Restricting and Generating Hypotheses About Focus Alternatives

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XPRAG  4/24/09
Only Matt got a perfect score.
(students in some class; some exam or homework)

Katie only has a bike.
(ways of getting to work)

Natalie only met Lucy.
(Bobby’s ex-gfs)
Same general problem as quantifier domain restriction

Language Log

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QUANTIFIER DOMAIN RESTRICTION AND GEL-FILLED BRAS

As Mark Liberman noted, security expert Bruce Schneier had some fun with this line from the Transportation Security Administration’s byzantine list of prohibited carry-on items:

We encourage everyone to pack gel-filled bras in their checked baggage.

Schneier’s riposte:

Everyone? Do I have to as well? Where should I go buy one?

Nobody ridiculed the TSA for matching up an ostensibly singular quantifier (everyone) with an ostensibly plural personal pronoun (their). That sort of thing is old hat and hardly worth remarking upon (though Lord knows that doesn’t stop us from remarking upon it, e.g., here, here, here, here, here, here, here, here, here...). The humor, such as it is, instead hinges on a supposed ambiguity in determining the domain of the quantifier everyone.
Katie only has a $[\text{bike}]_F$. 

\{\text{ways of getting to work}\}

In general, what factors determine this set?
The idea is to (temporarily) restrict the domain of evaluation for the whole sentence or even the whole discourse. The pragmatics will help in choosing a suitable universe for the evaluation of a particular sentence, but the semantics can just operate abstracting away from any such choice of a universe.

von Fintel (1998)

Its reference [the context variable] is to be fixed pragmatically, subject to the constraint introduced by focus interpretation.

Rooth (1996)

The domain of quantification is understood as consisting of just three propositions, rather than the full set of propositions of the form “John introduced \( y \) to Sue”.

(24) John brought Tom, Bill, and Harry to the party, but he only introduced Bill\(_F\) to Sue.

Rooth (1996)
Another contender: Context Informativity

He’s only buying [sneakers].
Another contender: Context Informativity

Greg is at the mall.

*He’s only buying [sneakers].*

\[
\{\text{sneakers, gloves, CDs, magazines, suitcases, } \ldots \}
\]
Another contender: Context Informativity

Greg is at the shoe store.

*He’s only buying [sneakers].*

{hiking boots, sandals, flip-flops,…}
Outline

- Background
- Experiments 1-2: Factors that constraint focus alternatives
- Experiment 3a: Generating hypotheses about the alternative set
- Experiment 4: Comparing different focus operators—*only v. also*
- Experiment 3b: General domain narrowing effects
- Conclusions
Using the Visual World paradigm to investigate reference resolution for definite descriptions


- Sedivy, Tanenhaus, Chambers & Carlson (1999): In the context of a definite, scalar adjectives are interpreted to satisfy uniqueness in a visual context

- Chambers, Magnuson & Tanenhaus (2004): Knowledge about the world constrains what is considered a possible referent (i.e. restricts the referential domain)
Knowledge about the world constrains what is considered a possible referent (i.e. restricts the referential domain).

“Put the whistle on the folder in the box.”
Knowledge about the world constrains what is considered a possible referent (i.e. restricts the referential domain).

“Put the whistle on the folder in the box.”

A question for experimental pragmatics

How do comprehenders construct relevant contexts for interpreting context-dependent meanings?

Focus operators like *only*:
How do comprehenders appropriately restrict focus alternatives on the basis of contextual information?
Restricting focus alternatives for Only

How do we measure preference for one alternative interpretation over another?

Visual World paradigm: ‘preferences’ are revealed by how much you look at a particular referent relative to others in a visual scene.
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Experiment 1: Previous mention

Is the set of alternatives you consider in a sentence like

‘Jane only has some candy’

constrained by the set of things just mentioned in the discourse?
Restricting focus alternatives for *Only*

\[
\text{Jane only has some } [\text{candy}]_F.
\]

\[
\{\text{candy, cupcakes, apples, sandwiches, gum, \ldots}\}
\]

– dry-erase markers, refrigerators, pickup trucks \ldots
Restricting focus alternatives for *Only*

*Mark has some candy and some apples.*
*Jane only has some \([\text{candy}]_F\).*

\[
\{\text{candy, cupcakes, apples, sandwiches, gum, \ldots}\}
\]\n
– dry-erase markers, refrigerators, pickup trucks…
Restricting focus alternatives for *Only*

Mark has some *candy* and some *apples.*
Jane only has some $[\text{candy}]_F$.

\[
\begin{align*}
\{\text{candy, cupcakes, apples, sandwiches, gum,} & \ldots\} \\
\text{dry-erase markers, refrigerators, pickup trucks} & \ldots
\end{align*}
\]
Mark has some candy and some pencils. 

*Jane only has some candy.*

**target**

cohort competitor
Mark has some candy and some pencils. Jane only has some candy.

target

cohort competitor
Experiment 1: Previous mention

No Mention + No Only
(1) Mark has *some toothpicks and some pencils*. 
    Jane has *some candy*.

Mention + No Only
(2) Mark has *some candy and some pencils*. 
    Jane has *some candy*.

No Mention + Only
(3) Mark has *some toothpicks and some pencils*. 
    Jane only has *some candy*.

Mention + Only
(4) Mark has *some candy and some pencils*. 
    Jane only has *some candy*. 
Experiment 1 results

*No Mention + No Only*: late disambiguation, >500 ms.

Mark has some toothpicks and some pencils.

Jane has some candy.

...has some candy.

‘Mark has *some toothpicks* and some pencils.’

‘Jane has *some candy.*’
Experiment 1 results

*Mention + No Only*: disambiguation \(~400\) ms.

‘Mark has some candy and some pencils.’
‘Jane has some candy.’
Experiment 1 results

*Mention + Only*: earliest disambiguation, \(\sim 200\) ms.

Excerpts:

- ‘Mark has some candy and some pencils.’
- ‘Jane only has some candy.’

Diagram showing proportion of fixations over time, with a circle highlighting the point where ‘only has some candy’ is first disambiguated.
Experiment 1 results

*No Mention + Only:* latest disambiguation, >500 ms.

‘Mark has some toothpicks and some pencils.’
‘Jane only has some candy.’
Experiment 1 results

Average point of disambiguation

![Graph showing the average point of disambiguation for NoMention and Mention conditions with error bars indicating standard deviation. The graph compares ms from target word onset for NoOnly and Only conditions. The NoMention condition shows a significantly higher average point of disambiguation compared to the Mention condition, as indicated by the asterisks (***).]
Experiment 1

- *Mention effect*: earlier disambiguation when the target word was mentioned in the previous sentence.

- Mention effect strengthened by the presence of *only*—given the time it takes to program and launch an eye movement, listeners seem to be disambiguating the target at the very onset of the target word.
Experiment 2: Context informativity

Does providing richer contextual information have a further restrictive effect on the interpretation of *only*?
Experiment 2: Context informativity

Context type x Mention x Only (8 conditions)

Informative Context: Jill and Peter are at the shoe store.
  No mention: Jill wants to buy some sneakers and some sandals.
  Mention: Jill wants to buy some boots and some sandals.
  No only: Peter wants to buy some boots.
  Only: Peter only wants to buy some boots.

Underinformative Context: Jill and Peter are at the mall.
  No mention: Jill wants to buy some dresses and some coats.
  Mention: Jill wants to buy some boots and some coats.
  No only: Peter wants to buy some boots.
  Only: Peter only wants to buy some boots.
Experiment 2: Context informativity

Peter (only) wants to buy some boots.
Experiment 2: Context informativity

Does providing richer contextual information have a further restrictive effect on the interpretation of only?

Possible outcomes:

• Highly informative contexts are like Mention, restricting the domain of interpretation especially with only present.
  – Greatest facilitation in Only conditions (on top of Mention effect from Exp 1).

• Enriching the context has a restrictive effect on subsequent interpretation, but in a general way not specific to the presence of only.
  – Across-the-board faster convergence on target in Informative conditions, irrespective of the presence of only.
Experiment 2 results

Average point of disambiguation
Experiment 2 results

Average point of disambiguation
Experiment 2 results

Average point of disambiguation
Experiment 2 results

Average point of disambiguation
Experiment 2 results

Informative context + Mention + Only

‘Jill and Peter are at the shoe store.’
‘Jill wants to buy some boots and some sandals.’
‘Peter only wants to buy some boots.’

‘...only wants to buy some candy.’
‘Jill and Peter are at the shoe store.’
‘Jill wants to buy some boots and some sandals.’
‘Peter wants to buy some boots.’
Experiment 2

- Underinformative context conditions pattern like Exp 1, as expected

- Informative context has a general restrictive effect: on average 250 ms earlier convergence on target relative to corresponding Underinformative condition

- Only-dependent effect of Context Informativity: Informative context helps even more when only is present

- Largest advantage for Mention-Only condition: listeners are able to disambiguate the target referent well before the onset of the target word.
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Experiment 3a: Conceptual similarity

Two explanations for what people are doing in Exp 1-2:

(1) Given the items in the visual display, they rule out certain referents as unlikely (based on the previous discourse context, etc).

(2) Using the information from the discourse context, they start generating hypotheses about what items are likely to be in the alternative set.

If listeners are actively generating candidate alternatives, they might do this on the basis of something like conceptual similarity: predicts facilitation (early disambiguation) for same-category over different-category items, even without Mention.
Experiment 3a: Conceptual similarity

Mention
Mark has *some apples and some oranges.*
Jane only has *some apples.*

Novel + Same category
Mark has *some pears and some oranges.*
Jane only has *some apples.*

Novel + Different category
Mark has *some boots and some sandals.*
Jane only has *some apples.*
Experiment 3a results

Average point of disambiguation

![Bar chart showing the average point of disambiguation for different categories: Mention, Novel-SameCategory, Novel-DifferentCategory. The chart indicates a significant difference (**).]
Experiment 3a results

Average point of disambiguation

![Bar graph showing disambiguation times for different conditions.]
Experiment 3a results

Mentioned < Novel-SameCategory < Novel-DifferentCategory

‘Jane only has some apples’
Experiment 3a

- **Mention effect**: Expectation for Mentioned items in the context of *only* (as in Experiments 1-2).

- **Conceptual similarity bias**: Same-category Novel items have an advantage over Different-category Novel items (can’t be due to explicit mention).

- Suggests listeners actively generate candidate alternatives, given the presence of *only* and the material in the preceding discourse.
Only v. also

Other focus-sensitive operators?

Comparing other lexical items should let us pull apart what parts of these results are due to the meaning contribution of a particular lexical item, and what parts reflect something general about how people construct contexts and continually modify them.

Also is similarly alternative-sensitive, but the way the focus relates to the alternatives is different from Only.
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Only

Natalie only met \([Lucy]_F\).

Natalie met Lucy.
Natalie didn’t meet anyone but Lucy.
Also

Natalie also met $[Lucy]_F$.

Natalie met Lucy.
Natalie met someone other than Lucy.
Also

Natalie also met \([Lucy]_F\).

\[
[[VP \text{met } [Lucy]_F]]^o = \lambda x[\text{meet}(x,1)] \\
[[VP \text{met } [Lucy]_F]]^f = \{\lambda x[\text{meet}(x, y)] : y \in E\}
\]

met \(y\)

(contextually restricted set)
\[
\{\text{met lucy, met andrea, met emma, met jamie, \ldots}\}
\]
Experiment 4

- *Only*: expect upcoming material to be a subset of the mentioned items
- *Also*: expect upcoming material to be a superset of the mentioned items

Mark has some apples and some oranges.

Jane only has ...
Experiment 4

- *Only*: expect upcoming material to be a subset of the mentioned items
- *Also*: expect upcoming material to be a superset of the mentioned items

Mark has some apples and some oranges.

Jane only has some apples.
Experiment 4

- *Only*: expect upcoming material to be a subset of the mentioned items
- *Also*: expect upcoming material to be a superset of the mentioned items

*Mark has some apples and some oranges.*

*Jane also has ...*
Experiment 4

- **Only**: expect upcoming material to be a subset of the mentioned items
- **Also**: expect upcoming material to be a superset of the mentioned items

*Mark has some apples and some oranges.*

*Jane also has some pears.*
Experiment 4 results

200-400 ms after target word onset: subset preference for *only*, superset preference for *also*
Different sources of expectations

• Experiment 4: Different focus-sensitive lexical items give rise to different expectations about the resolution of the sentence → local effects (limited to scope of focus operator)

• General expectations about e.g. the coherence of a discourse?
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Mark has some apples and some oranges. Jane only has ...
Mark has some apples and some oranges. Jane only has …
After the grueling stats exam, the first-years decided they deserved a delicious snack.

Judith proposed making smoothies with her new blender.

Everyone agreed, and started figuring out who had what kind of fruit at home to contribute.

Mark had some apples and some oranges.

Jane only/also had…
Experiment 3b: Conceptual similarity

Mention
Mark has *some apples and some oranges.*
Jane only has *some apples.*
Jane also has *some apples.*

Novel + Same category
Mark has *some pears and some oranges.*
Jane only has *some apples.*
Jane also has *some apples.*

Novel + Different category
Mark has *some boots and some sandals.*
Jane only has *some apples.*
Jane also has *some apples.*
Experiment 3b results

Average point of disambiguation
Experiment 3

- Expectation for conceptually similar items

Experiment 4

- \textit{Only} - subset/mention bias
- \textit{Also} - superset/novelty bias
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Summary

- **Experiments 1-2:**
  Focus alternatives are constrained by previous mention, informativity of the preceding context

- **Experiment 3a:**
  Conceptual similarity bias—strength of expectations about alternatives varies with relatedness to preceding referents

- **Experiment 4:**
  *Only* v. *Also*—Different focus operators give rise to different local predictions

- **Experiment 3b:**
  General expectation for discourse coherence may underlie same category bias
Future work

- We’ve been treating focus alternatives as analogous to quantifier domains, but whether the same factors influence domain restriction is an empirical question. Do the current findings extend to quantifier domain restriction?

- A cue combination problem: how do prosody, discourse parallelism, discourse old/new status, other factors combine with each other? What happens when information sources of information conflict?

- Comprehenders must be tracking both the changing discourse topic and local dependencies (e.g. explicit mention in the last sentence). What’s the relationship between the two?
Thanks!

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