

Introduction

In referential communication, speakers are faced with the problem of unambiguously identifying target referents in complex visual contexts. Previous work has shown that speakers can **optimise their linguistic encodings** to the benefit of the listener [1, 2].

Research question

Do the **entropy-reducing properties** of referential expressions influence speakers' **linearisation choices** in coordinate structures?

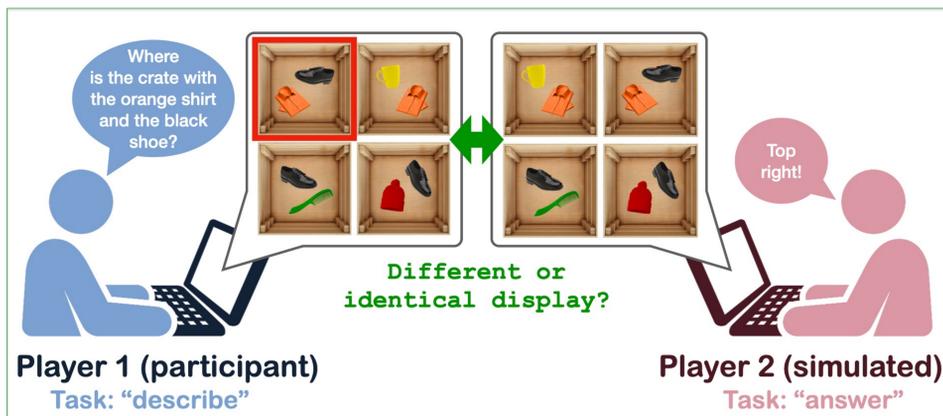
- **Maximal informativity:** preference for coordinations starting with the object that reduces referential entropy to a greater extent [3], *versus*
- **Uniform Information Density (UID):** preference to place less entropy-reducing objects early [4]

Methods

Referential communication game

Design

- Web-based production experiment (PC Ixet)
- Tasks: verbal description ("Where is the crate with [NP₁] and [NP₂]?") + display verification (key press)



Participants

- N = 60 native German participants (mean age = 31.3, 28 female), recruited through Prolific

Stimuli

Example item	Condition A <i>shoe more informative</i>	Condition B <i>control: both equal</i>	Condition C <i>shirt more informative</i>
Utterance entropy reduction profiles			

Utterance: Shoe first (shoe and shirt) Shirt first (shirt and shoe)

Manipulation

- **Varying frequency** of one object across conditions (A: 1 / B: 2 / C: 3) vs. **constant frequency** of the other object (always 2)

Stimuli

- 21 critical items, each in 3 conditions and in 2 counterbalanced versions; 21 fillers
- Object names matched for length + frequency
- Images pretested for color + object naming accuracy

Referential entropy reduction (RER)

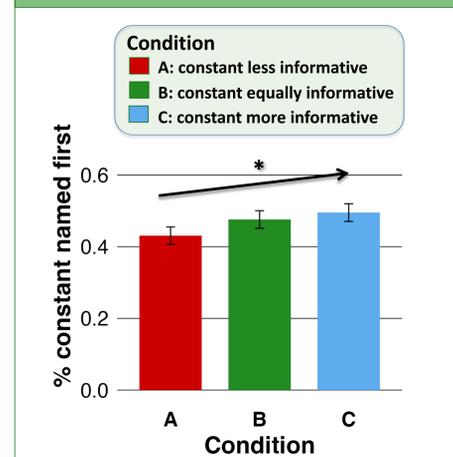
$$H = - \sum_{i=1}^N p_i \log_2(p_i)$$

$$\Delta H_{w_i} = H_{w_{i-1}} - H_{w_i}$$

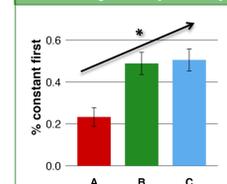
Results

- **Task accuracy** (display verification): 98%
- **Speaker production patterns**
 - N = 4 always used *left before right*
 - N = 1 always used *top before bottom*
 - N = 13 used *minimal specification (MS)* in condition A (at least once; e.g.: "the crate with the shoe")
- Generalized linear mixed-effects model with three-way-interaction: Condition * PositionTop * PositionLeft

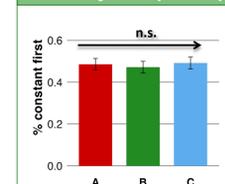
Linearisation choices



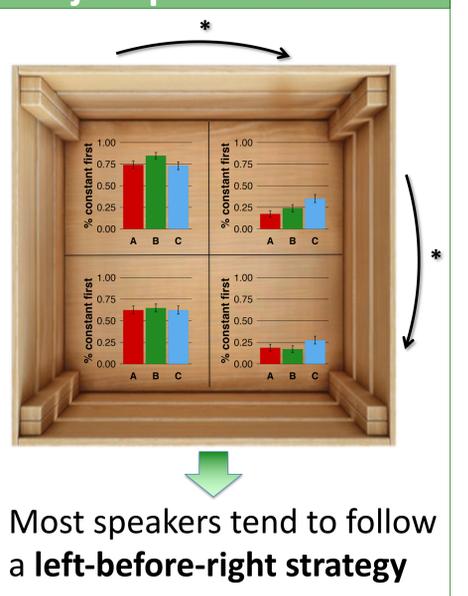
MS subjects (N=13)



OS subjects (N=47)



Object position effects



Effect of Condition driven by minimal specifications in condition A!

Conclusions

- Some speakers are **sensitive to the entropy-reducing properties of referential expressions** in visually situated communication, but:
 - **Object position** dominates linearisation choices!
 - **Maximally informative referring expressions only produced when minimal specifications are possible** → ego-centric strategy?
- Future research: exposure to both the speaker + listener role, highlighting the distributional properties (in progress); address position effects; more interactive setting (in-lab)

References

- [1] Tourtouri, E. N., Delogu, F., Sikos, L. and Crocker, M. W. (2019). Rational over-specification in visually-situated comprehension and production. *Journal of Cultural Cognitive Science*, 3(2):175–202.
- [2] Li, M., Venhuizen, N. J., Jachmann, T. K., Drenhaus, H. and Crocker, M. W. (2023). Does informativity modulate linearization preferences in reference production? *Proc. 45th CogSci Conf.*
- [3] Frank, M. C. and Goodman, N. D. (2012). Predicting pragmatic reasoning in language games. *Science*, 336(6084):998.
- [4] Jaeger, T. F. (2010). Redundancy and reduction: Speakers manage syntactic information density. *Cognitive psychology*, 61(1):23–62.



SCAN TO VIEW