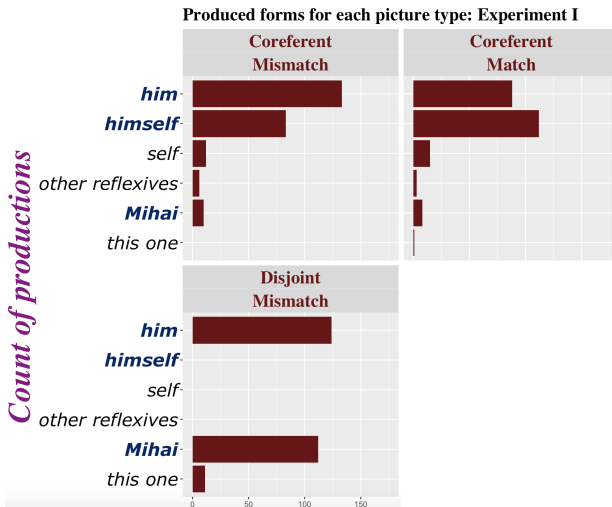
Raw Results



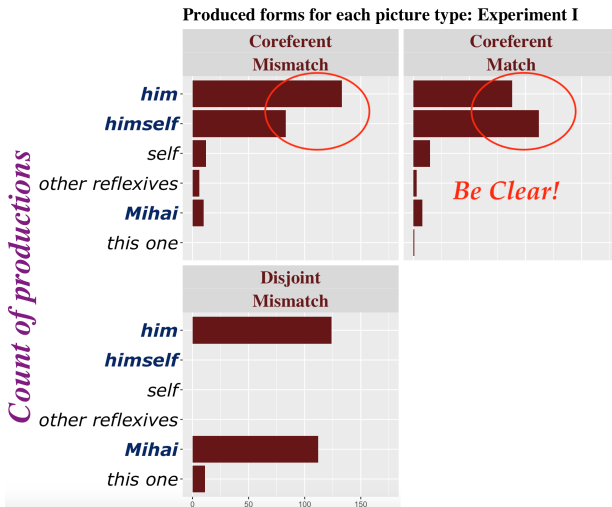
Raw Results



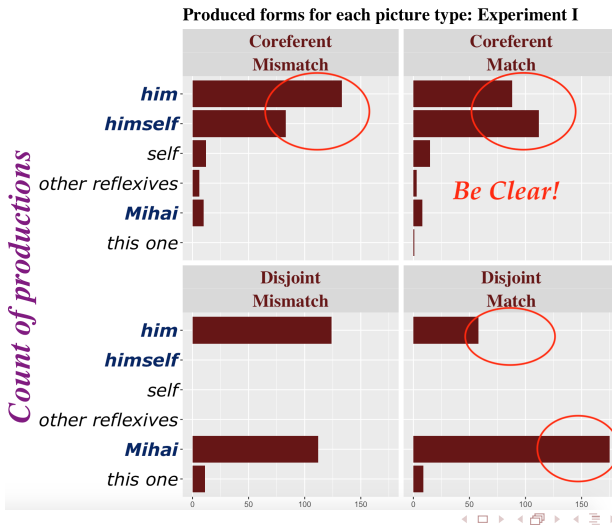
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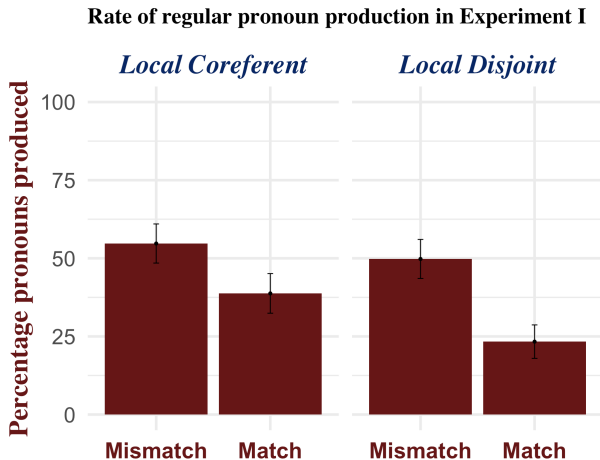
Raw Results



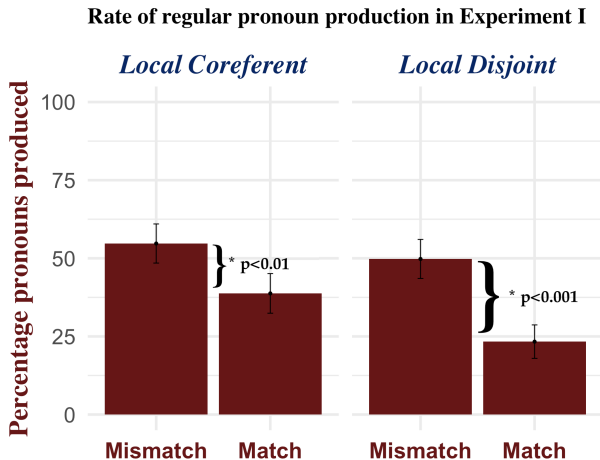
Raw Results



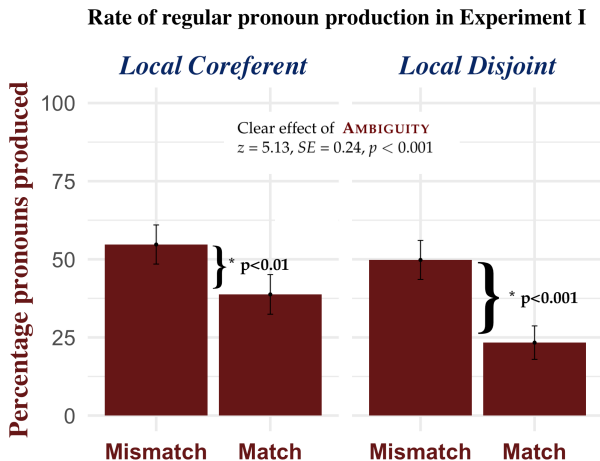
Results



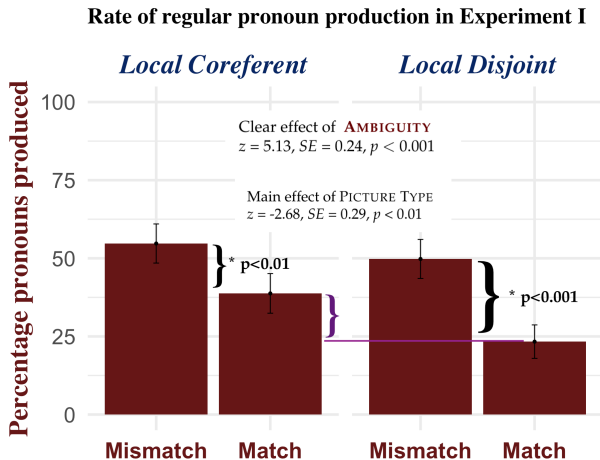
Results



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Discussion

Hypothesis:

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Does **BE CLEAR!** impact the choice of pronominal form for **locally bound variables** as well?

Experiment 2: Quantified Subjects

DESIGN, MATERIALS, ANALYSIS

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Experiment 2 is a **replication** of *Experiment 1*: the same design, procedure, data annotation and analysis were used.

The relevant differences:

- item subjects are quantified expressions - like *every boy*
- there are 4 referents per context per item

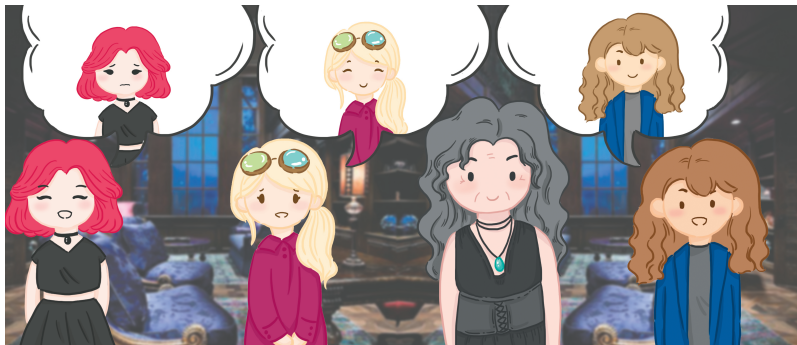
SAMPLE ITEM

SAMPLE ITEM

(11) Context Screen:

Grandma Laura was recently visited by her family.
Monica, Elena and Irina were there too.

LOCAL BOUND, CHARACTER GENDER MATCH



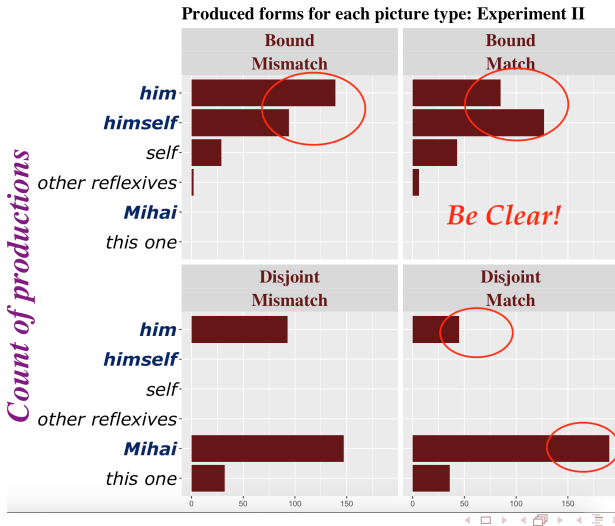
At Grandma Laura's house, every girl talked about ...

Sample Item Pictures & Target Sentences by Condition

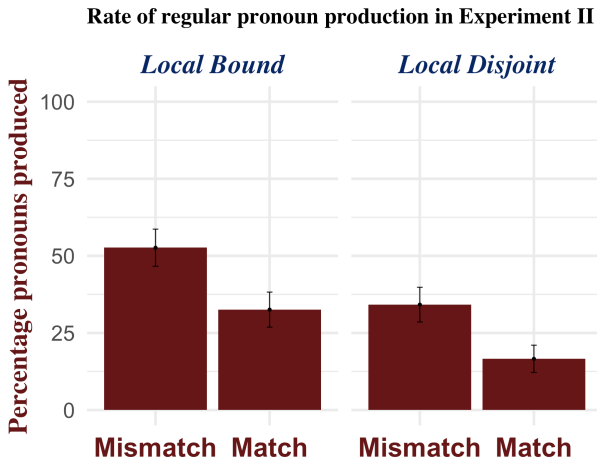
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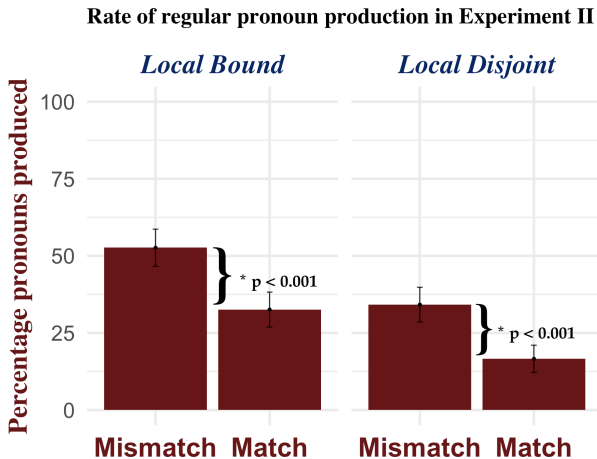
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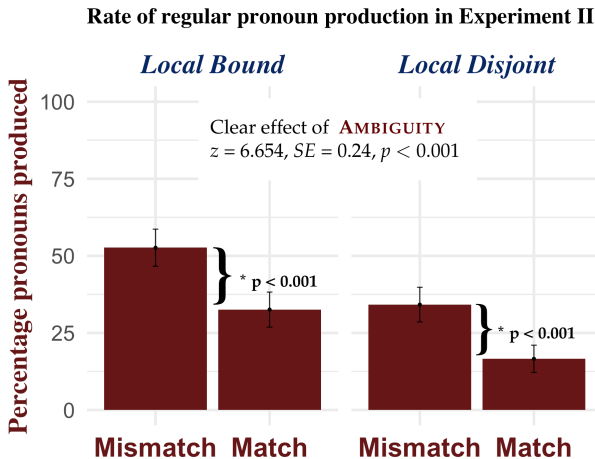
Results



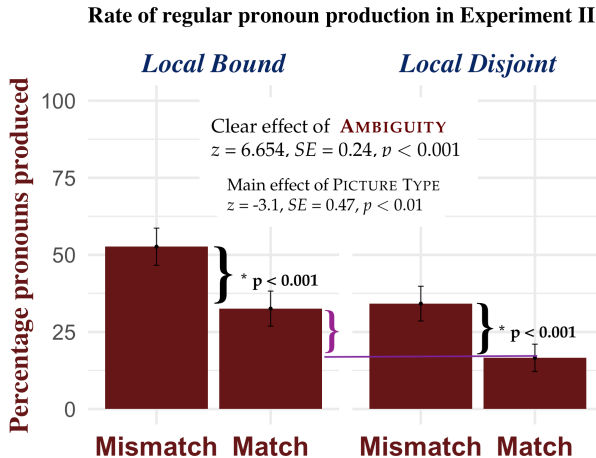
Results



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An ambiguity avoidance (**BE CLEAR!**) constraint impacts the choice of pronominal form in all three contexts: local disjoint reference, local coreference and locally bound variables.

General Discussion

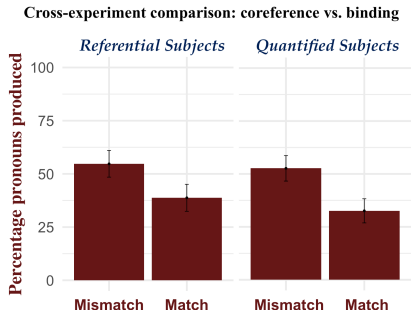
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- Pronouns do not obey Condition B, but their rate of production is affected by context ambiguity.

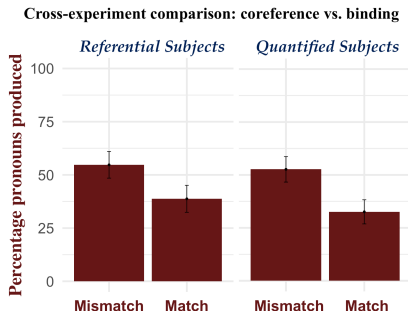
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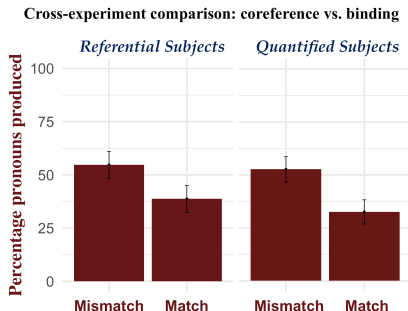
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- In unambiguous coreferent and bound contexts, the preferred pronominal form is the regular pronoun (around 50%), and not reflexive expressions.
- In ambiguous coreferent and bound variable contexts, the emphatic reflexive is the preferred pronominal form.



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- Despite a large body of work in the psycholinguistic literature that *ambiguity avoidance* affects the choice of referring expressions cross-sententially, there was a lack of evidence that the same strategy applies in intrasentential contexts.
- The results from *Experiment 1* and *Experiment 2* show that **ambiguity avoidance** strategies affect the production rate of regular pronouns for both **coreference** and **bound variables** in **intrasentential** contexts.

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- The experiments provided clear evidence of a generic intrasentential ambiguity avoidance principle.

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Question: Why is the regular pronoun *el/ea* the preferred form in unambiguous contexts?

Ask me about it!

Further Questions

- Is there psycholinguistic evidence in favor of competition between forms? (Yes!!)
- Should we expect **BE CLEAR!** to affect pronoun production in other languages? (Of course!)
- Is the data from comprehension consistent with the data from the production experiments? (Yes!)
- so many other questions...

Thank You!

Acknowledgements: We are grateful for all of the feedback, support and encouragement of Kyle Johnson, Seth Cable, Isabelle Charnavel, Alexandra Cornilescu, Marcel den Dikken, Lyn Frazier, Ken Safir, Dominique Sportiche, Adrian Staub, the audiences of WCCFL 36 @ UCLA (April 2018), *Pronouns in Competition* @ Santa Cruz (April 2018), and many others we're bound to forget. We are also very thankful to the NSF, the University of Bucharest, and the UMass Amherst Predissertation Grant for their support.



Rule I

Pragmatic competition

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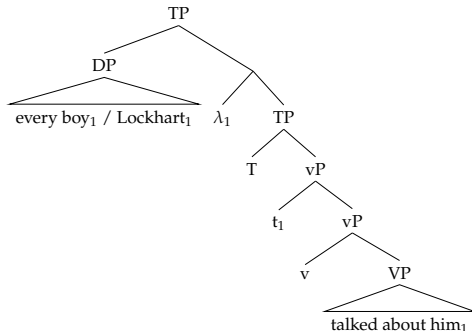
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Rule 1
○○○

Be Small!
●○○○

Experiment 1
○○○○

Experiment 2
○○○○○○○○

Production Comparison
○○○○

Comprehension
○○○○○○○○○○○○○○

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We suggest a generic economy constraint (inspired by *Minimize Restrictors*, Schlenker, 2005) **BE SMALL** and the generic pragmatic constraint **BE CLEAR!!** *jointly* determine the distribution of pronouns in Romanian. The experiments corroborate this assumption.

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Prediction: regular pronouns like *el* are preferred to emphatic reflexives like *el însuși* when they achieve the same meaning.

Experiment 1

Procedure *Experiment 1 & 2*

- The experiment took place at the University of Bucharest.
- Participants were recruited through flyers, class announcements and via online platforms.
- The experiment was coded and ran in PsychoPy.
- Participants were walked through the Instructions.
- Participants were instructed to choose a continuation before uttering the entire sentence.
- Participants' responses were recorded, transcribed and annotated.
- The entire process, including debriefing, lasted between 45-60 minutes per participant.

Raw Results *Experiment 1*

The rate of production for each on-target response type is as follows:

RESPONSE TYPE	PRONOUN	REFLEXIVE			OTHER	
	<i>him</i>	<i>himself</i>	<i>self</i>	<i>own person</i>	DEMONSTRATIVE	NAME
COREFERENT MISMATCH	54.5%	34%	5%	2.5%	0%	4%
COREFERENT MATCH	38.8%	49.3 %	6.6%	1.3%	0.5%	3.5%
DISJOINT MISMATCH	50%	0%	0%	0%	4.4%	45.5%
DISJOINT MATCH	24%	0%	0%	0%	3.7%	72.3%

Table 4.2: *Rate of Production by participant Response Type in Experiment 1.*

Translations of Participants' Responses as follows. PRONOUN: 'him' / 'her' - *el / ea*;
 REFLEXIVE: 'himself' / 'herself' - *el însuși / ea însăși*, 'self' - *sine*, 'own person' -
propria persoană; DEMONSTRATIVE: 'this one' - *acesta / aceasta*.

The rate of regular pronoun production (*el, ea*) can be used to measure the effect of **AMBIGUITY** in both contexts.

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Experiment 2

DESIGN EXPERIMENT 2

- picture description task
- 2 x 2 design: PICTURE TYPE x AMBIGUITY
Local Bound/Local Disjoint x *Character Gender Match/Mismatch*
- 16 items (distributed in 4 Latin Squared lists)
- 20 fillers
- same procedure as in *Experiment 1*
- 4 referents in the context per item

PARTICIPANTS

- 68 participants (60 female)
- University of Bucharest students
- The age range was between 18 and 33, with an average age of 21.3
- reimbursed 30 RON (\approx 8 USD) for participation

Data Exclusion Experiment 2

- excluded non-target responses
- no participants were excluded from the data analysis
- in total, 1.83% of the collected data was removed
- analysis ran on 1068 target responses out of a total of 1088
- improved rate of target responses in comparison to *Experiment 1* due to having tweaked the instructions to emphasize that the experiment was not a test of creativity.

Data Analysis

For all of the on-target responses, **logistic mixed effects regression** was used to model:

- the effect of **AMBIGUITY** (*Character Gender Mismatch/Match*)
- the effect of **PICTURE TYPE** (*Local Bound/Local Disjoint*)

A second nested model was fitted to estimate size of **AMBIGUITY** within each picture type.

MATERIALS

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 - No transitive verbs were used to avoid clitic doubling.

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CHARACTERS IN EXPERIMENT 2

Given the larger number of characters in *Experiment 2* and due to their familial relationships, the entire list of characters was presented to the participants during the instructions.



Participant Response Types *Experiment 2*

On Target Responses

- **pronoun:** *el, ea* ‘him, her’
- **emphatic reflexive:** *el însuși, ea însăși* ‘himself, herself’
- **reflexive:** *sine* ‘self’
- **other reflexives:** *propria persoana* ‘own person’, *persoana lui/ei* ‘his/her person’, etc.
- **names:** *Grandma Laura*
- **demonstrative:** *acesta, aceasta* ‘this one’

Non Target Responses

- pronouns/names targeting wrong referent
- possessive constructions: *his hair, his grandpa, her success*
- random NPs: *dissatisfactions, etc.*
- full sentences: *what he did, how she feels, etc.*

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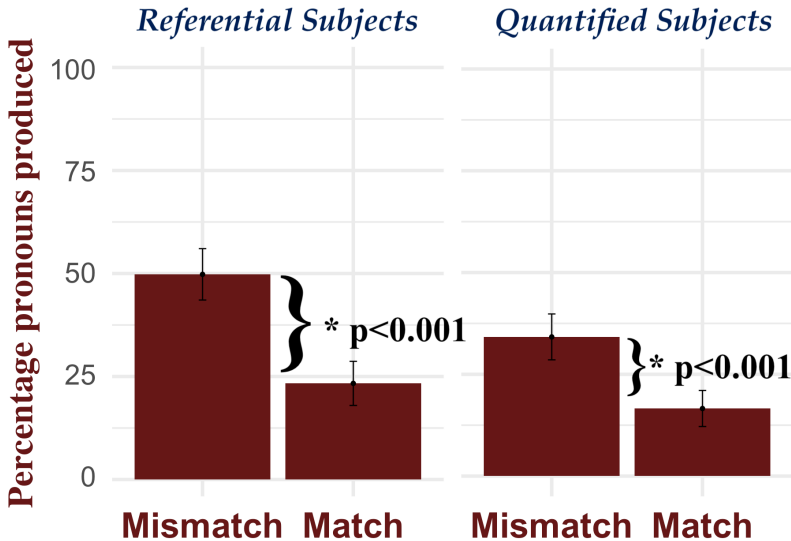
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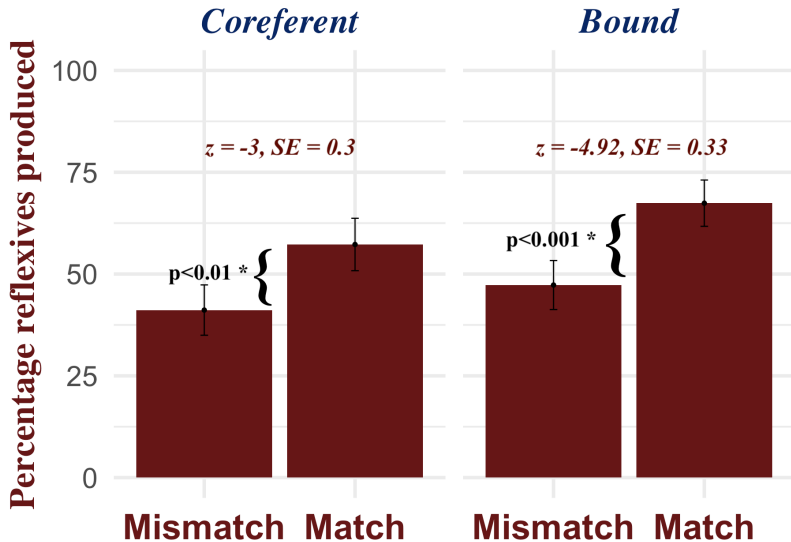
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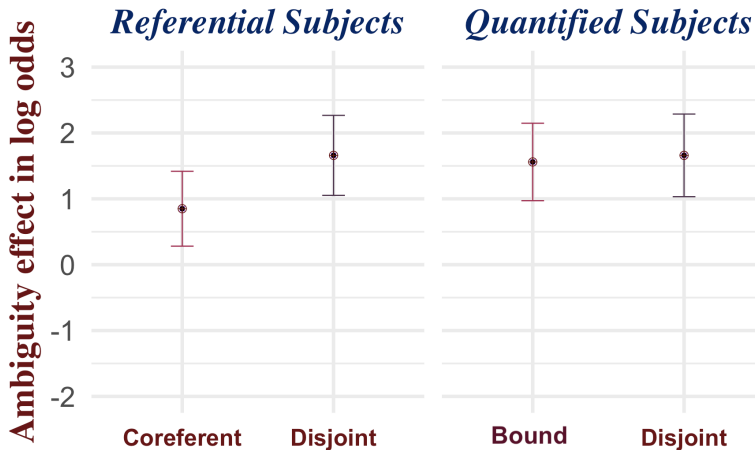
Production Comparison

Cross-experiment comparison: disjoint reference



Rate of reflexive production in both experiments





Comprehension

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the comprehension equivalent of **EXPERIMENT 2** (4 referents)

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In both comprehension experiments, we split participants into two groups:

- half of the participants only heard sentences with *him/her*
- half of the participants heard sentences with regular pronouns, emphatic pronouns and demonstratives

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GENDER GROUP, REFLEXIVE



D



K

Auditorily: *At Irina's house, Andrei talked about **him**.*

GENDER GROUP, DISJOINT



D



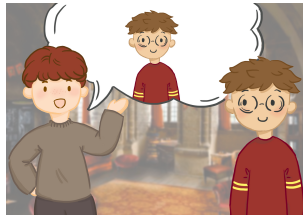
K

Auditorily: *At Irina's house, Andrei talked about **her**.*

AMBIGUOUS



D



K

Auditorily: *At Mihai's house, Andrei talked about **him**.*

FORM GROUP, REFLEXIVE



D



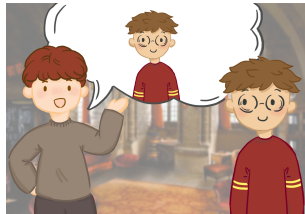
K

Auditorily: *At Mihai's house, Andrei talked about **him himself**.*

FORM GROUP, DISJOINT



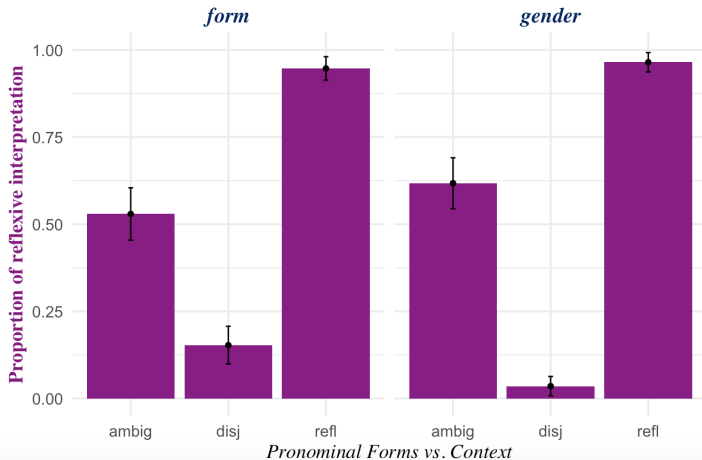
D



K

Auditorily: *At Mihai's house, Andrei talked about **this one**.*

Rate of reflexive interpretation in Exp. I



REFERENTIAL SUBJECTS

gender



BAYES' RULE!

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How do our models of production and comprehension differ?