Implicit questions-under-discussion raise expectations only in at-issue main clauses

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Causal Expectations

Imagine you heard some gossip in the company: '***The guy Jenny praised made lots of money for the company.***' —— Do you think Jenny praised the guy **because** he made lots of money?

- When processing discourse, comprehenders use contextual cues incrementally to predict upcoming **coherence relations**.
- **Implicit causality (IC) verbs** (e.g., praised) elicit expectations for upcoming causal coherence relations between sentences [1][2] and relative clauses [3][4]:
  - E.g., *Jenny praised the guy who made lots of money for the company.* ⇝ 'praised the guy because he made lots of money'
  - The RC is **processed faster** when it matches the causal expectation [3].
- Little work has explored the constraints of IC expectations (cf. [5]).

Question-under-Discussion

- Some studies have suggested that **Question-under-Discussions (QUDs)** guide IC-related expectations [6]:
  - Discourse is structured by a series of questions (i.e., QUDs) in the QUD framework [7].
  - While QUDs in narrative discourse are *What*-type questions by default, IC verbs are more likely to raise ***Why*-type questions** (e.g., *Why did Jenny praise the guy?*), raising expectations for upcoming causal relations [6].
- If so, IC-related expectations might be sensitive to the **(non-)at-issue status** of IC verbs:
  - **Topics** are non-at-issue and contained in the denotation of the question [8].
  - When embedded in restrictive **subject RCs** (i.e., *who was praised*), IC verbs are also included in topics, and cannot raise *Why*-type QUDs as main IC verbs (i.e., *Jenny praised …*) (see Fig1 for an illustration).

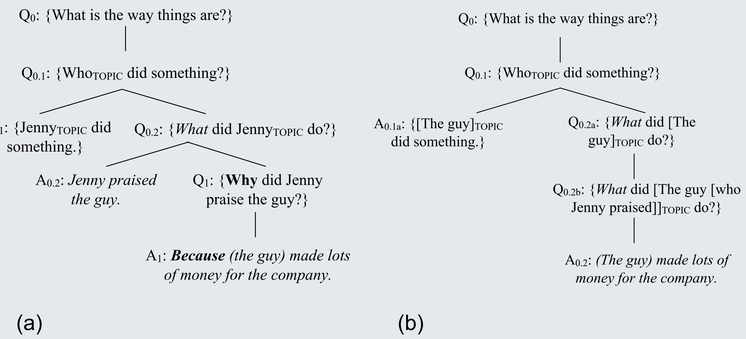


Fig 1: Compact QUD trees for (a) *Jenny praised the guy who made lots of money for the company* and (b) *The guy who Jenny praised made lots of money for the company*. The IC verb (i.e., *praise*) incrementally raises a Why-type QUD in tree (a) (bolded), but not in tree (b).

Experiments

➢ *Stimuli*

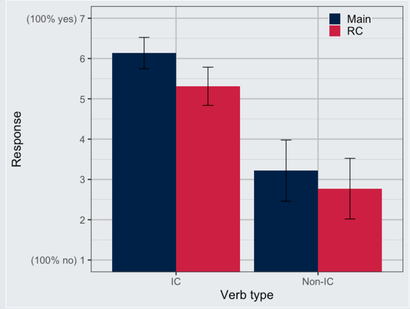
- 24 experimental stimuli, adapted from [3], were intermixed with 48 fillers. Sample stimuli :

Intro		Andrew looked over the crowd that*had assembled in the company lounge.*
Main	IC	He **admired** the woman who*had built a successful career in sales.*
Main	Non-IC	He **talked to** the woman who*had built a successful career in sales.*
RC	IC	The woman who he **admired***had built a successful career in sales.*
RC	Non-IC	The woman who he **talked to***had built a successful career in sales.*
Wrap up		She arrived at the conference room*just in time for her next meeting.*
Question		Did Andrew admire/talk to the woman because she had built a successful …?

† Asterisks mark boundaries of regions in Exp 2, with the critical region (CR) underlined.
† By manipulating Verb Position (Main, RC), we changed the (non-)at-issue status of verbs.

➢ *Exp1: Comprehension Task (N = 24)*

- 7-point Likert scale (1=100% No, 7=100% Yes); Prolific-recruited participants.
- Prediction: The **Main-IC condition** will receive **higher** scores than others.



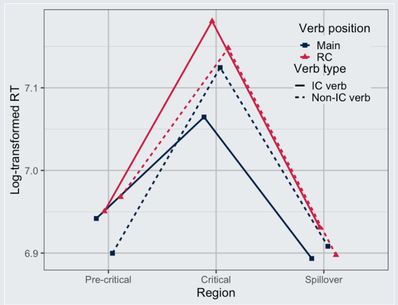
	Est	SE	z	Pr (> |t|)
Verb Type	-3.56	0.47	-7.53	<.001***
Verb Position	-0.69	0.21	-4.50	<.001***
Interaction	-0.76	0.35	2.16	.031*
Contrast: Main – RC				
	Est	SE	z	Pr (> |t|)
IC	0.82	0.18	4.63	<.001***
Non-IC	0.49	0.19	2.31	.021*

Output of CLMM model and post-hoc pairwise comparisons of Exp 1.

- Main IC verbs are more likely to trigger a causal inference than RC IC verbs.
  - The high scores obtained in the **RC IC condition** may be due to **comprehension questions** that inquire about causal relations in the target sentences.

➢ *Exp2: Self-paced Reading (N = 56)*

- Region-by-region; Prolific-recruited participants.
- Prediction: CRs will be read **faster** in the **Main-IC condition** than in other conditions.



	Est	SE	t	Pr (> |t|)
Verb Type	0.05	0.03	1.94	.063 .
Verb Position	0.12	0.03	4.00	<.001***
Interaction	-0.09	0.04	-2.42	.017*
Contrast: Main – RC				
	Est	SE	t	Pr (> |t|)
IC	-0.12	0.03	-3.99	<.001***
Non-IC	-0.02	0.03	-0.49	.441

Output of LMEM model and post-hoc pairwise comparisons of Exp 2. RTs are log-transformed.

- Only **main IC verbs** facilitated online processing by raising relevant ***Why*-QUDs** and **expectations** for upcoming answers.
  - **RC IC verbs** cannot raise QUDs and causal expectations without **explicit questions**.

Discussion

- IC verbs are more likely to raise implicit *Why*-QUDs and corresponding causal expectations in **at-issue main clauses**, rather than in non-at-issue RCs.
  - These findings support a **QUD-based analysis** of discourse.
  - The SPR results also support the **incremental** and **probabilistic** expectation-driven QUD processing model [5].
    - Future work may examine QUD-based analysis in more contexts with other types of QUD triggers.
  - The facilitation effect of main IC verbs that we observed aligns with previous studies [3].
- While the current study is motivated by a QUD-based framework, **insights from other perspectives** might also be helpful in understanding this phenomenon:
  - **Syntactic complexity** account [9]: IC inferences are more likely and quickly to be obtained in sentences containing **subject RCs** than in sentences containing **object RCs** [3].
    - Future work may test: *Jenny praised the guy who…* vs. *The guy who was praised by Jenny …*
  - **RC interruption** account: causal relations are less likely to be inferred when the RC interrupts the main clause [3].

Key Takeaways

- IC verbs do **NOT ALWAYS** raise causal expectations and inference:
  - Readers are more likely to make use of main IC verbs, but not RC IC verbs and non-IC verbs, to establish main-RC causal relations in both offline and online processing.
- The distinction between main IC verbs and RC IC verbs is arguably due to their (non-)at-issue nature.
  - IC verbs in at-issue main clauses can raise implicit *Why*-type QUDs
- Insights from other perspectives might also be helpful in understanding this phenomenon.

Reference

[1] Rohde, H. (2008). *Coherence-driven effects in sentence and discourse processing*. University of California, San Diego. [2] Grüter, T., Takeda, A., Rohde, H. & Schafer, A. J. (2018). Intersentential coreference expectations reflect mental models of events. *Cognition*. [3] Hoek, J., Rohde, H., Evers-Vermeul, J. & Sanders, T. (2020). Scolding the child who threw the scissors: Shaping discourse expectations by restricting referents. *Language, cognition and neuroscience*. [4] Hoek, J., Rohde, H., Evers-Vermeul, J. & Sanders, T. J. (2021). Expectations from relative clauses: Real-time coherence updates in discourse processing. *Cognition*. [5] Kim, H., & Chun, E. (2023). Effects of topicality in the interpretation of implicit consequentiality: evidence from offline and online referential processing in Korean. Linguistics, 61(1), 77-105. [6] Kehler, A., & Rohde, H. (2017). Evaluating an expectation-driven question-under-discussion model of discourse interpretation. *Discourse Processes*. [7] Benz, A., & Jasinskaja, K. (2017). Questions under discussion: From sentence to discourse. *Discourse Processes*. [8] Riester, A. (2019). Constructing qud trees. In *Questions in discourse*. Brill. [9] Staub, A. (2010). Eye movements and processing difficulty in object relative clauses. Cognition.

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