Top-down expectations vs. bottom-up information in prosodic memory

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How do different types of linguistic information interact in memory?

1 Background: focus as a test case

Focus marking is a good test case because:

1. Focus involves multiple sources of linguistic information

The interpretation of focus particles like *only* depends on the $[\text{focus}]_F$ they associate with [1]:

(1) a. Ethel gave only $[\text{TUlips}]_F$ to Sadie. (...not roses, daisies, ...)
b. Ethel gave tulips only to $[\text{SAdie}]_F$ (...not to Marsha, Edgar, ...)

Focus is marked by **prosodic cues** (e.g., pitch accent) and has **semantic effects** because it determines which alternatives are calculated.

2. Focus marking guides attention and generates expectations about upcoming input

- **Prosodically:** Native English listeners use prosodic cues on the syllable immediately before a contrastive accent (L+H*) to predict that accent, even in the absence of accent itself [2-4].
- **Semantically:** Given preceding semantic context, listeners can predict upcoming foci in the absence of prosodic information [5].

3. Foci are argued to be more deeply encoded in memory than non-foci [4-5].

- Better memory for lexical content [6], reading
- Higher accuracy in change and error detection [7], reading
- Better recognition of contrastive accents [8]. listening

Does deeper encoding of foci extend to prosodic features?
Or does syntactic/semantic information override surface prosodic features due to loss of surface detail over time?

Cue conflict configuration

Ethel gave (**only**) [**the** tulips]$_F$ to Sadie. ±sem +pros

Hypotheses:

- **Prosodic Cueing:** Listeners are always biased to expect an accent on the target due to preceding **prosodic cues**. This expectation, even when disconfirmed, has the potential to interfere with listeners' memory [9].
- **Top-down Overwriting:** Listeners are less sensitive to the absence of an accent in sentences with a particle, because memory for the **semantic representation** may overwrite prosodic details [10-12].

2 Method: stimuli

Two recognition memory experiments tested memory for accent in the presence (E1a) vs. absence (E1b) of preceding focus particles.

- Particle (Present, Absent) x Accent (Pres, Abs) x Match (Match, Mismatch)
- Original recordings were spliced to create 96 items (48 per subexperiment; in addition to 6 practice items and 90 fillers).

Stimuli were created by splicing in an [accented] (H*) or [unaccented] token into narrow focus syntactic frames with a particle present or absent.

The **prosodic cues** leading up to the accent (whether the accent was present or not) were retained:

Experimental stimuli

E1a	Nathaniel fed **only the**	{**CORGI** / **corgi**}	the new kibble
E1b	Nathaniel fed **the**	{**CORGI** / **corgi**}	the new kibble

2 Method: Original recordings

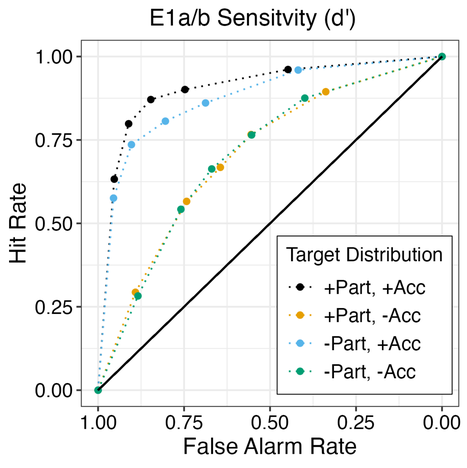
no particle, no accent	Nathaniel fed the [**corgi**] the new kibble
particle, accent (v1)	Nathaniel fed **only the** [**CORGI**] the new kibble
no particle, accent	Nathaniel fed **the** **CORGI** the new kibble
particle, accent (v2)	Nathaniel fed **only the** **CORGI** the new kibble

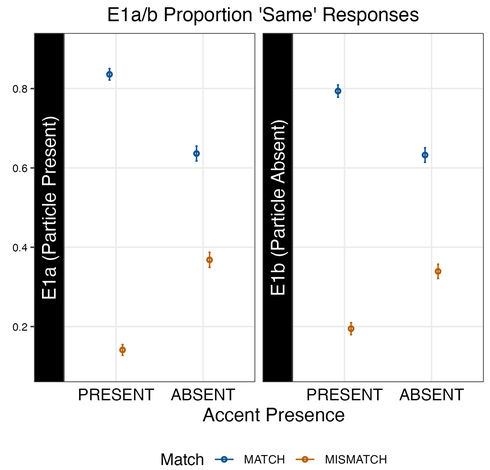
2 Method: Task

Trial structure:

a. **Exposure sentence**
b. **Exposure word list**
*3 unrelated words, pairwise LSA scores < .4, sometimes with H**
c. **Two math distractors**
randomly generated digits 0-50, addition or subtraction
d. **Target sentence** (a) or **word list** (b)
e. **Same/Different decision** on (d)
f. **Confidence rating** (1-3)

3 Results





Unequal Variance Signal Detection Theory Analysis [13-15]
E1a: Acc PRES > Acc ABS (D_{boot} = 11.69, p < 0.001)
E1b: Acc PRES > Acc ABS (D_{boot} = 9.3, p < 0.001)

Across experiments:
Acc E1a > Acc E1b (marginally, D_{boot} = 1.79, p = 0.07)
Within PRES: Acc E1a > Acc E1b (D_{boot} = 2.41, p = 0.01)

`brms` **[16] logistic regression on Same responses**
Greater tendency to erroneously respond Same for ABS-MM compared to PRES-MM (β = 6.05, [5.21, 6.92])

→ Degraded accuracy in ABS conditions across the board
→ No evidence for Top-down Overwriting

4 Conclusion

Results are most consistent with the **Prosodic Cueing Hypothesis**

- In ABS conditions, **prosodically driven expectations linger in memory**, resulting in retrieval interference during the recognition phase.
- The presence of a focus particle leads to better memory, but only in the presence of congruent sem and pros cues (in PRES conditions)
- **Future work** aims to test the focus-prosody interaction in memory in the absence of preceding prosodic cues:

Ethel gave (**only**) [**the** tulips]$_F$ to Sadie. ±sem −pros

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