Implicit Causality Influences the Choice of Anaphoric Expression

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Reference production in natural language

- Among several established referents, which one(s) do we choose to continue talking about?
- Which anaphoric forms do we choose when rementioning a referent?
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(1) **Peter** annoyed Mary because . . . **he** was practising the bagpipe.

(2) **Peter** wollte mit **Paul** Tennis spielen.

‘**Peter** wanted to play tennis with **Paul**.’

a. Doch **er** war krank.
   ‘However, he (=**Peter** or **Paul**) was sick.’

b. Doch **der** war krank.
   ‘However, he (=**Paul**) was sick.’

Bosch/Umbach (2007)
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b. Doch **der** war krank.
‘However, he (=Paul) was sick.’

Bosch/Umbach (2007)

- Do semantic phenomena that lead to remention expectations in discourse also influence the choice of anaphoric form?
Overview

1. Accessibility and anaphoric expressions
2. Discourse expectations: Implicit causality
3. Previous research
4. Production study
5. Open issues
Accessibility and anaphoric expressions

- Anaphoric forms used to refer to entities in discourse:
  null pronouns (*pro drop*), personal pronouns, demonstrative pronouns, definite noun phrases, etc.

- Anaphoric forms chosen according to cognitive salience/accessibility

**Reversed mapping hypothesis:**
- Simpler/more attenuated forms for more salient referents
- More complex forms for less salient referents

### Partial hierarchy of forms referring to animates (EN/GE)

<table>
<thead>
<tr>
<th>more salient</th>
<th>less salient</th>
</tr>
</thead>
<tbody>
<tr>
<td>∅ (pro drop)</td>
<td>def. NP</td>
</tr>
<tr>
<td>—</td>
<td>the woman</td>
</tr>
<tr>
<td>—</td>
<td>die Frau</td>
</tr>
<tr>
<td>er/sie</td>
<td></td>
</tr>
<tr>
<td>he/she</td>
<td></td>
</tr>
<tr>
<td>pers.pron.</td>
<td>dem.pron.</td>
</tr>
</tbody>
</table>

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Factors that influence accessibility

- Is the antecedent the subject of the immediately preceding clause?

(3) \( \text{Peter}_i \) liebt \( \text{Paul}_k \).

\( \text{Peter}_i \) loves \( \text{Paul}_k \).

- Where in the preceding clause did the antecedent occur?
- Is the antecedent the (discourse-pragmatic) topic of the preceding clause?
- Did the antecedent occur in a parallel syntactic configuration in the preceding clause?

⇒ Syntactic features are better understood than semantic and pragmatic properties
Implicit verb causality

- Implicit causality verbs: transitive verbs with two animate arguments
- Increased salience of one of the referents – more likely to be rementioned in subsequent discourse
- Expectation that an explanation referring to one of the two arguments will follow
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- Expectation that an explanation referring to one of the two arguments will follow
- Standardly assessed in continuation production studies

(4) a. Peter impressed Mary because . . . he played the bagpipe so well.
    b. Peter admired Mary because . . . she played the bagpipe so well.

- IC bias is the ratio of subject to object continuations
- Subject (NP1) vs. Object (NP2) bias
Two studies found no effect of implicit causality on the choice of anaphoric expression

- Fukumura & van Gompel (2010)
- Rohde & Kehler (2013), Kehler & Rohde (2014)
Previous research

- Two studies found no effect of implicit causality on the choice of anaphoric expression
  - Fukumura & van Gompel (2010)
  - Rohde & Kehler (2013), Kehler & Rohde (2014)
- Arnold’s (2008) *Expectancy hypothesis* predicts that reference production is (strongly) influenced by likelihood of mention
Fukumura & van Gompel (2010)

- IC has an influence on whom we talk about, but not how we do so.
- Forced reference continuation paradigm:
  “start the completion by referring to the entity [in the box]”

(5) a. Peter impressed Mary, because . . .
  b. Peter impressed [Mary], because . . .

(6) a. Peter admired [Mary], because . . .
  b. Peter admired [Mary], because . . .
Fukumura & van Gompel (2010)

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(a) Peter impressed Mary, because . . .  
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(a) Peter admired Mary, because . . .  
(b) Peter admired Mary, because . . .

- Participants produced personal pronouns and, occasionally, proper names
- When referring to antecedents in object position, anaphoric forms other than personal pronouns were used more frequently
- No effect of IC bias
Experimental study
Fukumura & van Gompel (2010), again

- Replication with two important additions/changes
  - **Gender sameness condition**: disambiguation (audience design)
    
    *Peter VERB-ed Mary vs. Peter VERB-ed John*

  - **Experiment in German**: broader range of referring expressions
    
    *er* (‘he), *der*, *dieser* (‘this one’), *jener* (‘that one’), *Peter*
Sample item (shown only for female subject)

(7) **Subject bias verb (stimulus-experiencer)**

a. Subject focus, different gender: Mary impressed Peter because . . .

b. Object focus, different gender: Mary impressed Peter because . . .

c. Subject focus, same gender: Mary impressed Jane because . . .

d. Object focus, same gender: Mary impressed Jane because . . .

(8) **Object bias verb (experiencer-stimulus)**

a. Subject focus, different different: Mary admired Peter because . . .

b. Object focus, different gender: Mary admired Peter because . . .

c. Subject focus, same gender: Mary admired Jane because . . .

d. Object focus, same gender: Mary admired Jane because . . .
Methods

- **2×2×2(×2)**
  - **1 verb type:** subject (NP1) vs. object (NP2) bias
  - **2 focus:** continuation about the subject or object
  - **3 gender of the two referents:** same or different gender referents
  - **4 counterbalancing of first referent gender:** female vs. male

- 40 items, 20 subject-biased and 20 object-biased verbs
- Bias assessed in a pretest without the focus condition
  (Subject bias verbs 90%, object bias verbs 10%)
- 32 native speakers of German
Annotation/Scoring

- Example condition
  - subject bias
  - object focus
  - same gender

(9) Peter beeindruckte Jonas, weil . . .

Peter impressed John because . . .

a. **Personal pronoun**: er leicht zu beeindrucken war.
   he was easily impressed . . .
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(9) Peter beeindruckte **Jonas**, weil . . .

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a. **Personal pronoun**: *er* leicht zu beeindrucken war.
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b. **Proper name**: *Jonas* leicht zu beeindrucken war.
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c. Proximal demonstr.: der/dieser leicht zu beeindrucken war.
   this one was easily impressed . . .
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d. Other, e.g. distal dem. jener leicht zu beeindrucken war.
   that one was easily impressed . . .
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- Inter-annotator reliability: Cohen’s $\kappa = 0.96$
Predictions

- More anaphoric forms different from personal pronouns with
  - *Object focus* (Fukumura & van Gompel 2010, Kehler & Rohde 2014)
  - *Gender sameness* (disambiguation strategy)
  - *Interaction between (i) verb type and (ii) focus and/or gender sameness* (against dissociation hypothesis in Kehler & Rohde 2014)?
Results
Object bias verbs

- 66.4 % personal pronouns with object reference in same gender condition
- 89.5 % personal pronouns with object reference in different gender condition

![Bar chart showing the proportion of anaphoric forms for different conditions.](chart.png)
Subject bias verbs

- 51.7% personal pronouns with object reference in same gender condition
- 93.5% personal pronouns with object reference in different gender condition

<table>
<thead>
<tr>
<th>Prop. of anaphoric forms %</th>
<th>pers.pron.</th>
<th>name</th>
<th>dem.pron.</th>
<th>other form</th>
</tr>
</thead>
<tbody>
<tr>
<td>gsame subj.</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>gsame obj.</td>
<td>90</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>gdiff. subj.</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>gdiff. obj.</td>
<td>100</td>
<td>0</td>
<td>0</td>
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Object-focus conditions at a glance

- Reference to object using personal pronouns: 51.7% for subject-biased and 66.4% for object-biased verbs. Significant interaction between verb type and gender sameness (Wald’s $z=2.7$, $p<.01$)

![Diagram showing the proportion of anaphoric forms with various personal pronouns and names for different conditions: gsame, gsam, gdiff., and gdiff. for subject and object bias.](image)
Results: overall remarks

- **Reference to subject arguments**
  - Almost 100 % personal pronouns
  - No significant difference between verb types (subject vs. object bias)
  - Small effect of gender sameness: only different-gender conditions triggered anaphoric forms other than personal pronouns
Results: overall remarks

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- **Reference to object arguments**
  - Coreference to the object more often with other anaphoric forms than coreference to the subject argument
  - **Effects of verb type, but only in same-gender condition**
  - Main effects of focus and gender sameness
Open issues

- Is production speaker- or hearer-oriented, or both?
- Relatively small effects? Explanations may disambiguate, too:

  (10) Mary impressed Jane because . . .
  a. she played the bagpipe so well.
  b. she was easily impressed.

- Complicating things: Results of continued testing indicate an influence of gender (which we only included for counterbalancing)
  ⇒ Effects may be stronger in male-male than in female-female conditions
  ⇒ feminine personal pronouns are a less valid cue due to syncretisms not present with masculine forms (German *die* = ‘she’ or ‘they’)?

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Conclusion and outlook

- We found an effect of IC bias on the choice of anaphoric expression
- Contingency on reference to objects
- Future research: Interaction between
  - topicality in larger stretches of discourse (global remention bias)
  - implicit causality (possibly only local remention bias)
Thank you!