Feature distortion is not limited to upward percolation

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Agreement attraction

Agreement attraction: More agreement errors when a verb-matching distractor appears in the sentence [1-3].

No match: *The key to the cabinet were rusty ☹

Dist. match: *The key to the cabinet**s** were rusty ☺

Retrieval interference

Attraction reflects mis-retrieval of a distractor that matches the verb's features [2,4].

Feature percolation

Attraction arises when the distractor's features percolate upward within the NP [5].

! Attraction also occurs in relative clauses (RCs), where the distractor lies outside the subject phrase [2].

No match: *The driver who the runner wave to ☹

Dist. match: *The driver**s** who the runner wave to ☺

A new test of feature distortion

Composite attraction: More agreement errors when a conjunction of features across nouns match the verb [6] (tested in Hebrew, which marks number & gender).

No match: *the worker.M.**PL*** of the editor.M.**PL** delay.F.PL

Comp. match: *the worker.M.**PL*** of the editor.**F**.SG delay.F.PL

Does composite attraction impact RC configurations?

→ **the editor.**F**.SG that the worker.M.**PL** delay.F.PL*

Composite attraction in RCs cannot be explained by **retrieval interference** (as the distractor is unattractive) nor by **feature percolation** (as the distractor is outside of the target NP).

However, the **morpheme-position binding** model predicts composite attraction in RCs, as feature misbinding within the model is not hierarchically or linearly restricted [7].

✔ predicted / ✗ not predicted	Agreement attraction		Composite attraction	
	poss.	RC	poss.	RC
Retrieval interference	✔	✔	✗	✗
Feature percolation	✔	✗	✔	✗
Feature misbinding	✔	✔	✔	✔

Speeded grammaticality

132 Hebrew speakers; Binary speeded grammaticality task
36 item sets, 2 × 3:

Possessive

No match	… ha-ovdim šel ha-orxim me'akvot … … the-worker.M.**PL** of the-editor.M.**PL** delay.F.PL …
Composite match	… ha-ovdim šel ha-orexet me'akvot … … the-worker.M.**PL** of the-editor.**F**.SG delay.F.PL …
Distractor match	… ha-ovdim šel ha-orxot me'akvot … … the-worker.M.**PL** of the-editor.**F.PL** delay.F.PL …

Relative clause (RC)

No match	… ha-orxim še-ha-ovdim me'akvot … … the-editor.M.**PL** that-the-worker.M.**PL** delay.F.PL …
Composite match	… ha-orexet še-ha-ovdim me'akvot … … the-editor.**F**.SG that-the-worker.M.**PL** delay.F.PL …
Distractor match	… ha-orxot še-ha-ovdim me'akvot … … the-editor.**F.PL** that-the-worker.M.**PL** delay.F.PL …

Accuracy

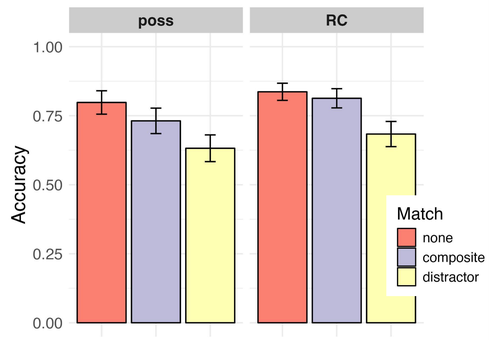
(% of "ungrammatical")

Composite attraction errors extend to RCs

	Est.	Error	95% CrI
Match1: Comp. vs None	**-0.38**	**0.12**	**-0.63, -0.14**
Match2: Dist. vs Comp	**-0.73**	**0.12**	**-0.98, -0.50**
Structure	**-0.15**	**0.05**	**-0.26, -0.04**
Match1 × Stru.	-0.15	0.11	-0.36, 0.05
Match2 × Stru.	0.11	0.10	-0.08, 0.31

BF_{01} $N(0,1)$ ≈ *3,823*
BF_{01} $N(0,0.5)$ ≈ *591*
BF_{01} $N(0,0.2)$ ≈ *6.25*

Match1:
poss -0.54, [-0.9, -0.23]
RC -0.20, [-0.51, 0.10]



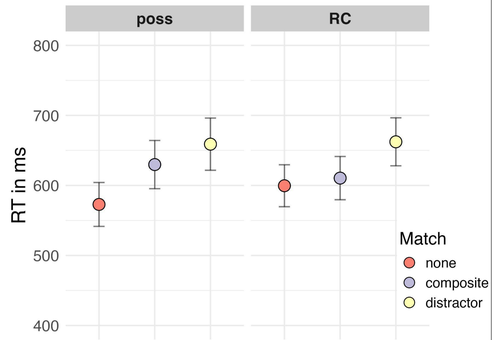
Response times

(in accurate trials)

Composite attraction slowdown is weaker in RCs

	Est.	Error	95% CrI
Match1: Comp. vs None	**0.04**	**0.02**	**0.01, 0.08**
Match2: Dist. vs Comp	0.07	0.02	-0.01, 0.01
Structure	0.00	0.00	-0.01, 0.01
Match1 × Stru.	**0.04**	**0.01**	**0.00, 0.07**
Match2 × Stru.	-0.01	0.01	-0.05, 0.02

Match1:
poss -0.09, [-0.04, -0.15]
RC -0.01, [-0.05, 0.06]



Discussion

Feature distortion in agreement processing: A conjunction of features across nouns may erroneously license an ungrammatical verb

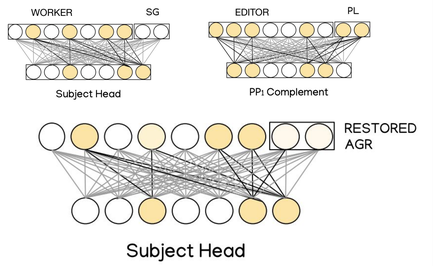
→ Not predicted by **retrieval interference**

Feature distortion is not limited to intra-NP percolation: Distortion extends to RC configurations, where the distractor appears before the target and in another clause

→ Not predicted by **feature percolation**

The morpheme-position binding model (Keshev et al. 2024)

Feature distortion is the outcome of overlapping associations between multiple item and position vector representations. Distortion may apply across NPs and clauses.



Composite attraction is weaker than agreement attraction

Composite match triggers less errors than the classic *distractor match* configuration.

? Joint contribution of retrieval interference and feature distortion to errors [8]

? Fully matching morphological marking is more illusory

Composite attraction is potentially weaker in RCs, but agreement attraction is not

The accuracy effect of composite attraction seems weaker in RCs (unreliable) + RCs did not display a composite attraction slowdown.

? Random variation

? RC distractors cause less feature distortion, reflecting the role of **position similarity** (only in composite attraction?)

[1] Bock & Miller (1991) *Cogn. Psychol.* **[2]** Wagers, Lau, & Phillips (2009) *JML*. **[3]** Pearlmutter, Garnsey, & Bock (1999) *JML*. **[4]** Lewis, Vasishth, & Van Dyke (2006) *TiCS*. **[5]** Bock, Eberhard, Cutting, Meyer, & Schriefers. (2001) *Cogn. Psychol*. **[6]** Cartner, Keshev, Lipitz, Dillon, & Meltzer-Asscher (2024) *AMLaP*. **[7]** Keshev, Cartner, Meltzer-Asscher, & Dillon (2024) *TopiCS*. **[8]** Yadav, Smith, Reich, & Vasishth (2023) *JML*.

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