Frequency affects pronoun production

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1. Introduction

Reference production

Referring expressions:

The monk calmed the girl.
[The girl (NP)/ she (pronoun)] lost her mom.

Factors affecting English reference production:

Competition effect (e.g., Arnold & Griffin, 2007)
More pronouns in one-entity than two-entity contexts
The monk went for a walk. > The monk went for a walk with the girl.

Gender effect (e.g., Fukumura Hyönä & Scholfield, 2013)
More pronouns in different-gender than same-gender contexts
The monk calmed the girl. > The nun calmed the girl.

Subjecthood effect (e.g., Rohde & Kehler, 2014)
More pronouns referring to subject than non-subject entities
The monk calmed the girl.

The accessibility account

- Pronouns refer to highly accessible information
  NPs refer to relatively less accessible information
  (e.g., Ariel, 1990; Arnold, 2010)
- Limited memory and attention →different pieces of information compete for cognitive resources
- Stronger competition when there are multiple entities
- The more features the entities share, the stronger the competition

Competition effect: (Arnold & Griffin, 2007)
The additional entity captures some attention →stronger competition in two-entity contexts →referent entity becomes less accessible →fewer pronouns

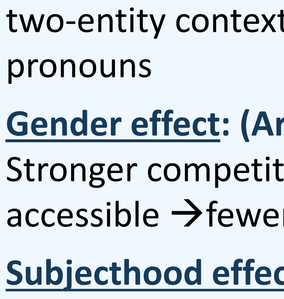
Gender effect: (Arnold & Griffin, 2007)
Stronger competition in same-gender contexts →referent becomes less accessible →fewer pronouns

Subjecthood effect:
Subject entities more accessible than non-subject (e.g., Bock & Warren, 1985) →more pronouns referring to the subject

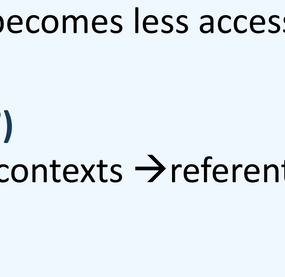
Frequency effect

Frequency effect on naming:
HF representations more accessible than LF representations
→HF words recognized and produced faster than LF words
(e.g., Balota & Chumbley, 1984; Jescheniak & Levelt, 1994)

Frequency effect on reference production (Navarrete, Basagni, Alario & Costa, 2006):
"pronoun (this/that)+verb+adjective (new/old)"



e.g., LF: Hot air balloon
e.g., "That is new."



e.g., HF: Car
e.g., "This is old."

Result: participants produced the given structure faster when the depicted object has a HF name rather than LF
Limitations: fixed structure, does not address the choice of reference form (pronoun/NP)

2. Research question

Does frequency affect reference production in terms of the choice of reference form (pronoun/NP)?

3. Current study

Participants: 52 native English speakers from the U.S. (Amazon Mechanical Turk)
Task: Story continuation task
Conditions:

Entity	*Frequency*	*Example*
One	HF Subject	The girl (HF) ran to the pool.
	LF Subject	The postman (LF) skated to the house.
Two	HF Subject-LF Object	
	(same gender)	The husband (HF) begged the pastor (LF).
	(different gender)	The husband (HF) encouraged the duchess (LF).
	LF Object-HF Subject	
	(same gender)	The mermaid (LF) rescued the mother (HF).
	(different gender)	The nun (LF) forgave the boy (HF).

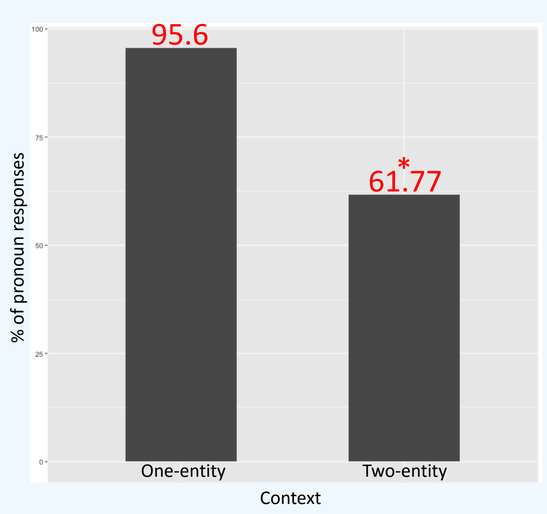
48 target items, 8 sentences per condition, constructed by 8 HF and 8 LF referent nouns, 16 equi-biased verbs used in the two-entity conditions (Hartshorne & Snedeker, 2013)

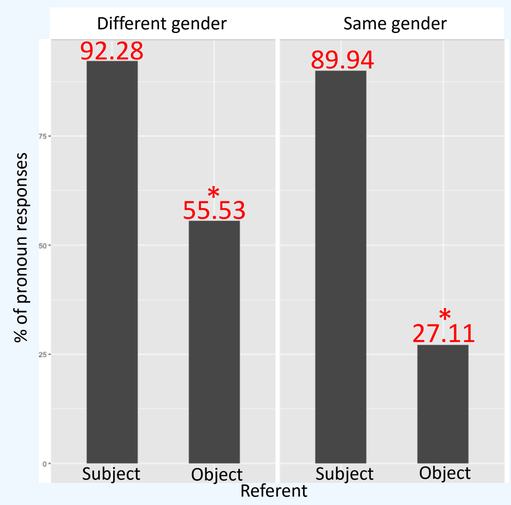
Analyses:

- Pronouns and NPs that strictly referred to the subject and object entities
- Logit mixed-effect models for competition, gender, subjecthood, and frequency in one-entity conditions (can better accommodate unbalanced data)
- Paired t-tests for frequency in two-entity conditions
  - Due to the strong subject bias, we focused on the subject-object difference (% pronoun for subject-% pronoun for object) for frequency in two-entity conditions

4. Results

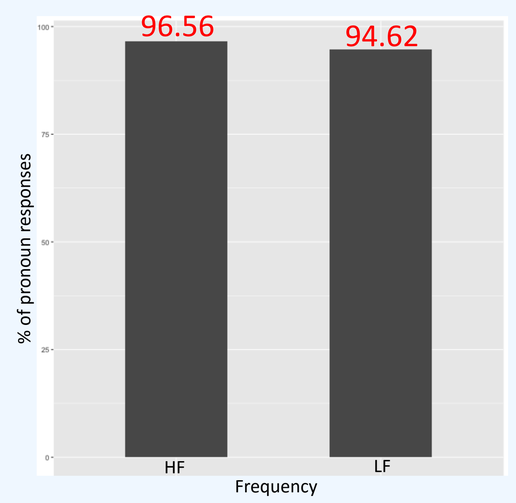
Replicated competition, gender, and subjecthood effects

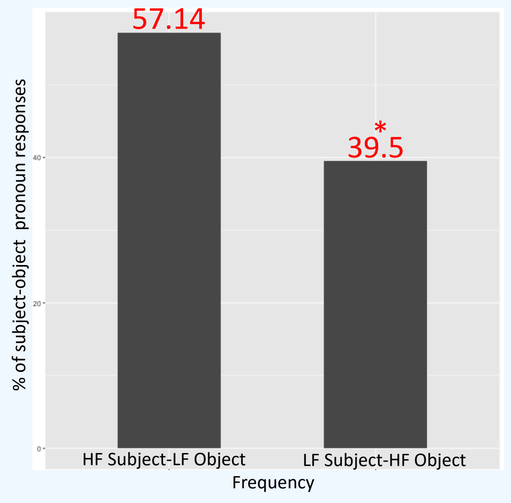




Frequency effect in two-entity contexts

- One-entity: not significant
- Two-entity: significantly affected the subject-object difference in the rates of pronoun use





5. Conclusion

Frequency is a factor affecting pronoun production in the presence of multiple entities, along with gender and grammatical roles.

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