Presupposition satisfaction preserves discourse constituency

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Two observations & two questions

1. Dependencies are often constrained by locality in sentence processing.
   - → Are discourse-level dependencies also constrained by locality?

2. Discourse is structured.
   - Beyond subsentential syntax, semantics
   - Different discourse structure yields different outcomes in e.g. anaphora resolution (Grosz & Sidner 1986; Webber & Joshi 1998; Polanyi 1999; Kehler 2000; Wolf & Gibson 2005, 2006; among many others)
   - → Behavioral measure sensitive to discourse structure and constituency?
Andy also bought \([\text{some nectarines}]_F\)

- \(\psi = \) Andy bought some nectarines
- \(\phi = \exists \alpha \in A. \alpha \text{ is true} \& \alpha \neq \psi\) \approx Andy bought something other than nectarines
- \(A = \{\) Andy bought some nectarines,
  Andy bought some bagels,
  Andy bought some tangerines,
  Andy bought some apples,
  Andy bought some lilacs,
  Andy bought some lightbulbs, ...
\}

Unbounded set of possible meanings \(\rightarrow\) Very small set of possible meanings in a particular discourse context
Using focus interpretation to study discourse structure

Beth bought [some bagels]_F

Andy also bought [some nectarines]_F

ψ = Andy bought some nectarines

φ = ∃α ∈ A.α is true & α ≠ ψ
    ≈ Andy bought something other than nectarines

A = {Andy bought some nectarines,
     Andy bought some bagels,
     Andy bought some tangerines,
     Andy bought some apples,
     Andy bought some lilacs,
     Andy bought some lightbulbs, ... }

q1: Are discourse dependencies constrained by locality?
q2: Is the relevant notion of locality linear or hierarchically structured?
1. Experiment 1 (questionnaire): Locality in presupposition satisfaction
2. Experiment 2 (questionnaire): Linear v. structured locality
3. Experiment 3 (eye-tracking): Tracking presupposition satisfaction in real time
4. Conclusions & remaining questions
Is presupposition satisfaction constrained by locality?

**local interpretation**

1. The roommates went to the farmer’s market this morning.
2. Beth bought some bread.
3. Andy bought some carrots and some celery.
4. His doctor says he needs to eat more vegetables.
5. Today Andy treated himself to some croissants.
6. He also bought some nectarines.

**Q:** Andy got:

nectarines, croissants
global interpretation

1. The roommates went to the farmer’s market this morning.
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4. His doctor says he needs to eat more vegetables.
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Q: Andy got:
nectarines, croissants, carrots, celery, bread
Experiment 1

- 10 items, N=20
- 2 pseudo-randomized lists
- Participants read discourses on a computer screen. Each 6-sentence discourse was followed by a sentence fragment (e.g. ‘Andy got:’).
- Participants completed the fragment by choosing 1 of 5 continuations:

1. The roommates went to the farmer’s market this morning.
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3. Andy bought some carrots and some celery.
4. His doctor says he needs to eat more vegetables.
5. Today Andy treated himself to some croissants.
6. He also bought some nectarines.

*local*

Andy got . . . nectarines and croissants.
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global
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Andy got ... bread.
Experiment 1 predictions

- If presupposition dependencies are subject to a locality constraint, **local** interpretation should be preferred.

- If locality effects are graded (stronger bias as dependency length increases), the intermediate interpretation should be preferred to the global one.

- False interpretation should be rejected.
Local interpretation > Intermediate > Global > False
✓ Local interpretation preferred, suggesting presupposition satisfaction is constrained by (some kind of) locality.

✓ Increasing dependency length corresponds to increasing dispreference: Locality effects appear to be graded.

✓ False interpretations rejected.
The roommates went to the farmer's market today.
Beth bought some bread.
Andy bought some carrots and some celery.
His doctor told him he needs to eat more vegetables.
Today Andy treated himself to some croissants.
He also bought some nectarines.
Interpretation 2: Locality relativized to structured discourse representation

Which roommate bought what at the farmer’s market?

Beth?
  Beth bought some bread.

Andy?
  Andy bought some carrots and some celery.
  Why?
    Today he treated himself to a croissant.
    His doctor told him he needed to eat more vegetables.
  He also bought some nectarines.
Interpretation 2: Locality relativized to structured discourse representation
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local

Which roommate bought what at the farmer’s market?

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Why?

Today he treated himself to a croissant. He also bought some nectarines.

His doctor told him he needed to eat more vegetables.
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His doctor told him he needed to eat more vegetables.
Interpretation 2: Locality relativized to structured discourse representation

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Andy?
- Andy bought some carrots and some celery.
- Why?
  - Today he treated himself to a croissant.
  - He also bought some nectarines.

His doctor told him he needed to eat more vegetables.
Roadmap

1. Experiment 1 (questionnaire): Locality in presupposition satisfaction
2. Experiment 2 (questionnaire): Linear v. structured locality
3. Experiment 3 (eye-tracking): Tracking presupposition satisfaction in real time
4. Conclusions & remaining questions
Disentangling linear distance and structured locality

**Experiment 1**

```
Q
  ├── Sub-Q
  │    └── Ans
  ├── Sub-Q
  │    ├── Ans
  │    ├── Sub-Q
  │    │   ├── Ans
  │    │   └── Ans
  │    └── Ans
  └── Ans
```

**Experiment 2**

```
Q
  ├── Sub-Q
  │    ├── Ans
  │    └── Sub-Q
  │         ├── Ans
  │         └── Sub-Q
  │             └── Ans
  └── Ans
```
Disentangling linear distance and structured locality

Which roommate bought what at the farmer’s market?

Beth?
- Beth bought some bread.

Frank?
- Frank bought some carrots.

Andy?
- Andy also bought some nectarines.

When his girlfriend is there, she always gets some croissants.
Experiment 2

linear local

1. The roommates went to the farmer’s market this morning.
2. Beth bought some bread.
3. Frank bought some carrots and some celery.
4. When his girlfriend is there she always gets some croissants.
5. Andy also bought some nectarines.

Andy bought ... nectarines and croissants.
The roommates went to the farmer’s market this morning.

Beth bought some bread.

Frank bought some carrots and some celery.

When his girlfriend is there she always gets some croissants.

Andy also bought some nectarines.

Andy bought ... nectarines, croissants, carrots and celery.
intermediate (consistent with situation model)

1. The roommates went to the farmer’s market this morning.
2. Beth bought some bread.
3. Frank bought some carrots and some celery.
4. When his girlfriend is there she always gets some croissants.
5. Andy also bought some nectarines.

Andy bought . . . nectarines, carrots and celery.
The roommates went to the farmer’s market this morning.

Beth bought some bread.

Frank bought some carrots and some celery.

When his girlfriend is there she always gets some croissants.

Andy also bought some nectarines.

Andy bought ... nectarines, carrots, celery and bread.
Based on Experiment 1, expect **local bias** for presupposition dependencies.
→ Strict linear locality preferred even when incompatible with the situation model?

Is there evidence for **structured locality**, when no longer aligned with linear distance?
Local interpretation in terms of *linear distance* is still (always?) available
Presupposition satisfaction respects discourse constituency—bias for interpreting presupposition relative to *local discourse unit*. 

ALG2bMeans.pdf
✓ **Linear locality** bias → Preferred even when incompatible with situation model!

✓ Preference for locality w.r.t. *hierarchical structure*. (Can’t be due to minimizing linear distance.)

- Do these locality biases influence **online discourse processing** and presupposition resolution?

- Do linearly and structurally local interpretations **compete** in online interpretation?
Roadmap

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The roommates went to the farmer’s market this morning.

Beth got some bread.

Frank got some carrots and some apples.

Andy also got some nectarines.

→ Click on what Andy got.
The roommates went to the farmer’s market this morning.

Beth got some bread.

Frank got some carrots and some apples.

Andy also got some nectarines.
The roommates went to the farmer’s market this morning.

Beth got some bread.

Frank got some carrots and some apples.

Andy also got some nectarines.
The roommates went to the farmer’s market this morning.

Beth got some bread.

Frank got some carrots and some apples.

Andy also got some nectarines.

linearly local
→ minimizes linear distance
→ breaks up a discourse constituent
1. The roommates went to the farmer’s market this morning.
2. Beth got some bread.
3. Frank got some carrots and some apples.
4. Andy also got some nectarines.

structurally local
→ local discourse tier
→ preserves discourse constituency
The roommates went to the farmer’s market this morning.
Beth got some bread.
Frank got some carrots and some apples.
Andy also got some nectarines.

linear local only:
(a) carrots, apples
(b) apples
(c) nectarines
(d) nectarines, carrots, apples
The roommates went to the farmer’s market this morning.
Beth got some bread.
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structured local only:
(a) carrots, apples
(b) apples
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The roommates went to the farmer’s market this morning.

Beth got some bread.

Frank got some carrots and some apples.

Andy also got some nectarines.

**linear and structured:**

(a) carrots, apples  
(b) apples  
(c) nectarines, carrots, apples  
(d) nectarines, carrots, apples, bread
Experiment 3 questions

- Do linearly and structurally local interpretations **compete in online interpretation**?

- Experiment 3 pits linear locality against **discourse constituency**.
  - Do comprehenders break constituency in order to minimize linear dependency length?
  - Or violate strict linear locality to preserve constituency?
Experiment 3 results

target:other + target ratio

RatioC.pdf
Experiment 3 results

**linear local only display**: 200 ms before-200 ms after target word onset

The bar chart shows the average fixation count for different conditions:

- False (Mentioned subset)
- False (Mentioned set)
- Presupp failure
- Linear local

The linear local condition has the highest average fixation count, indicating a notable difference compared to the other conditions.
Experiment 3 results

**linear local only**: 400-800 ms after target word onset

→ Linear local no better than presupposition violating interpretation.
Experiment 3 results

structured local only: 200 ms before-200 ms after target word onset

→ Early convergence on structured local interpretation.
Experiment 3 results

**structured local only display**: 400-800 ms after target word onset

→ Early convergence on structured local interpretation.
Experiment 3 results

**linear and structured**: 200 ms before-200 ms after target word onset

→ Linear and structured local interpretations compete in early window.
Experiment 3 results

**linear and structured**: 400-800 ms after target word onset

→ Late convergence on structured interpretation.
Experiment 3 results

**target:other + target ratio:** early and late windows

[RatioEL.pdf](#)
✓ Linearly and structurally local interpretations compete in online interpretation.

✓ Comprehenders appear to sacrifice minimizing strict linear locality in order to preserve discourse-level constituency.

✓ Presupposition triggers do give rise to expectations about likely discourse continuations—even when these expectations are about abstract focus alternatives.
Evidence for locality w.r.t. linear distance and hierarchically-organized discourse structure.

In online discourse processing, bias in favor of discourse constituency-preserving interpretations is stronger than bias toward minimizing dependency length.

More generally: presupposition triggers like also give rise to expectations about likely focus alternatives/comparison sets.
Open question & future directions

- A lot of open issues about the nature of discourse structure
  - hierarchical structure?
  - discourse/rhetorical relations?
  - what types of dependencies are allowed?

- How is discourse organized?
  - QUD/topic structure?
  - different organizations by discourse type?
  - narrative v. dialogue/conversation?
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RAs: Justin Gumina & Seth Rosenblatt

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