Discourse accessibility and structural bias: Processing d-linked phrases in sluices

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Introduction

D(iscourse)-linking: *Which*-phrases presuppose a salient set of alternative discourse entities (Pesetsky, 1987), accessed by the processor immediately (Frazier & Clifton, 2002, 2005).

(1)   Some guests arrived at the party.

$$\left\{ \begin{array}{l} \text{Who} \\ \text{Which ones} \\ \text{Which guests} \end{array} \right\} \text{did Mary see?}$$

Sluices: Focus-sensitive clausal ellipsis after a *wh*-question (e.g., Merchant, 2001). In (2), the processor must 'fill-in' the *wh*-restrictor of the elided remnant with the **object** or **subject**.

(2)   A comedian told an old joke, but I don't know **which**.

    a. ⟨old joke it was⟩   (object)

    b. ⟨comedian it was⟩   (subject)

> **Research question:** Sluices with *who* show bias towards the object (e.g., Carlson et al, 2009). Is this bias sensitive to the d-linking requirement of *which*-phrases? If so, when?

Object bias (OB)

> **Object bias:** Resolve restrictor in sluice remnant to object of a SVO main clause under default focus.

(3)   The captain talked with the co-pilot, but we couldn't find out who else.

Bias to resolve remnant to **object** unless **subject** marked as contrastive with either L+H* accent or syntactic cleft. *Carlson et al, 2009*

Alternatives on demand (AD)

> **Alternatives on demand:** When interpreting a d-linked phrase, favor discourse alternatives overtly given by previous discourse.

Alternative	Example	Preference
Overt	Bill or Sue	Favored
Covert	A guest	Disfavored

Proposal & Predictions

> **Proposal:** Assume a cue-based content-addressable retrieval mechanism (e.g., Lewis & Vasishth, 2005), in which (a) potential antecedents are accessed in parallel, but (b) linguistic focus strengthens memory representations, facilitating availability (e.g., Foraker & McElree, 2007).

Predictions

P1 **Position:** If preference for interpretations that satisfy both OB and AD, then disjunctions selected more often when in **object** than **subject** position.

P2 **Online:** Advantage for disjunction antecedent in **object** position appears online.

P3 **Cue-strength:** Time-course of the effect in P2 depends on strength of retrieval cue in *wh*-phrase.

P4 **Invariance:** Cue-poor retrieval will be delayed regardless of contextual support.

Experiment 1a: Questionnaire

32 UMass Amherst students; 16 items in Internet forced-choice questionnaire.

(4)   a. A guest talked to Bill or Sue [83%], but I don't remember which one.

    b. Bill or Sue [55%] talked to a guest, but I don't remember which one.

    What don't I remember?

    a. **Whether it was Bill or Sue**

    b. Which guest it was

> ☞ **Effect of position:** More likely to select disjunction in **object** than in **subject** position, $z = 3.30$

Experiment 1b: Questionnaire

36 AMT subjects; 20 items.

(5)   a. A guest talked to Bill or Sue [91%], but I don't remember which (one).

    b. Bill or Sue [65%] talked to a guest, but I don't remember which (one).

    What don't I remember?

    a. **Which of Bill and Sue it was**

    b. Which guest it was

	Position of disjunct			
Wh-element	Object		Subject	
Null	91%	(2)	67%	(4)
Pronoun	88%	(2)	63%	(4)
Average	91%	(2)	65%	(3)

> ☞ **Effect of Position replicated:** Preference for disjunct when in **object** over **subject** position, $z = 3.63$

> ☞ **Effect of *wh*-element:** Disjunction less likely with pronoun than without, $z = 3.38$

Experiment 1c: Completion

36 AMT subjects; items from E1b, replacing disjunction *or* with blank.

(6)   a. A guest talked to Bill ___ Sue [78%], but I don't remember which (one).

    b. Bill ___ Sue [65%] talked to a guest, but I don't remember which (one).

> ☞ **Effect of Position replicated:** Disjunct more likely when blank in **object** than in **subject** position, $z = 3.78$

Interim conclusion

E1 supports prediction P1, but need an online measurement to address P2 – P4:

> P1 Confirmed. General preference for interpretations satisfying OB and AD in judgment data, and the effect cannot be attributed solely to the anaphoric properties of the pronoun.

Thanks & Selected references

Thanks to Joel Fishbein for assistance in data collection, and to Chuck Clifton, Brian Dillon, and Lyn Frazier for valuable feedback.

Carlson et al (2009). Information structure expectations in sentence comprehension. *QJEP* 62: 114 – 139. ★ Foraker & McElree (2007). The role of prominence in pronoun resolution: Active versus passive representations. *JML* 56: 357–383. ★ Frazier & Clifton (2002). Processing "d-linked" phrases. *J Psy Res* 31: 633–659. ★ Lewis & Vasishth (2005). An activation-based model of sentence processing as skilled memory retrieval. *Cognitive Science* 29: 375–419. ★ Pesetsky, D. (1987). Wh-in-situ: Movement and unselective binding. In *The Representation of (In)definiteness*, 98 – 129.

Experiment 2: Self-paced reading

48 Claremont Colleges students; each trial followed by a forced-choice interpretation question. 30 sextets in a 2×3 design, crossing *Position* of the disjunction (Subject vs. Object) and *Continuation* (Singular (*one*) vs. Plural (*of them*) vs. Indefinite (*guest*)).

(7) $|_1 \left\{ \begin{array}{l} \text{A guest} \\ \text{Bill or Sue} \end{array} \right\} |_2$ talked to $|_3 \left\{ \begin{array}{l} \text{Bill or Sue} \\ \text{a guest} \end{array} \right\}, |_4$ but I don't $|_5$ remember which $|_6 \left\{ \begin{array}{l} \text{one} \\ \text{of them} \\ \text{guest} \end{array} \right\} |_7$ it was $|_8$ at the moment.

    What don't I remember? **a. Which of Bill or Sue it was.** b. Which guest it was.

> ☞ **Effect of position:** Object increased disjunct preference for pronouns, but not the indefinite.

> ☞ **Continuation effect:** Preference for disjunct responses for pronouns, but not the indefinite.

	Position of disjunct			
Continuation	Object		Subject	
Singular	80%	(3)	50%	(3)
Plural	97%	(1)	91%	(2)
Indefinite	5%	(1)	4%	(1)

Experiment 2: Residual reading time results
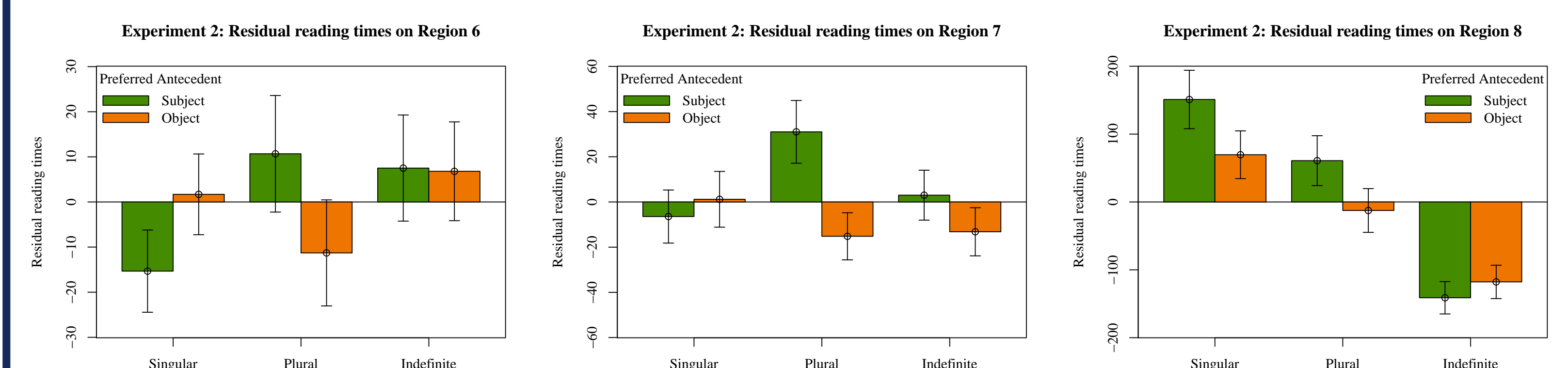
- ☞ General reading time advantage for given antecedents in **object** position (Regions 7 and 8); retrieval initially favors given antecedent for *which*-phrases in **object** position.
- ☞ **Object** advantage **seen only for pronominal elements**, and the **time course** of the effect is delayed for cue-poor pronouns.
  - ★ *Singular pronoun:* Penalty for violating the preference for antecedent with given alternatives in **object** position is **delayed** until sentence-final region.
  - ★ *Plural pronoun:* Early and sustained cost when given antecedent can't be found in preferred position.
  - ★ *Indefinites:* Show no processing costs due to positional effects; large advantage in sentence-final position.

## Experiment 3: Self-paced reading with contexts

32 Claremont Colleges students; 20 sentences with singular pronoun (*which one*) continuations from E1b were given contexts whose efficacy was confirmed in an exit questionnaire. 2×2 design, crossing *Position* and *Context* (Neutral vs. Biased to Indefinite).

Context		*Yes*	*No*	*Not sure*
Neutral	It was a particularly humid night.	10%	56%	34%
Biased	The party was swarmed with people.	86%	7%	7%

(Does the sentence suggest there were multiple guests?)

Target

$|_1 \left\{ \begin{array}{l} \text{A guest} \\ \text{Bill or Sue} \end{array} \right\} |_2$ talked to $|_3 \left\{ \begin{array}{l} \text{Bill or Sue} \\ \text{a guest} \end{array} \right\},$ $|_4$ but I don't remember $|_5$ which one $|_6$ it was $|_7$ at the moment.

> ☞ **Effect of position:** Same as above; effect appears only in final region regardless of contextual bias.
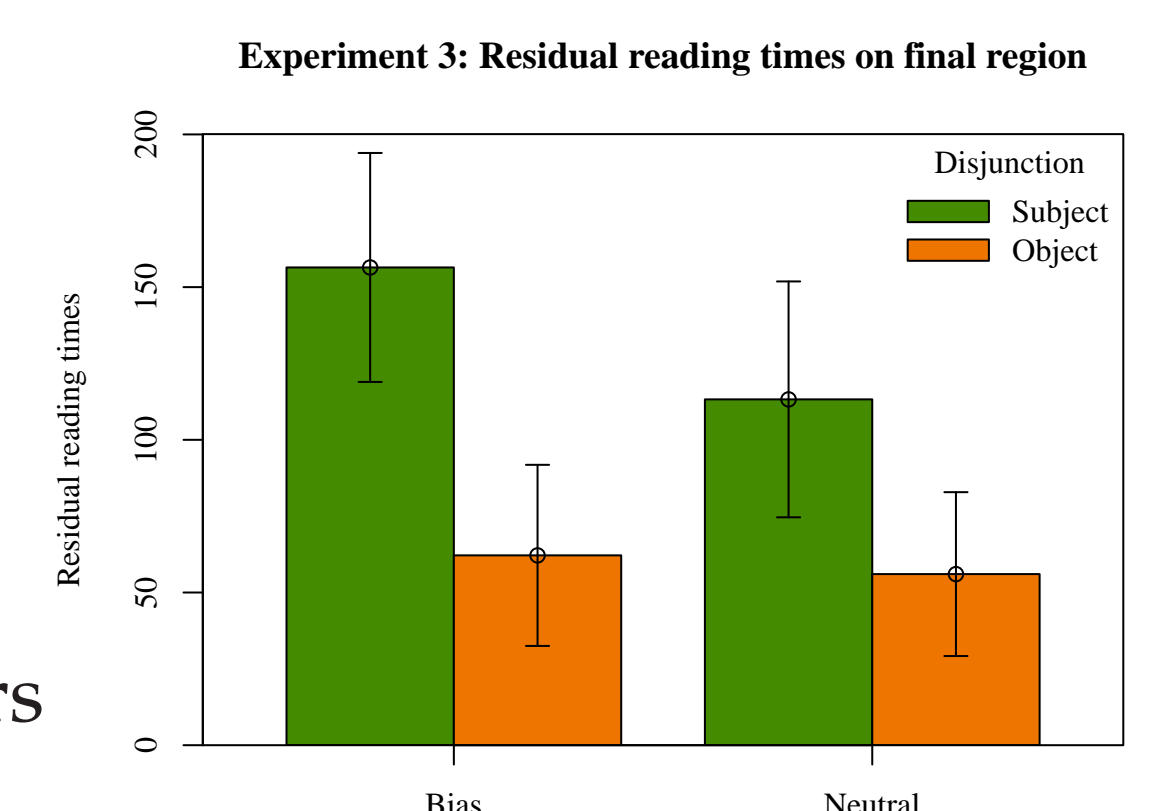
Experiment summary

E1 Evidence for **Position** prediction – disjunctions selected more often when in **object** than **subject** position in a variety of paradigms.

E2 Supports **Online** and **Cue-strength** predictions, in that the expected advantage for given antecedents in **object** position appears online, but is affected by the strength of the retrieval cue within the sluice.

E3 Support for **Invariance**, in that delayed cost for resolving cue-poor pronouns occurs regardless of supporting context.

Conclusion

Results from E1–E3 **support a processing model in which**

- Retrieval seeks antecedents for d-linked anaphors in default focus position (OB); this process may be sensitive to discourse-economy considerations (AD).

- Generating new discourse alternatives is costly when given ones are already present.

- Resolution may be delayed for cue-poor probes with multiple possible antecedents, despite contextual bias.