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How to cite

SCHMID, Samuel et al. Two mechanisms underlying agreement errors. In: CUNY Sentence Processing Conference. Davis (USA). 2018. doi: 10.17605/OSF.IO/4G7FH

This publication URL: https://archive-ouverte.unige.ch/unige:116536
Publication DOI: 10.17605/OSF.IO/4G7FH

TWO MECHANISMS UNDERLYING AGREEMENT ERRORS

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BACKGROUND

- **Agreement attraction,** i.e. the erroneous agreement between the verb and an interfering attractor element, manifests in terms of a higher error rate when the attractor mismatches the head in number (**The key to the cabinets are...*) than when it matches it (*The key to the cabinet is…* , e.g., Bock & Miller 1991)
- Two prominent models assume different mechanisms underlying attraction errors:

(a) Marking and Morphing (M&M, Eberhard, Cutting & Bock 2005**)**
Agreement involves a stage of Marking and a stage of Morphing
Attraction is due to the contamination of the controller's agreement feature by the attractor at the stage of Morphing
→ Attraction arises independently of number match

(b) Self-Organized Sentence Processing (SOSP, Smith, Franck, & Tabor, 2018**)**
Words activate treelets that compete for all attachment sites during the building of the structure. Similarity between elements increases competition for verbal attachment.
Attraction can result in the incorrect instantiation of the attractor as the agreement controller.
→ Attraction is stronger in match due to the fact that featural similarity increases the risk of erroneous structure building (which results in attraction)

- The usual production method used to study attraction does not allow us to tease apart the two models, since errors in match conditions are not visible

PRESENT STUDY

- To distinguish the predictions of the two models, we collected data on two tasks:
(1) An **agreement verb-selection task**, allowing us to standardly assess attraction errors
(2) A **yes/no question comprehension task** targeting thematic role attribution, allowing us to assess structure building

- Predictions about the effect of match:
  - **Agreement verb-selection task** : both M&M and SOSP predict more agreement errors in mismatch, since errors are invisible in match
  - **Question comprehension task** : M&M predicts no effect of match; SOSP predicts more errors in match due to the effect of featural similarity on structure building

- Predictions concerning the source of attraction:
  - If attraction errors result exclusively from structure building errors, we should observe a 1:1 mapping between errors in the two tasks (each error in the comprehension task should correspond to an error in the agreement task)
  - If attraction errors results exclusively from feature contamination, the distribution of errors in the two task should be independent
  - If attraction errors result from a combination of feature contamination and erroneous structure building, agreement errors should also arise in trials with correct comprehension

METHODS

Participants: 87 native French adult speakers

Materials: 32 sets of object relative clauses with object-past participle number agreement
E.g., Voici **les danseurs-PL** que le serveur-SG disait avoir **énervés-PL**
Here's the dancers-PL that the waiter-SG claimed to have annoyed-PL

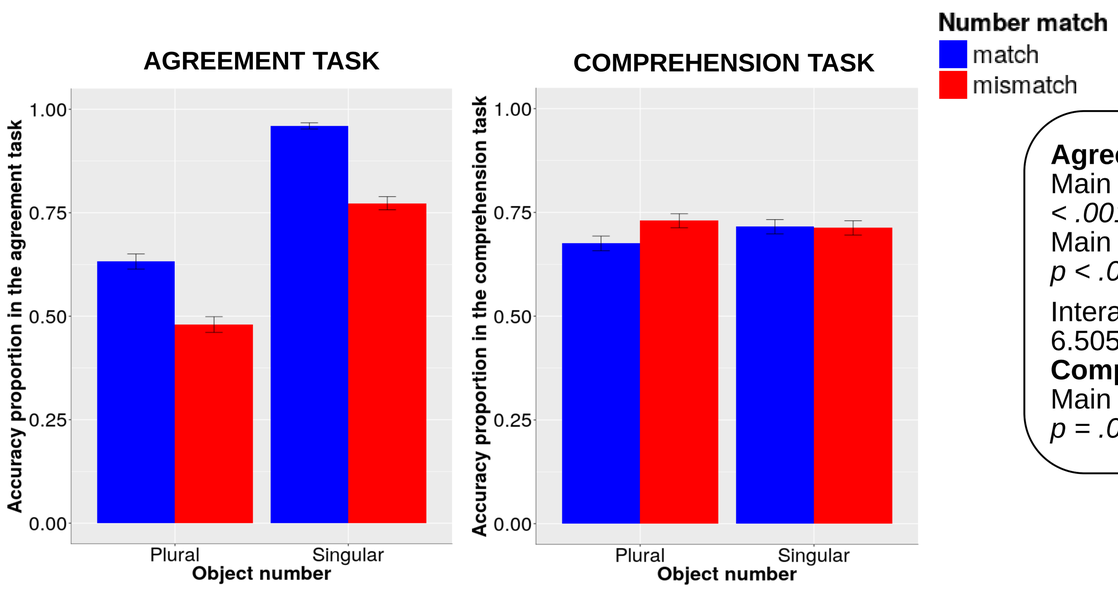
Variables manipulated:
1. Number of the object (Singular vs. Plural)
2. Number match between the object and the subject (Match vs. Mismatch)

Procedure: Forced-choice paradigm with a rapid serial visual presentation procedure (Staub 2009, 2010) followed by a yes-no comprehension question task targeting thematic role attribution (e.g., *Did the waiter annoyed the dancers?*)

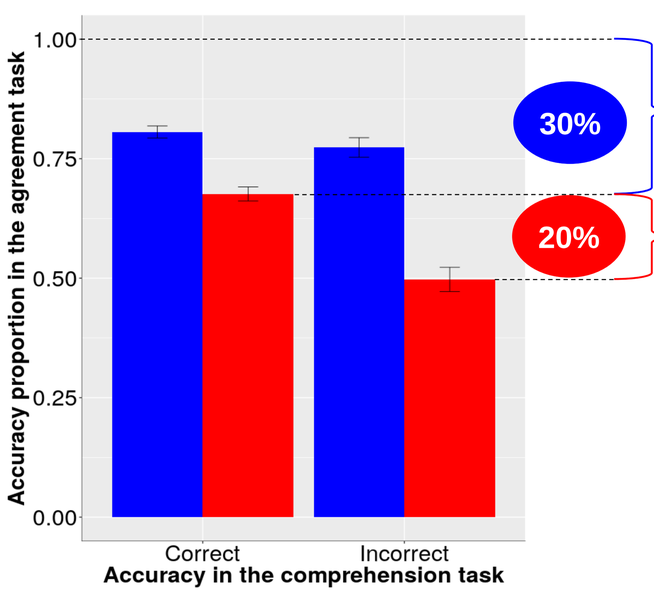
Dependent variables: Proportion of correct responses in both tasks.

Number object	Number match	Examples
Singular	Match (SG-SG)	Voici/le danseur-SG/que/le serveur-SG /disait/ avoir /énervé-SG - *énervés-PL *Here's/**the dancer-SG**/that/**the waiter-SG**/claimed/to have/**annoyed-SG - *annoyed-PL***
	Mismatch (SG-PL)	Voici/le danseur-SG/que/ les serveurs-PL /disait/ avoir /énervé-SG - *énervés-PL *Here's/**the dancer-SG**/that/**the waiters-PL**/claimed/to have/ **annoyed –SG - *annoyed-PL***
Plural	Match (PL-PL)	Voici/les danseurs-PL/que/ les serveurs-PL /disait/ avoir /énervés-PL - *énervé-SG *Here's/**the dancers-PL**/that/**the waiters-PL**/claimed/to have/ **annoyed-PL - *annoyed-SG***
	Mismatch (PL-SG)	Voici/les danseurs-PL/que/ le serveur-SG /disait/ avoir /énervés-PL - *énervé-SG *Here's/**the dancers-PL**/that/**the waiter-SG**/claimed/to have/ **annoyed –PL - *annoyed-SG***

RESULTS and DISCUSSION



Agreement task:
Main effect of Match (*z*=-4.729, *p < .001)*
Main effect of Number (z=17.047, *p < .001*)
Interaction Match x Number (z=-6.505, p<.001)
Comprehension task:
Main effect of match (*z*=2.315, *p = .020*)



30% FEATURE CONTAMINATION

20% STRUCTURE BUILDING ERROR

20%

The agreement error rate in mismatch is about **20%** higher when performance on the comprehension task is incorrect. We suggest that this percentage reflects **structure building errors.**

30%

Nevertheless, about **30%** of the trials exhibit incorrect agreement even when performance on the comprehension task is correct. We suggest that these errors are due to **feature contamination** of the attractor in an otherwise correctly build structure.

CONCLUSIONS

- Although production is penalized by feature mismatch, comprehension is penalized by feature match, replicating recent findings (Villata et al., 2018) and acquisition data (e.g., Adani et al., ref)
- M&M fails to account for agreement errors due to a structure building error.
- SOSP explains the agreement errors due to structure building by the cue-based nature of treelets' bonding: similar elements compete more strongly for verbal attachment, thus increasing the chances that the attractor will be incorrectly attach as the subject of the verb
- SOSP explains erroneous agreement in otherwise correctly built structures because features are transferred during the continuous dynamical interaction between treelets (*feature passing*), and can remain transferred even when they are in compatible with a final, correct structure.
- In contrast to cue-based retrieval approaches to attraction (ACT-R, Lewis & Vasishth 2005; Badecker & Kuminiak 2007; Wagers et al., 2009), SOSP assumes that errors can arise at encoding.
- Past participle agreement is disappearing in French, giving rise to singular as default (Belletti 2006). Nevertheless, analyses excluding participants showing no plural objects did not change the general pattern of results.

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