The use of common ground information in real-time comprehension and production

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message

Pick up the box
message

Context (non-linguistic information)

Pick up the box
Contextual information

- Where does contextual information come from?
  - The physical environment
  - Prior discourse
  - Encyclopedic knowledge
  - Interlocutors’ goals
  - Interlocutors’ knowledge

- Information has to be coordinated and updated constantly.

- This is computationally costly, and may be too slow to affect the earliest moments of comprehension and production.
**Interlocutors’ knowledge: common ground**

**Common ground.** Knowledge that is shared by both interlocutors (and is mutually accepted as such).

**Privileged ground.** Knowledge that is available to one interlocutor and not the other.
Common Ground

- Common ground is the context against which utterances are made (Stalnaker 1979).
- The common ground doesn’t have one perceptual correlate, but has to be developed using information from multiple sources.
  - The physical environment (“physical co-presence”)
  - The linguistic context (“linguistic co-presence”)
  - Background information about interlocutors (“community membership”).
Can interlocutors use the distinction between common and privileged ground from the earliest moments?

- No, they use strategies that approximate perspective-taking behavior.
  - “Egocentric first” (Keysar et al. 2003): use egocentric perspective until it fails.
  - “Information overlap strategy” (Wu & Keysar 2007)

- Yes
  - Comprehension (Experiment 1)
  - Production (Experiment 2)
Experiment 1: comprehension

with Daniel Grodner & Micheal K. Tanenhaus
Scalar Adjectives

one contrast

Sedivy, Tanenhaus, Chambers & Carlson (1999)

“pick up the big duck”

two contrasts

“pick up the big duck”
The Visual World Eye-tracking Paradigm

- Eye movements are closely time-locked to aspects of linguistic interpretation (Cooper, 1974; Tanenhaus et al. 1995).
- Visual context (and other aspects of context) can be manipulated in a controlled way.
one contrast

“pick up the small basket”
two contrasts
“pick up the small pot”
Common vs. privileged ground

Common ground objects (physical co-presence)

Privileged ground object
Common vs. privileged ground

“Egocentric first”
(Keysar et al. 2003)
2 (contrasts) x 2 (ground)

“pick up the big duck”

one contrast
“big” (early)

two contrasts
“duck” (late)

one privileged
“big” (early)

two privileged
“big” (early)

Listener’s view
2 (contrasts) x 2 (ground)

“pick up the big duck”

one contrast
"big" (early)

two contrasts
"duck" (late)

one privileged
"big" (early)

two privileged
"duck" (late)

Listener’s view
Eye tracking data

Target: big duck
Competitor: big box
Other: small duck, small box
one contrast

“Pick up the big duck”
two contrasts

- referent
- same-size competitor
- contrast to referent
- contrast to competitor

“Pick up the big duck”
two privileged

“Pick up the big duck”
one shared: early

two shared: late

two privileged: early
Listeners do not process initially from their egocentric perspective.
- Listeners use the distinction between common and privileged ground in the earliest moments.

OR

- Listeners strategically ignore privileged information, simulating the speaker’s perspective.
A strategy of focusing on common ground?

“pick up the big duck”

one contrast
“big” (early)

two contrasts
“duck” (late)

one privileged
“big” (early)

two privileged
“big” (early)

Speaker’s view
Privileged Objects Analysis

one privileged

two privileged
Privileged Objects Analysis

**OPTION 1**
simulating the speaker’s perspective

**OPTION 2**
distinguish common and privileged

one privileged

≠

two privileged
one privileged

two privileged
one privileged

![Image of a shelf with a yellow object]

![Graph showing the proportion of fixations over time for an unrelated object]

two privileged

![Image of a shelf with a yellow object]

![Graph showing the proportion of fixations over time for a contrast to competitor object]
Privileged Objects Analysis

"Pick up the big duck"
Experiment 1 Conclusions

- Listeners…
  - … do not process from their egocentric perspective.
  - … integrate information about common ground from the earliest moments.
  - … integrate information about speaker’s knowledge into their own perspective.
Experiment 2: production

with Kristen Skovbroten & Michael K. Tanenhaus
Common Ground in Production

- Perspective taking in production might be cognitively more demanding.
  - Production is cognitively more demanding, so the processing system may not have enough resources to deal with integrating common ground.
  - Speakers need to contribute privileged information to the common ground (Stalnaker 1979), so it could be harder to demote privileged information.

- Evidence that speakers use strategies.
  - Wardlow Lane et al. (2006) argue that speakers use their egocentric perspective.
  - Wu & Keysar (2007) argue that speakers use global assessment of shared vs. privileged information, and they are not sensitive to the status of individual objects.
Experiment 2 adapted from Wu & Keysar (2007)

Training

block 1
- danzo
- nelke
- flooble
- bannar
- abvinit
- flukium

block 2
- stoggy
- etrett
- pright
- grampent
- buttly
- stoggy

block 3
- inclyder
- chitney
- archow
- bolgan
- hydron

block 4
- fluliket
- cortlog
- inta
- bluchek
- molget
- flazap33
Experiment 2: Methods

High Overlap: 18 shared / 6 privileged
Experiment 2: Methods

Low Overlap: 6 shared / 18 privileged

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<th>danzo</th>
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Experiment 2: Methods

Referential communication task
The speaker was instructed to get the addressee to click on the correct shape “as quickly and accurately as possible”

- 6 shared shapes.
- 6 privileged shapes.
- 6 new shapes.
Producing Referring Expressions

A pattern of optimal behavior where speakers are being only as informative as necessary:

- Shapes with shared names will be referred to with names.
- Shapes with privileged names will be referred to with descriptions
  - A privileged should not be used because it will not be informative and can cause confusion.

If a name is uttered, it means that the speaker assumes that the name is shared.
Results: name use

- Many names for privileged shapes.
- More in names in high overlap.
- Information Overlap Strategy?
Our Study: Methods

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- floogle
- tluliket
- fluchek
- flazap
- flanzo
- flukium
Name use: examples

Shared names

1. uh, abypit.
2. ah, banpar, your favorite.
3. um, abypit I think it's called, I forget

Privileged names

1. oh you don't know this, ok it's square with arrows coming out of it... it's called floogle if you were interested.
2. ah, inta, you haven't seen it, it's four arrows
3. ah, this is called molget, it's like a triangle and a rectangle.
Name use: can a listener tell?

Can a naive listener distinguish names were assumed by the speaker to be shared from names that were assumed to be privileged?

- Three naive coders listened to the conversations.
- They were blind to the status of shapes.
- Categories of name use:
  - Assumed Shared. If the coder thought the speaker expected the addressee to know the name.
  - Assumed Privileged. If the coder thought the speaker didn’t expect the addressee to know the name.

[repeated name after addressee]
Name use: can a listener tell?

- Speakers sometimes mention their assumptions explicitly:
  1. It's fluliket, but you don't know what that means, it's like a ghost scaring children.
  2. Um, I learned this, it's cortlog, it almost looks like a guy dancing…
  3. Ah, this is called molget, it's like a triangle and a rectangle. [laugh] I'll tell you what it's called.

- 83% agreement among all three coders (99% agreement among two coders).
Listeners have an intuition for whether the speaker assumed that a certain name was shared or privileged.
Form analysis

Did speakers use different forms in naming shared and privileged shapes?

- Already excluded names that were preceded by a description (7% of trials in our study).

- We distinguish two forms in which the name comes first: name-alone vs. name-then-description

  - oh you don't know this, ok it's square with arrows coming out of it... it's called **floogle** if you were interested

  - **banpar**

  - **flucheck**, like something just crashed, bam
Speakers distinguish shared and privileged names in the form of their utterance:

- **Name-alone** is the preferred form for shared names.
- **Name-then-description** is the preferred form for privileged names.
Form Analysis: name-then-description as repair?

- But do speakers know these names are privileged in the earliest moments?

**Early.** Information about shared vs. privileged is accessed and used during planning.
  - Speakers choose this form for privileged names.

**Repair.** This kind of information is used late (cf. Keysar et al 2003’s “egocentric-first” approach).
  - Speakers repair their utterance once they realize they used an uninformative privileged name.

*fluchec*ck, like something just crashed, bam
Form Analysis: name-then-description as repair?

- Examples of obvious repairs
  - Due to feedback from the addressee.
    “flanzo. [pause] ok, looks like Ganzo...“
  - Due to self-monitoring
    “um, flu-, it’s like, it looks like a person sort of”
    “oh flan- you don't know this one, it looks like a bunny rabbit”

- Examples of name-then-description
  1. ah, fluliket, looks like a ghost kind of with big arms, a head.
  2. molget it's got a triangle and a rectangle.
  3. cortlog, it’s a guy kicking.
Form Analysis: name-then-description as repair?

- If speakers plan the description ahead of time, this will be reflected on the way they pronounce the name.
- We truncated utterances right after the name.

Listeners listened to names and rated how likely they thought a continuation was:

1. definitely nothing after
2. 3.
3. can’t tell
4. 5.
5. 6.
6. definitely something after
7. 4.
Form Analysis: name vs. name-then-description

Results.
- Naïve listeners can distinguish names that were uttered followed by a description (name-then-description) from names that were uttered alone.

Interpretation.
- Speakers pronounced names differently when they are followed by a description.
- This form is planned early.
- The form does distinguish shared and privileged names.
Experiment 2: conclusions

1. Name use. Speakers are over-informative when talking about entities that have privileged names, violating Grice’s Maxims of Quantity.
   - Other cases of over-specification:
     
     Director. *Seventh is looking out across the square, it looks like the middle of town, with a bunch of flags, international flags.*

     Matcher. *Fine, Rockefeller Center.* (Issacs & Clark 1987)

2. Ground. Speakers distinguish shared and privileged names in the form of their utterances.
   - Over-specification of names for privileged shapes is planned early.
   - No effect of the category manipulation because speakers were distinguishing shared and privileged.
Experiment 2: conclusions

3. Overlap. Speakers use names more often when they share more knowledge with their addressee (for both shared and privileged shapes).

• Not because they know the names better, or know which ones are shared better, in the high overlap conditions.
• Maybe they are teaching the name?
General conclusions

- Experiment 1 demonstrates that listeners can keep track of common vs. privileged information and use this distinction from the earliest moments of comprehension.
  - Addresses the IF question: our cognitive mechanisms can use a model of the other (“theory of mind”) in real time.
- Experiment 2 shows perspective-taking behavior in a more complex situation: (i) more objects (ii) no perceptual cue to their status.
  - Perspective-taking behavior scales up to more realistic situations.
  - These results do not require using a model of the other, and can come out “for free” from memory traces (Horton & Gerrig 2005). It might be art of the story, but cannot be extended to the comprehension results.
Thank you

Collaborators
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