More Than One Type of Number Agreement Computation Process?
Investigating Planning Time-Course through Agreement Attraction in Reflexive Pronoun Production

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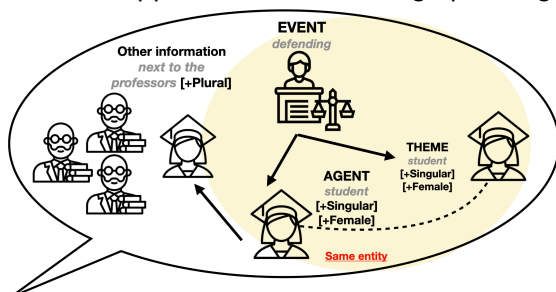
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INTRODUCTION

- Consider two types of number agreement attractions:

  - **Subject-Verb Agreement (VERB):**
    - ▸ The student next to the *professors* * are singing. [+SG] [+PL] [+PL]
  - **Reflexive-Antecedent Agreement (REF):**
    - ▸ The student next to the *professors* defended * themselves. [+SG] [+PL] [+PL]

- Previous studies (specifically, Kandel & Philips 2022) showed that in naturalistic sentence production, they have different error rates:
  - ▸ Mean error rate for VERB ≈ 12.5% >> REF ≈ 1.5%
- Assume the concensus framework (e.g. Levelt 1994), sentence production involves mapping from *preverbal message encoding* to sentence utterance.

Research Questions:

- ✦ Where is number agreement in the sentence planning & production process?
- ✦ **Different attraction rates → Different underlying mechanisms?**

HYPOTHESIS 1: PLANNING ORDER (PO)

Planning Order Hypothesis: one single mechanism for both VERB and REF, but applied at different timing / planning stages:
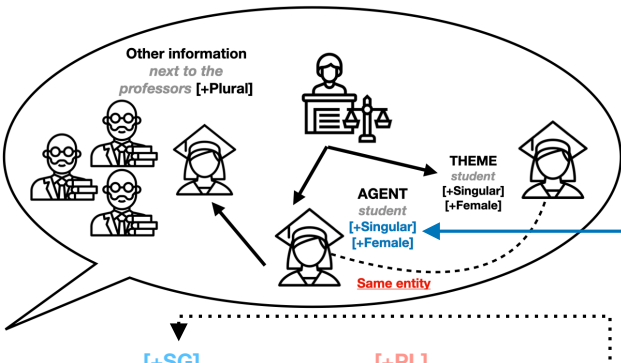

- Both retriving numbers from the morpho-syntactic features of the planned materials;
- REF: applied *before* intervener is planned;
- VERB: applied *after* the intervener is planned.

Planned: *The student next to the professors defended herself.*
② ③ ① ~②

HYPOTHESIS 2: NUMBER SOURCE (NS)

Number Source Hypothesis: two distinct mechanisms for both VERB and REF regarding to the source of the number feature retrieval:

- REF: directly retrieve number from preverbal conceptual representations;
- VERB: retrieving number from the morpho-syntactic features of the planned materials.

Planned: *The student next to the professors defended herself.*
[+SG] [+PL]

CURRENT STUDY

- Both hypotheses are compatiable with previous experimental results.
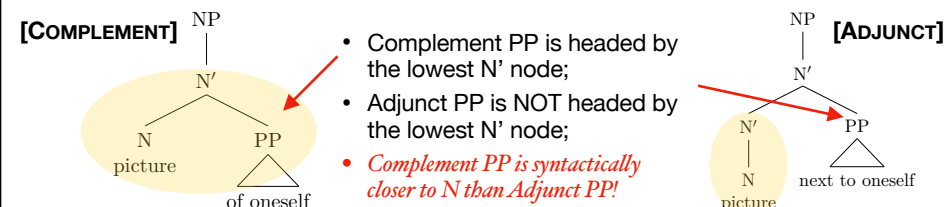- The current study examines two additional reflexive cases where the two hypotheses diverge:

VERB	*The bluey above the greenies was mimming.*
COARGUMENT	*The bluey above the greenies mimmed [itself].*
COMPLEMENT	*The bluey above the greenies mimmed [the picture of itself].*
ADJUNCT	*The bluey above the greenies mimmed [the picture [next to itself]].*

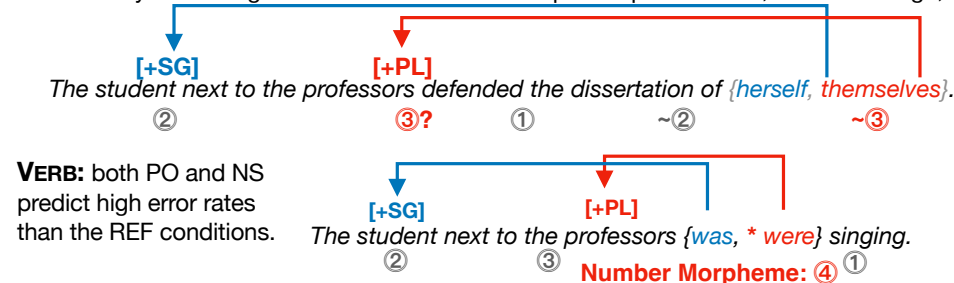* For each condition, we tested all SS SP PS PP number combinations.

[COMPLEMENT]

- Complement PP is headed by the lowest N' node;
- Adjunct PP is NOT headed by the lowest N' node;
- *Complement PP is syntactically closer to N than Adjunct PP!*

[ADJUNCT]

PREDICTIONS

- **Planning Order**: COARGUMENT < COMPLEMENT < ADJUNCT < VERB
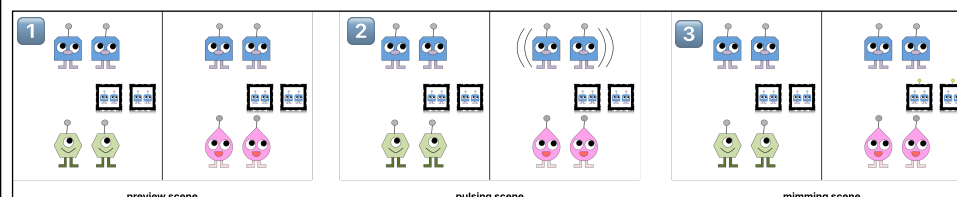- **Number Source**: COARGUMENT = COMPLEMENT = ADJUNCT < VERB

COMPLEMENT & ADJUNCTS:
- ▸ PO: the PP (thus REF) are less obligatory than in COARGUMENT, could be planned later;
- ▸ NS: always retrieving number feature from conceptual representation, thus no change;

[+SG] [+PL]
The student next to the professors defended the dissertation of {herself, themselves}.
② ③? ① ~② ~③

VERB: both PO and NS predict high error rates than the REF conditions.

[+SG] [+PL]
*The student next to the professors {was, * were} singing.*
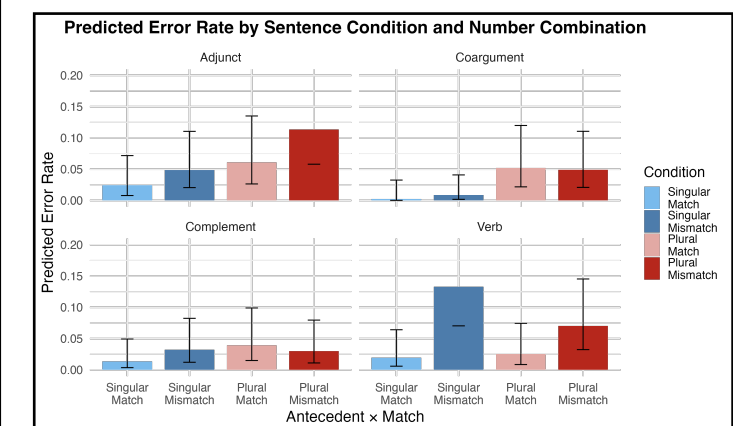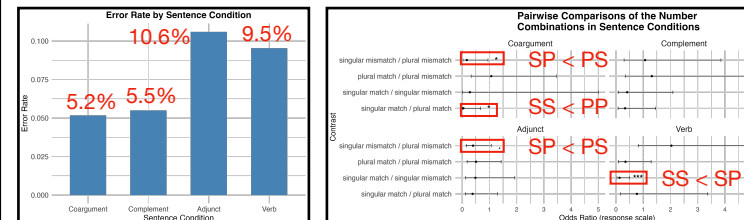② ③ **Number Morpheme: ④** ①

METHOD: SCENE DESCRIPTION TASK

- **Goal** = to elicit the naturalistic process of sentence production: from generating preverbal messages to planning the sentence structure before utterances.
- **Current Approach** (extending Kandel & Philips) = alien world with nonce words: participants see a series of 2 or 3 pictures and produce a sentence to describe the depicted event.

Stimuli for sentence: *The blueys above the pinkies mimmed the pictures of themselves.*

RESULTS

- 2573 production trials from 88 participants are computed.
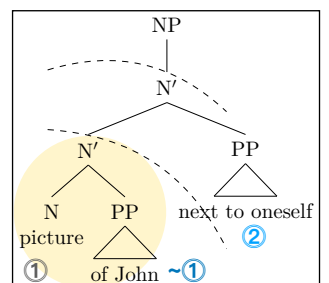- Fitted with a `GLMM` model and `Emmeans` to interpret the model.

⇒ **COARGUMENT ≈ COMPLEMENT < ADJUNCT ≈ Verb**

INTERPRETATIONS

Planning Order:
1. Verb lemma
2. [COARGUMENT] Argument head (verb's specifier and complements);
3. **COMPLEMENT** of verb's argument head;
4. **ADJUNCT** of verb's argument head.
5. … **VERB**'s morphemes.

⇒ **The lowest N' phrase** could be considered as an atomic planning unit, planned within the same temporal range as the matrix verb and the subject, earlier than the adjunct PP.

CONCLUSION

- We extended Kandel & Philips with 2 reflexive conditions;
- Results replicate K&P and support the Planning Order hypothesis over the Number Source hypothesis;
- This is a case where theoretical syntax and psycholinguistic behaviors coincide, where the lowest N' is a planning unit.